

Mobile Technologies in Denmark

– Perspectives for entrepreneurship and venture capital



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Mobile Technologies in Denmark

– Perspectives for entrepreneurship and venture capital

(2008)

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MOBILE TECHNOLOGIES IN DENMARK

INDHOLDSFORTEGNELSE

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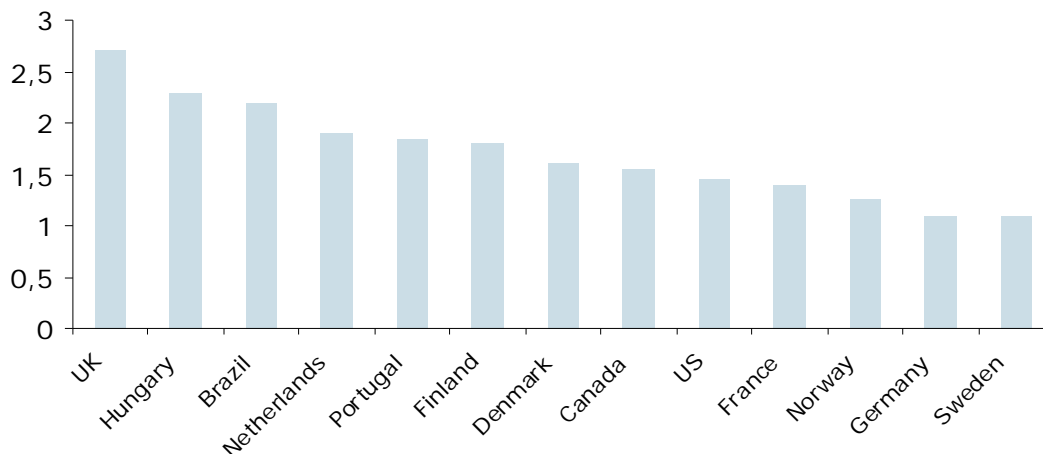
1. INTRODUCTION

Today, there are more than 4 billion mobile phones around the world, with more than a billion phones sold every year. Mobile phones are becoming more and more technically advanced, moving towards multi purpose devices that can handle the things a PC handles. In this report we will focus on mobile technologies including equipment and infrastructure, as well as applications and content used in mobile phones, PDAs, etc. The analysis will account for the global market conditions, market drivers and tendencies within mobile technologies. To create this report we have used both quantitative data; data from statistical sources, and qualitative data consisting of interviews with 20 central players within the mobile technology industry in Denmark.

THE MARKET FOR MOBILE TECHNOLOGIES

To get an initial feel for the market potential of mobile technologies, one can look at how much of GDP the national telcos account for. In most countries, the revenue of financial telcos account for between 1 and 3 % of GDP, cf. figure 2.1

FIGURE 2.1 NATIONAL TELCOS' REVENUE AS PERCENTAGE OF GDP



Source: Merrill Lynch, 2007

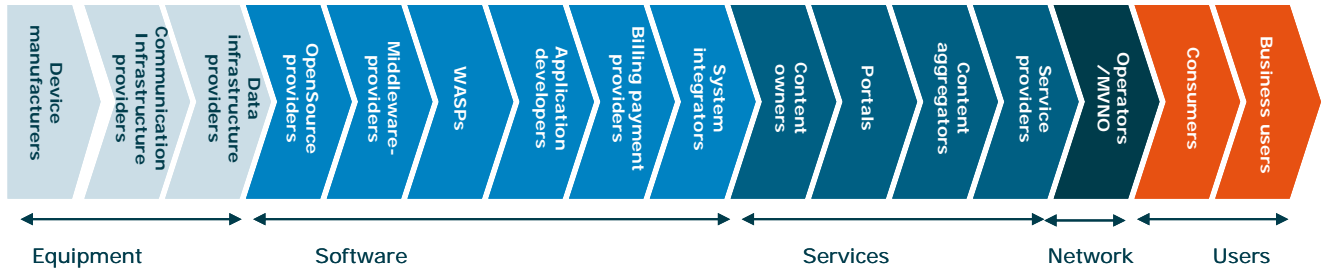
This obviously does not give the full picture, as the revenues of other telcos as well as hardware and software producers are not accounted for. Nokia, SonyEricsson and Motorola have accumulated yearly revenue of more than 700 billion DKK in the global market.

THE GLOBAL MOBILE INDUSTRY: PLAYERS AND COMPETITION

In general, the market for mobile technologies is characterised by tough competition in all areas due to the great market potential. The market is dominated by large, well consolidated terminal manufacturers and operators. These players define and set new standards for which options there may be for applications and features on the mobile phones.

The mobile industry has a complex value chain with numerous players, cf. figure 2.2.

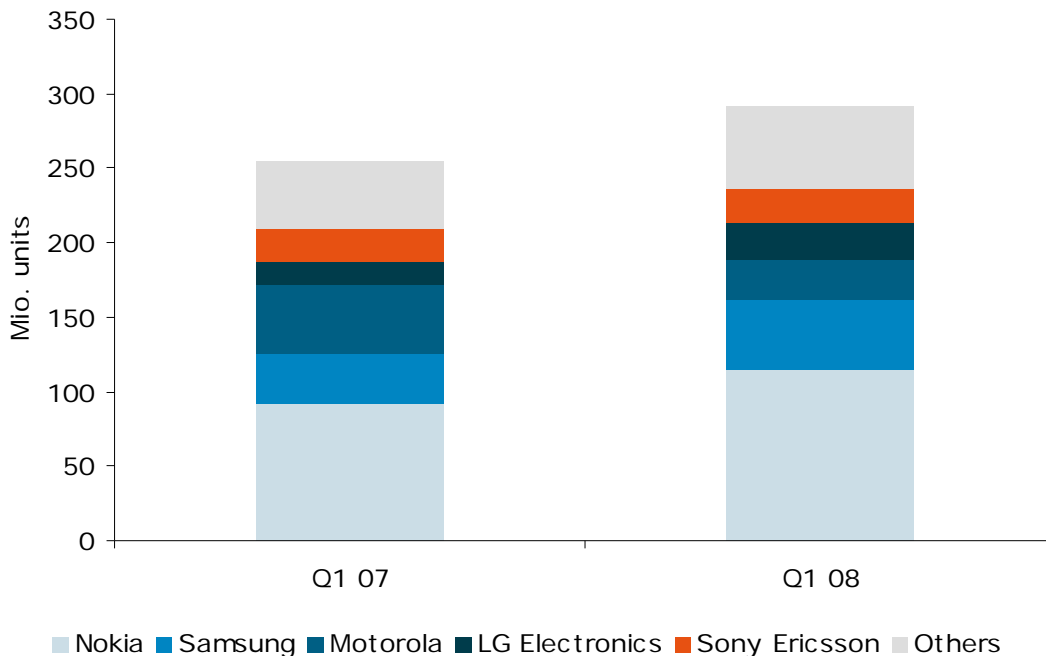
FIGURE 2.2 VALUE CHAIN FOR THE MOBILE INDUSTRY



Source: Strand Consult

Moving from left to right, it starts out with the hardware producers, manufacturing mobile phones and infrastructural equipment. This part of the value chain is characterised by a fiercely competitive environment, where manufacturers compete on features, price, design, brand and relations to mobile operators. This environment only leaves room for large, well consolidated global players that are able make large investments in the next generation of mobile phones, cf. figure 2.3.

FIGURE 2.3 TOTAL MOBILE PHONES SOLD



Source: IDC, 2008

The second part of the value chain is within software, i.e. software for system integration or handling and billing customers. The third part, services, includes players developing services and applications for mobile phones, e.g. content producers and

content aggregators. The latter is a broker who buys content and sells it to the operators. The content producers have so far been dependent on either getting their content or applications directly on the devices, which on the whole has not been possible for smaller independent players, or getting access to the operators' portals. It is characteristic of this part of the value chain that potential new, large players in media and advertising industries are closely monitoring the market situation wanting to get in. Especially owners of content, e.g. large media corporations are very keen on utilising their distribution channels to include mobile phones. This type of player is characterised by nervousness that the mobile platform will take over from other traditional media and thereby shift the competitive situation. The large media corporations are, however, not yet in the market but typically licence rights to independent content producers that develop games and content in various forms (e.g. music, wallpapers, ring tones, cartoons and news).

The final part of the value chain, before reaching the customers is the operators, both traditional telcos and newer players delivering virtual mobile networks (MVNO). The operators are mostly very large companies that have benefited from monopoly-like conditions, but now find themselves in a tough competitive market where customers are very price sensitive and have little loyalty towards their operator.

The traditional value chain is, however, transforming due to the new possibilities created by the increased speed of the 3rd generation mobile network (3G) giving direct access to the content through the internet. This is different from 2nd generation network, where wireless internet access is only obtainable through routers associated with wired broadband connections. The 3G technology therefore makes it possible to access wireless internet from anywhere and with greater speed. Next development phase is 4th generation, 4G, which consists of a combination of the wireless and wired systems making all traffic wireless.

MARKET TRENDS AND GROWTH DRIVERS

The mobile phone is increasingly becoming a part of our identity, both socially and culturally. This entails that there is a tendency towards doing things on the move, both in the personal life and as part of the business life as there are efficiency gains to be had from able to access the internet while being on the move. Technologically, the performance of mobile phones is of crucial importance in relation to which applications and services contain new and relevant business opportunities. Even though mobile phones have improved remarkably technically in few years, it is still a challenge to increase their technical performance if mobile content is to have a breakthrough in the broad consumer market.

One of the most important factors, if the mobile phones are to be used for other purposes than talking and text messaging, is battery life. It is important that there is still battery power left for talking after using the mobile for something else that might be battery intensive. Other important factors are screen size, capacity and speed of data input and processors.

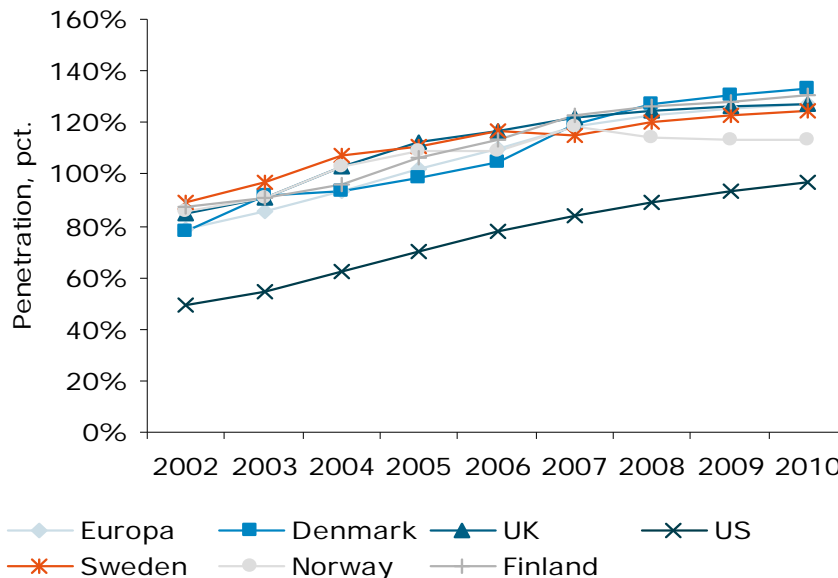
Another key factor is the stability and coverage of the 3G network. If consumers experience too many outages when using the mobile internet or if the potential amount of customers is limited due to lack of access, then this will be a barrier for the market size of the mobile technologies.

Finally, price is an important factor, as consumers in this market are very price sensitive. Even though it is possible to get a mobile subscription with unlimited download traffic, the price is still at a level where most average consumers will not make use of the offering.

Market Trends

In Denmark each citizen has on average 1.3 mobile phones which correspond to a penetration of 130 %, cf. Figure 2.4.

FIGURE 2.4 WIRELESS MARKET PENETRATION



Source: Merrill Lynch, 2008

The high degree of wireless penetration causes the operators to compete intensively on price. Whereas only a few years back they could create growth in revenue solely by improving the amount of subscriptions, in the current situation they are forced to target less on developed markets or focus on new business models to increase or merely to sustain revenues.

Today consumers primarily use mobile phones for talking and text messaging. Together, this accounts for 95 % of the traffic. That leaves only 5 % of traffic used on mobile content, data or internet browsing. As previously mentioned, the 3G network is a crucial factor in this, and according to Juniper Research, the amount of mobile phones that can run 2.5 or 3G network in 2012 will account for 88 % of all mobile phones on the market, and should therefore not be a constraint in the near future.

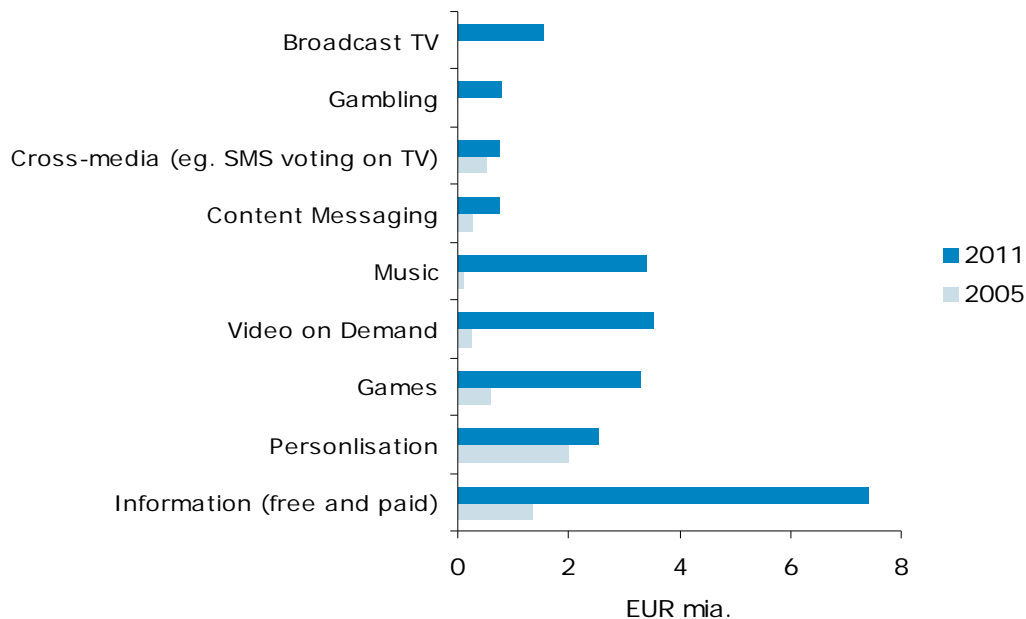
However, the implementation of the 3G network has hitherto happened slower than market observers had foreseen due to political, technological and social barriers in adopting the service cf. Analysis Research.

Globally, the revenues on mobile content account for approximately EUR 13.5 billion in 2008. This, however, is expected to triple to more than EUR 40 billion by 2010, cf. Juniper Research.

One of the large drivers of traffic will be applications and services dealing with information. There exists both free information services, generating revenue by using the network, and services that customers pay for, e.g. tourist information. However, consumers are used to getting the latter for free, and are therefore not likely to become a vital revenue driver for content makers.

In the future, more advanced types of content are expected to create the highest growth rates in revenue. There are great expectations for video, games and music, but also broadcast TV is expected a breakthrough in the years to come, cf. Figure 2.5.

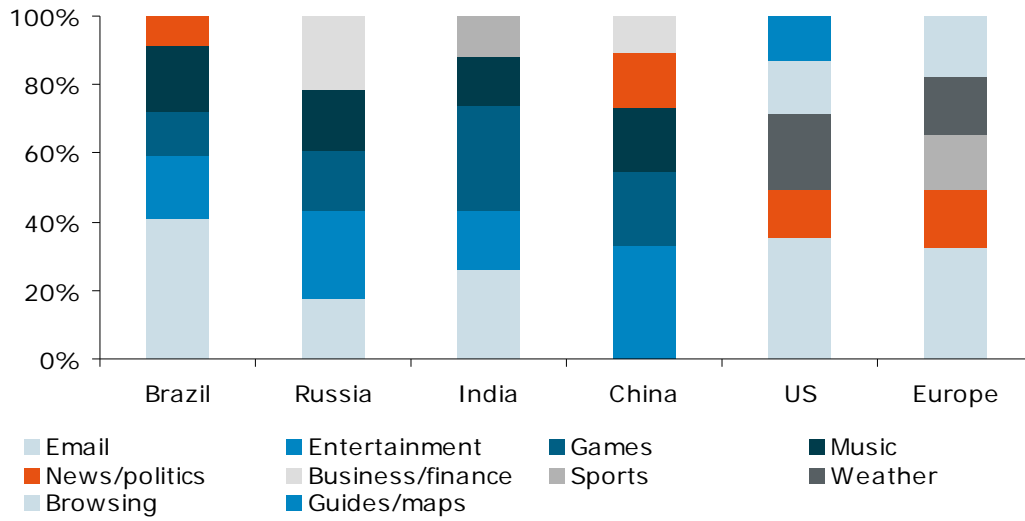
FIGUR 2.5 TURNOVER AND GROWTH WITHIN MOBILE CONTENT



Source: Analysys Research, 2006

There are very large geographical differences in what mobile content consumers use, cf. The Nielsen Company. Consumers in Europe and USA primarily use e-mail, internet and information services such as the weather, whereas in growth markets such as China, India and Russia, it is primarily entertainment and games that are used on the mobile internet, cf. Figure 2.6.

FIGUR 2.6 MOST USED CONTENT ON THE MOBILE INTERNET



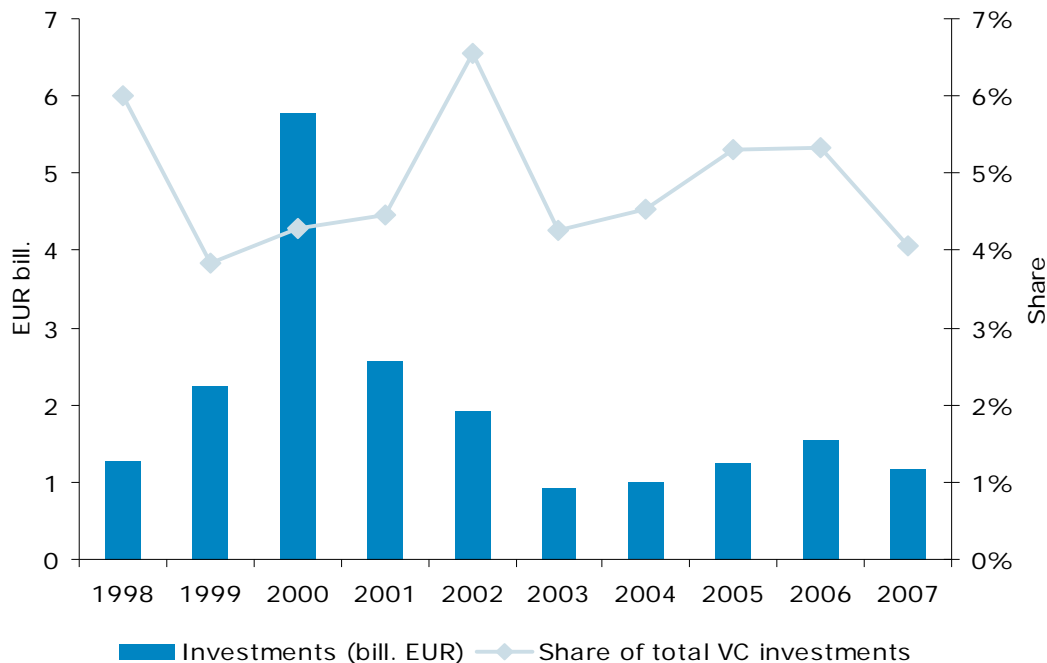
Source: The Nielsen Company

3. VENTURE CAPITAL INVESTMENTS IN MOBILE TECHNOLOGIES

During the last four years annual investments in mobile technologies have reached more than EUR 1 billion in USA and Europe. Overall, investments in mobile technologies have totalled approximately EUR 20 billion in the past 10 years, funding almost 2000 different companies.

The percentage of investments in mobile technologies has, out of all venture capital investments, declined in 2007 to a level of 4.1 %, the lowest level since 1999. It should also be noted that in spite of investments being almost 3 times greater in 2000 than in 1999 and 2001, the percentage only changed marginally, cf. Figure 3.1.

FIGUR 3.1 VENTURE INVESTMENTS IN MOBILE TECHNOLOGIES IN EUROPE AND USA



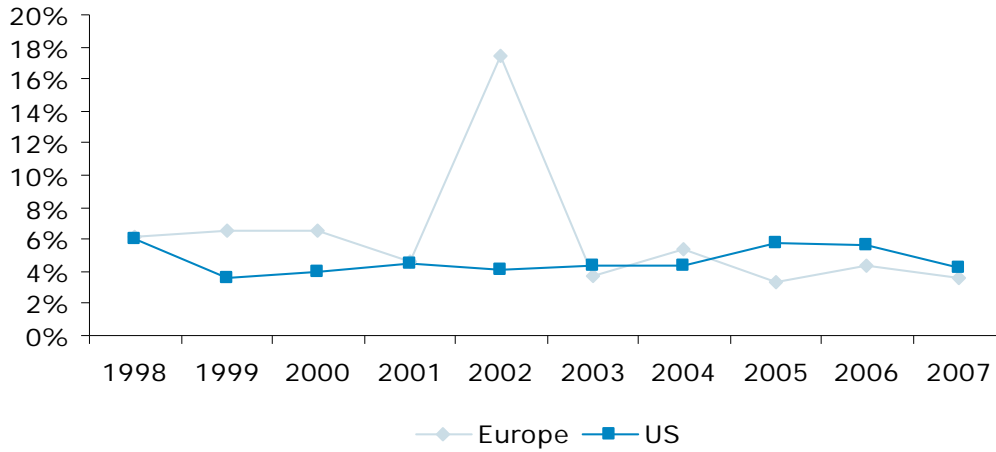
Source: VentureXpert

Venture capital funds have shown a significant interest in mobile technologies in the period 1998 to 2007. Throughout the period, 2/3 of the capital in both Europe and USA has been invested in later-stage companies.

Between 1999 and 2007 the percentage of venture capital invested in mobile technologies has varied from 3 % to 7 % of the total capital invested, both in Europe and USA. The only exception was in 2002 where one later stage mega-investment was made in the Spanish mobile operator, Airtel Movil1, cf. Figure 3.2.

¹ The Airtel Movil investment accounts for 70 % of total investments in 2002. If this investment is disregarded, total investments in mobile technologies in 2002 correspond to a level of 3 % to 7 %

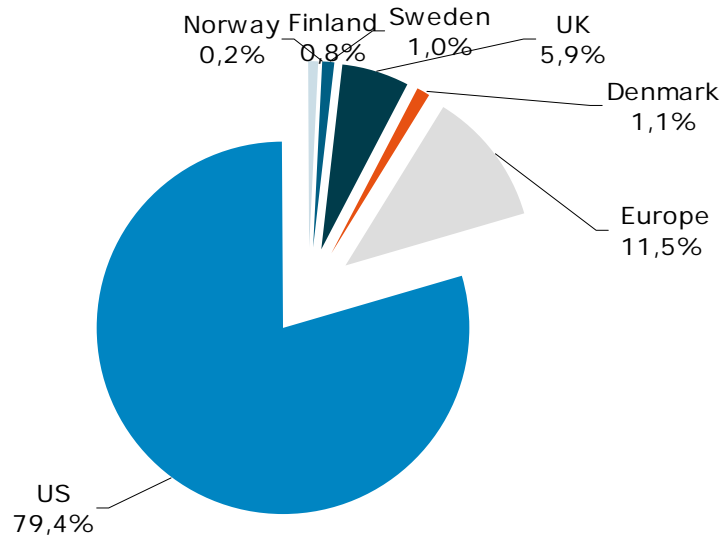
FIGURE 3.2 SHARE OF VENTURE CAPITAL INVESTMENTS IN MOBILE TECHNOLOGIES



Source: VentureXpert

Accumulated over the entire period from 1998 to 2007, the vast majority of capital has been invested in American companies (79%) compared to European companies (21%), cf. Figure 3.3.

FIGUR 3.3: INVESTMENTS IN MOBILE TECHNOLOGIES BY COUNTRY



Source: VentureXpert

Note: Investments are calculated on accumulated capital supplied.

Denmark accounted for 1.1 % of the investments, which amounted to EUR 130 million. Compared to the rest of the Scandinavian countries, Denmark has attracted most

capital. However, it should be noted that this amount is dominated by investments in a single company, End2End.

End2End

End2End was established in 2000 in Aalborg, Denmark and designs and develops content for mobile phones. In 2006 End2End was acquired by MACH Group.

End2End has received venture capital from a group of large foreign investors including Draper Fisher Juvetson, Hewlet-Packard and Cisco Systems. Since End2End was established, it has received almost EUR 70 million in venture capital.

Established: 2000

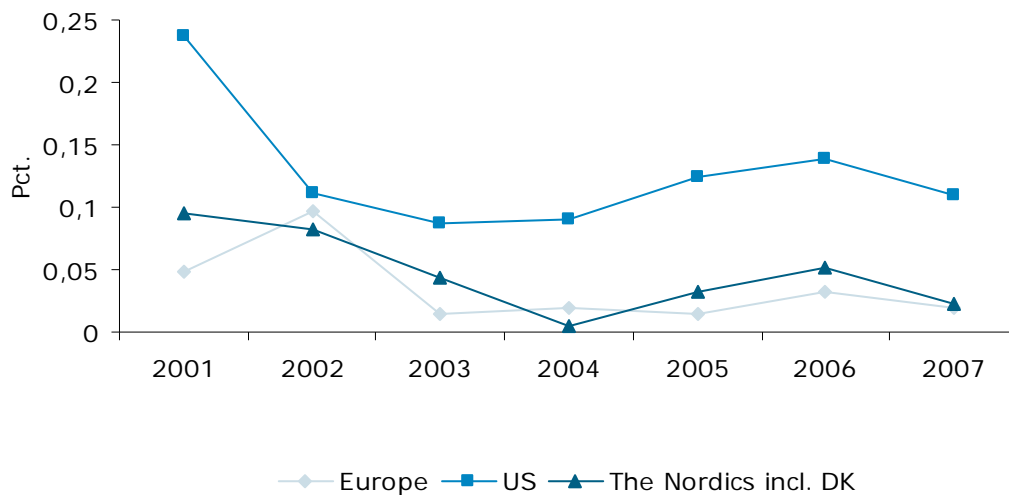
Investors: Cisco Systems, Hewlet-Packard, Amadeus Capital Partners, DB Venture Partners, Draper Fisher Juvetson, ePlanet Ventures, e-millennium Partners

Received venture capital: EUR 70 million

Exit: Sold in 2006 to MACH Group

The investments in mobile technologies as a percentage of total investments are, as mentioned above, very similar for the US and Europe. However, if we measure the investments relative to GDP, it reveals a quite different picture, cf. Figure 3.4.

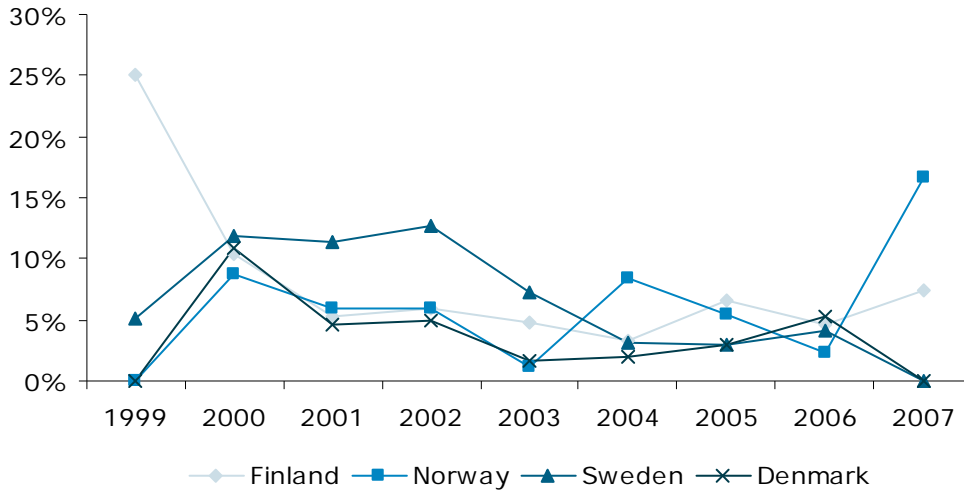
FIGUR 3.4 VENTURE CAPITAL INVESTMENTS IN MOBILE TECHNOLOGIES RELATIVE TO GDP



Source: VentureXpert and Statistics Denmark

In the US, the investments relative to GDP are much higher than in Europe. As mentioned above, the majority of the capital in Denmark has been invested in one single company. It is therefore not surprising that Denmark, measured in number of companies which has received venture capital, lags behind the leading Nordic countries, cf. Figure 3.5

FIGUR 3.5 NUMBER OF VENTURE INVESTMENTS IN MOBILE TECHNOLOGIES IN THE NORDIC COUNTRIES



Source: VentureXpert

Denmark and Norway are the two countries that have received venture capital to fewest companies averaging 2 and 1.8 per year, respectively. Finland and Sweden have received capital to significantly more companies, averaging 6.9 and 7.7 per year, respectively. This, however, is not surprising since Nokia and Ericsson (Sony-Ericsson) work as drivers for spin-outs and knowledge sharing in these countries.

As a point of reference, in the US, from 1999 to 2007, 951 companies within mobile technologies received venture capital investments. This corresponds to an average of 95 per year, almost 50 times as many as in Denmark.

The trend in Denmark has been reasonably constant over the period with investments in 2-3 companies every year since 2001. It should be noted that two Danish companies, Blip Systems and Unwire, have received capital in 2007, however, these are stated as buy-outs in VentureXpert and thus excluded from the analysis.

INVESTORS AND EXITS IN MOBILE TECHNOLOGIES

The most active investors in mobile technologies can be grouped into three categories: The global multi investors, e.g. J. P. Morgan, the large venture capital funds, like OAK Investment Partners, and Corporate Venture Capital investors (CVCs), such as Motorola Ventures.

The majority of the most active investors are mainly active in the US. More than 1000 different funds have invested in mobile technologies from 1999 to 2007, but only four have undertaken 20 investments or more in the industry cf. Tables 3.1 and 3.2.

TABLE 3.1: US INVESTORS WITHIN MOBILE TECHNOLOGIES

The name of the investor	Capital under management (BDKK)	Number of investments
Apax Partners Worldwide	175	20
J. P. Morgan Partners	125	18
OAK Investment Partners	42	19
New Enterprise Associates	25	15
Draper Fisher Jurvetson	20	21
Intel Capital	5	50
Telesystem-Argo Global Capital	2	13
Motorola Ventures	2	21

Source: VentureXpert

The most active investor is Intel Capital with investments in 50 companies, more than twice as many as the second most active investor in the US. In Europe, one investor is by far the most active in the industry throughout the period, namely 3i Group with its 29 investments. But unlike in the US, the most active investor in Europe is not a CVC investor.

Table 3.2: EUROPEAN INVESTORS WITHIN MOBILE TECHNOLOGIES

The name of the investor	Capital under management (BDKK)	Number of investments
3i Group	106	29
Amadeus Capital Partners	3	7
Finnish Industry Investment	1	8
Ledstiernan	0,5	7
Ruukki Group Oyj	N/A	7

Source: VentureXpert

In Denmark, investors have typically invested in one or two companies within mobile technologies. In Finland and Sweden the picture is quite different; In Finland investors such as Finnish Industry Investment and Ruukki Group are the most active with 8 and 7 investments, respectively. Apart from these two, Eqvitec Partners and Innofinance both invested in 5 companies in the period. In Sweden it looks pretty much the same, with Ledstiernan and BrainHeart Capital as the most active investors, each with 6 investments in Swedish companies.

A common feature in all the Scandinavian countries is that the most active investors are local investors rather than large foreign investors. The only exception to this is 3i Group with five mobile technology investments in Nordic countries.

As previously mentioned, during the last 10 years venture capital investors have invested in 951 companies within mobile technologies in the US, while in the same period there were 143 exits. This corresponds to an exit rate of 15 % through trade sales or IPO's. This is significantly higher than the average of all industries which was 9% in the same period.

Most companies within mobile technologies have been exited through trade sales (76 %), which correspond to the trend of the rest of the venture capital industry, where 77 % of the companies are exited through trade sales and 23% through IPO's.

4. THE INDUSTRY FOR MOBILE TECHNOLOGIES IN DENMARK

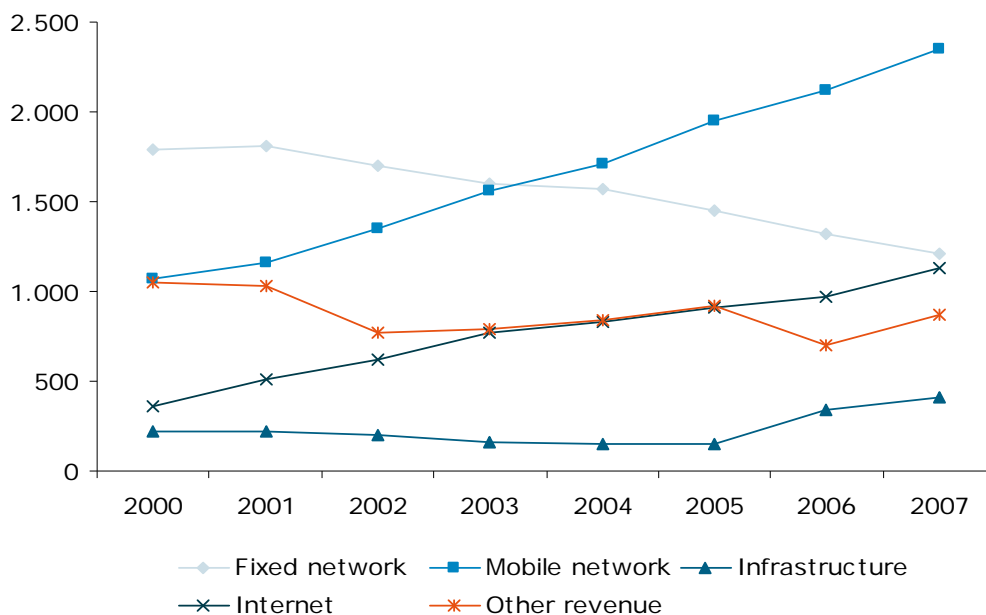
The global market for mobile technologies is experiencing an explosive growth these years. It is therefore interesting to take a closer look at Denmark's opportunities in this industry, and whether Denmark has the capability to capitalise on the global growth.

Denmark has a long tradition for being advanced with respect to IT. In World Economic Forum's Global Competitiveness Report, Denmark rates 5th in terms of accessibility and use of new technologies, and the Danish competitive position in the IT space has moved from 8th place to 5th place from 2007 to 2008 due to, among other things, an advanced technological infrastructure and an open business environment, cf. The Economist Intelligence Unit.

In Denmark, the telecom industry had total revenue of EUR 6 billion in 2007. This includes revenue generated on wireline, mobile/wireless, internet and infrastructure, and corresponds to 3% of Danish GDP. Adding related revenue in other segments, the telecom industry is estimated to account for approximately 4 % of GDP, or about EUR 9 billion.

When looking at developments in the Danish telephone industry, it is obvious that mobile telephony has overrun wireline telephony. Revenues from mobile traffic account for approximately 35 % of the total revenues in the telecom industry cf. Figure 4.1.

FIGURE 4.1 DEVELOPMENTS IN TURNOVER IN THE DANISH TELECOM INDUSTRY 2000-2007, MILLION EUR.



Source: Danish National IT and Telecom Agency, 2008

Historically speaking Denmark has had a dominant position within mobile and wireless technologies. This is primarily driven by a technology cluster in the Aalborg area but also in Copenhagen. The cluster in Aalborg has mostly been focused on hardware based technologies, whereas the Copenhagen cluster has had predominance within software development for wireless and mobile technology.

The dominant position was originally created by the company SP Radio in the 1960's where the company developed phones for ships. In the 1970's the first spin-outs from SP Radio were established – Dancom (later Dancall) in 1973 and Shipmate in 1977. These companies created the foundation for an industry within mobile and wireless industry.

In the beginning of the 1990's, these Danish companies were acquired by international players. Dancall, was acquired by Bosch, which later was acquired by Siemens and Flextronics. The cluster in the Aalborg area experienced rapid growth in the second half of the 1990's, which led to several multinational companies establishing development activities in the region, e.g. Ericsson, Nokia, Siemens Networks and Motorola.

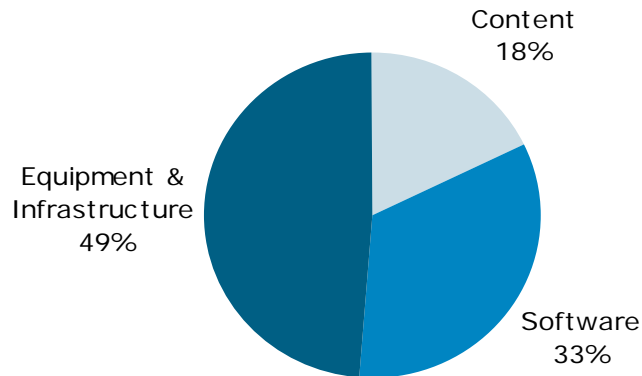
A contributing factor to the dominant position in Aalborg is also to be found in the research tradition build around Aalborg University within this industry. Aalborg University's Centre for Tele infrastructure has world leading research, inter alia within 4G network and infrastructure in general.

Denmark thus has a dominant position when it comes to research and development in particular within wireless networks. However, the increased globalisation and competition as a result of more easily accessible technology have caused the dominant position of the cluster to dwindle. At the same time, the shift in focus from hardware and infrastructure, which today is a mature market with fierce competition between global players, to applications and new services and content for mobile phones means that the Danish cluster has to get move in new directions if the companies are to keep a leading position in the global market.

The companies can be split up in the segments equipment and infrastructure, which is primarily development and production of hardware, software development and development of services and content for mobile phones. In this statistical description only companies with research and development within mobile and wireless technologies are included, thus excluding operators. Operators are traditionally regarded as a part of the mobile technology industry, and in other countries the operators also have significant research and development activities, but that is not the case in Denmark.

Denmark's historical dominant position within hardware implies that there is a prevalence of companies within this segment, which accounts for almost half of the industry, cf. Figure 4.2.

FIGURE 4.2 DANISH COMPANIES WITHIN WIRELESS/MOBILITY SPLIT INTO SEGMENTS

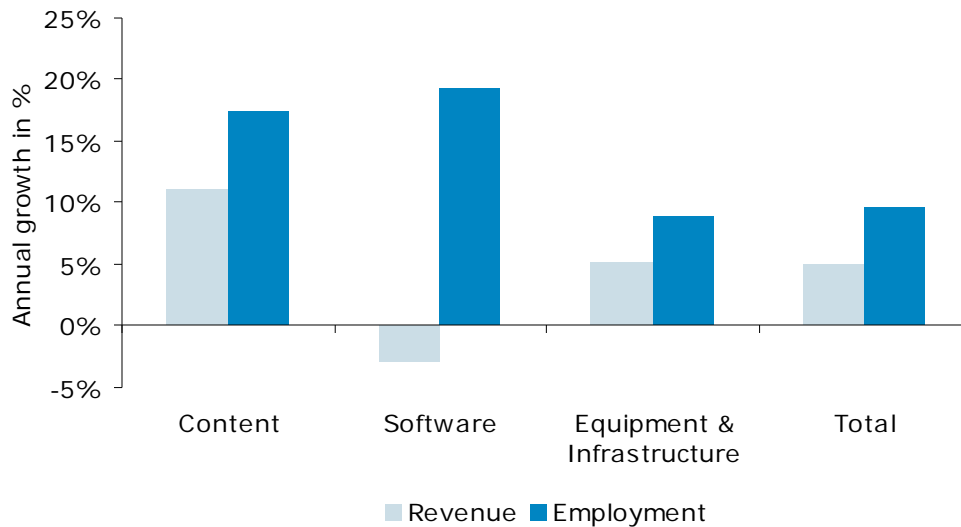


Source: Vækstfonden

Companies within equipment and infrastructure also represent the primary revenue in the industry. All in all, 97 % of revenues within mobile and wireless technologies are created by hardware makers. Thus, both software development and content have very limited revenues compared to hardware producers. This has to do with the fact that Danish industry encompasses a number of very large hardware manufacturers which act on the global market and therefore have significant revenues.

Where hardware producers account for most of the revenues in the industry this segment has not experienced the greatest growth. Overall, the annual growth of the total mobile and wireless industry is 5% in revenues and approximately 10% in employment. These figures, however, mask very large variations across companies, cf. Figure 4.3.

FIGURE 4.3 ANNUAL GROWTH IN TURNOVER AND EMPLOYMENT 2004-2007



Source: Vækstfonden and BusinessView

As with the global trend, the highest growth is found within the content segment. However, this growth is created from a modest point of departure. Companies in this segment have experienced annual growth in revenue around 10 % and growth in employment of 17 %. The hardware producers have a much lower annual growth of only 5 % and 9 % in revenue and employment, respectively. The negative growth in revenue for the software segment should be seen in connection with the fact that some large international players have scaled down their activities in Denmark.

4.1 PLAYERS WITHIN MOBILE TECHNOLOGIES

The Danish industry for mobile technology can be categorised into knowledge institutions, established companies and start-ups, cf. Table 4.1.

TABLE 4.1 CENTRAL PLAYERS WITHIN MOBILE TECHNOLOGIES IN DENMARK

Established Companies	
Manufacturers	Operators
Nokia Motorola Texas Instruments Nokia Siemens Networks RTX Telecom End2End	TDC Telia 3
Knowledge institutions	Start-ups / Smaller companies
Aalborg University – Centre for Telecom infrastructure (CTIF) Aalborg University - Centre for Communication, Media & Information Technologies (Ballerup) Crossroads Copenhagen Innovation Lab	BLIP Systems Campfire CDRator Excitor Kiloo Powerhouse Games Unwire Zyb

4.2 SWOT ANALYSIS OF THE MOBILE TECHNOLOGY INDUSTRY

In the following, we will sum up the current strengths, weaknesses, opportunities and threats of the Danish mobile technology industry in a SWOT analysis.

Strengths

Denmark generally has a strong foothold within IT, which provides a good starting point for developing mobile technologies as Denmark is regarded as a technologically advanced market. In Denmark people on average have almost 1 ½ mobile phone each, but even more importantly, Danish consumers have fairly advanced utilization of mobile phones and many experts emphasise Denmark as a good test market.

The industry has a strong foundation for research and development. There are some large, global companies with R&D within mobile communications. Many Danish engineers are employed in these companies, which provide a strong skills base in mobile technologies.

Another strength is a university environment with high quality research, and good collaboration between universities and companies, creating a strong experience base within mobile technologies. Finally, experts emphasize that in general it is easy to establish new companies in Denmark and that the culture is conducive to the establishment of new growth orientated companies.

Weaknesses

One weakness for the mobile industry and especially for new companies in the industry is the limited home market. This makes it difficult to achieve proof of business before entering the global market.

It is also emphasized that the historical focus on mobile telephones and infrastructure can be a disadvantage, because the industry as a result has failed to develop a first mover advantage within the fast growing market for content and applications.

The entrepreneurial spirit within mobile technologies in Denmark is limited even though more than 10.000 people are employed in the industry. Experts point out that this is due to a lack of willingness to take risks and a lack of role models that have created successful companies. This should be seen in connection with the fact that the industry is very engineer driven, which the experts suggest is often too technology focused to grab the market opportunities that are opening up.

Opportunities

There are great opportunities for the Danish industry in the changes that the value chain is undergoing these years due to the increasing speed and implementation of the mobile internet. This opens up for new players with easy access to the global market due to the character of the technology.

Threats

The threats facing the Danish position within mobile technologies are, among others things, coming from the fact that the market – as it looks today – is dominated by large global players. Even though a transformed value chain will give some opportunities for new players, especially within content and applications, the large corporations still have an advantage due to their market position. On top of this comes that due to the attractive growth rates within the industry, the market becomes interesting for content producers of other platforms, e.g. large game producers. There is a risk that the switch from hardware towards content and applications will be a huge squeeze on Denmark's position in the global industry.

As to the development in the Danish industry it is emphasized by the experts as a worrying factor that many young people are not attracted to IT and technology in general. The Danish industry is at risk of falling behind because the creative capabilities and ideas are not transformed into new companies, and because other countries have a stronger focus on innovation within the industry.

FIGUR 4.8 SWOT-ANALYSIS OF THE DANISH INDUSTRY FOR MOBILE TECHNOLOGIES

Strengths	Weaknesses
Advanced market: Many mobile phones and progressive in the use of them Good IT infrastructure Highly educated work force (engineers are globally competitive) Good R&D capacity due to presence of large R&D heavy companies and great university environment Strong collaboration between universities and companies and a good entrepreneurial environment Easy to establish new companies and a culture that supports it	Limited home market Lacks an engine for the development of the industry Taxation that makes it difficult to attract foreign competencies Limited political attention and financing of research, especially regarding content Lack of willingness to take risks, entrepreneurial spirit and few role models Limited commercial competencies; too much focus on technology instead of market
Opportunities	Threats
Historical value chain barriers disappearing in the years to come The industry is "born global" and the internet makes it easy to penetrate the market Low entry costs and scalability in software and content gives easy access for new companies	Global market, where the large and well-known brands set the agenda The Danish industry is dominated by global players that can leave "over night" Young people are not attracted by technology The infrastructure and value chain is kept shut as today Creative capabilities and ideas do not keep up with other countries

4.3 BUSINESS OPPORTUNITIES WITHIN MOBILE TECHNOLOGIES

There are some great additional opportunities for new players within mobile technologies. These opportunities do not, however, lie in the traditional value chain, which is characterised by fierce competition, but in the adjacent part of the value chain in the development and production of applications and services for mobile phones.

Entertainment

Entertainment is one of the segments where high growth rates are expected. This segment, which covers games, music, TV, video on demand, etc., is experiencing a demand that is positively correlated with the development of more advanced phones and enhanced user-friendliness. Personalisation content such as ringtones, wallpapers, games and music are the services that are used the most today, while demand for TV on mobile phones is expected to grow significantly over the coming years. For applications and content within entertainment, access to consumers is crucial and the market is driven by the possibility of getting entertainment on the move.

As the market is today, it is a perpetual challenge for new companies to get around the operators and manufacturers, to gain access to end users. It is difficult for an independent player to create enough volume because there are many different mobile platforms. Thus, independent players still have to have agreements with mobile manufacturers or operators in order to get access to end users.

Integrated systems such as Iphone and Itunes have revolutionised business models for distribution and payment of content, and the large mobile manufacturers now turn to

this business model, e.g. Nokia's Ovi-platform and SonyEricsson's Play Now Arena, where users can download music, games and other content via the manufacturers' own web pages. This leads to enhanced competition between manufacturers and operators, even though it is not something they do to create revenue, but rather to keep customers loyal and to brand their own services.

A new tendency is open source operating systems such as Google's Android platform. This creates opportunities for developers who want their content and applications out to the end users, because the platform is free for mobile phone manufacturers. If the manufacturers in a broader sense adopt the Android platform it will enhance the scaling potential for new content and applications.

Independent content producers have an array of distribution channels, and the manufacturers portals are thus another possible distribution channel for independent players, together with the operators' portals, content aggregators and web pages as Handango that gather content and distribute it directly to consumers.

The Danish company Powerhouse Games has succeeded in developing three games for iPhone that are sold through Apples AppStore, and thereby have accessed the large market that iPhone creates. Analytics estimate that AppStore will get a turnover of more than 5 billion DKK in 2009. Up till now AppStore has had 65 million downloads.

Powerhouse Games

Powerhouse Games was established in 2006 and has developed four games within the casual games category for iPhone and iPod Touch. These games can be downloaded directly from Apples AppStore and are being done so more frequently than games from international giants like EA Games. Powerhouse Games has signed an agreement to become a certified developer for iPhone and expects to launch three more games this year.

Powerhouse Games offers a multiplatform which enables it to release it on various platforms such as iPhone, Android, Symbian, Nintendo DS and Wii, interactive TV and PC/Mac. In addition to producing games, Powerhouse Games also helps other brand-owners and game suppliers to launch on these platforms.

Year of Establishment: 2006

Investors: Capital Plus

Number of employees: 1

Website: www.powerhouse-games.com

The challenge for new players is that even if it is possible to get direct access to consumers through a web page, the number of users that retrieve significant amounts of content for the mobile phones is still very limited. Secondly, the well-known brands often have a much higher impact with consumers than new players and have the opportunity to exert massive advertising. This is underlined by the fact that eight out of the games on the top ten of most downloaded mobile games were from well-known

brands, cf. Deloitte. This is in part due to consumers often downloading games from the operators' portals.

A solution for smaller players is thus to get access to consumers through partnerships with large players, e.g. operators, producers or large media companies, owning content. This is exactly the approach that the Danish venture financed company, Campfire, has utilised by entering an agreement with Marvel to make animated previews as cartoons for the mobile phones when they launch new movies, e.g. The incredible Hulk and Spiderman.

Campfire A/S

Danish Campfire A/S has developed a technology that enables transformation from classic printed cartoons to the mobile platform. Campfire's product is launched under the name CATOOZ® and it enables addition of special effects such as cinema sound, vibration and animated speech bubbles for each picture. The reader uses his mobile phone to flick pages and the added effect ensures that the reader has a unique experience.

Campfire A/S' dynamic cartoons are based on well-known cartoon universes, of which many are still published in printing. Campfire has, among others signed an agreement with Marvel™ about publishing mobile cartoons of Spider-Man, The Incredible Hulk, X-Men, Fantastic Four and Ironman. All five universes have been launched in theatres throughout the world with great success, and there are more Marvel films on the way. Additionally, Campfire has a license to publish Frank Madsen's "Kurt Dunder", Werner Wejp-Olsen's "Inspector Danger's Crime Quiz", ITE's "Agent Hugo" and many more. These agreements ensure that Campfire A/S will have direct access to a large consumer market via world famous brands

CATOOZ is launched in Scandinavia and Germany.

Year of establishment: 2007

Investors: Vækstfonden, Tingskifte Invest

Raised venture capital: 5,5 million DKK

Website: www.campfire.dk

Another option is to use social networking pages for viral sales promotion and thereby provide users with knowledge about content and at the same time make investors interested in the project. This is what Danish Limbo Games did, by putting a trailer of their coming 2D black and white game "Limbo" on the internet and in two weeks accomplished more than 2 million downloads.

Location based services

Services related to where the users are located, is expected to grow as more and more mobile phones are sold with integrated GPS. Telematics Research Group expects that by 2012, 220 million mobile phones will be sold with navigation applications and this is foreseen to grow to 500 million units by 2015. There is thus a very large market for such services solely due to the consumer base. It is also an area where the large mobile manufacturers already have launched services, e.g. Nokia Maps, and where a good deal of M&A activities occurs. In 2007 Nokia acquired Navteq for 5.7 billion EUR.

Navteq is a leading supplier of digital maps for car navigation, mobile phones and internet based maps. If new players are to penetrate this market, they have to have a significant value proposition that stands out from what the large mobile manufacturers offer.

The combination of navigation/GPS and internet searching is another area that is expected to have a breakthrough with the distribution of GPS enabled mobile phones. This includes searching based on where the user is located geographically to find for instance a particular shop or restaurant. It can also be an effective tool in connection with marketing activities.

Mobile marketing is one of the largest business areas within the location based services. In 2008 expenses for mobile advertisements will account for about EUR 1 billion but it is expected to grow to approximately EUR 5 billion by 2010, cf. Juniper Research. Danish BLIP Systems, which was established as an MBO from Ericsson in 2003, base their location based services on Bluetooth technology and is focused on marketing at indoor locations where the GPS does not reach.

BLIP Systems

BLIP Systems (Bluetooth local infotainment point) develops and sells BlipZones, which is a product for mobile marketing that allows advertisers and owners of information and entertainment to publish content on consumers' mobile phones at times where consumers and products are located near each other.

Companies that want to market themselves can use BlipZones to focus the geography of their marketing efforts very precisely. The product targets people at the right place and time no matter if it involves distribution of content, focused marketing campaigns or tailor made events.

BlipZones was for example used at Euro 2008 Football tournament. One of the main sponsors, KIA Motors, installed BlipZones in their demo cars which were set up in the Fan zone – areas dedicated for fans in cities where the games were played. BlipZones was used to launch campaigns about KIA, meanwhile, fans could download information about games played.

Year of establishment: 2003

Investors: LD Equity

Number of employees: 15

Community based applications

On PC's, social and interactive networks with user generated content such as YouTube, Facebook and MySpace gain more and more ground. These types of forums have now turned towards the mobile market, where applications typically will be offered through the operator's services. Social networks have, however, yet to penetrate the mass market for mobile technologies, cf. Juniper Research.

In South Korea, where users have a more advanced use of their mobile phones than European and American users have today, a social website, Mobile Cyworld, a Korean version of MySpace, gives a turnover to operators of around EUR 33 million. The Global market value of community based applications is expected to increase tenfold over the next 5 years to more than EUR 3 billion, cf. Juniper Research, and it is expected that more than 140 million people will use mobile social networks by 2013, cf. ABI Research.

There are, however, already examples of companies that have penetrated the consumer market without being constrained to operators. In Denmark, Zyb's interactive phone book managed to build a large user base. However, Zyb was later acquired by Vodafone, which exemplifies the operators' desire for accessing users on this market.

Zyb

Zyb was established in 2005 and started offering a service for mobile users that enabled them to create back-ups of their contacts and calendar from their mobile phone. This could be imported to a new phone easily and free of charge. Based on the more than 20 million contacts that were connected to Zyb's phone book service, Zyb has built a mobile social network where users can share contact data and exchange information and messages with friends, family and other contacts.

Zyb's address book interacts with Google Maps and Facebook. The user will automatically get updated addresses, share calendar with friends and see where contacts are located at any point in time.

In 2008, Zyb was acquired by Vodafone, because Zyb's social phone book fits into Vodaphone's strategy of enhancing and improving the services that the company can offer their customers.

Year of establishment: 2005

Investors: Nordic Venture Partners

Exit: Acquired by Vodafone in 2008 for € 31,5 million

Number of employees: 18

Website: www.zyb.com

Business applications

The increased globalisation and competition puts pressure on companies to minimize response times and the increasing overlap between professional and private life enhances the need for employees to be always "on". Furthermore, there is a large market for solutions in niches in the value chain which can make business processes more efficient and make new product development available for customers.

Mobile business applications such as e-mail, internet access, sales tools, etc. to make business processes mobile, are expected to grow from EUR 0,8 billion in 2005 to EUR 2,3 billion by 2010, cf. IDC. The largest growth is expected for processes related to specific line of business. This could be tools that allow a mobile sales unit to directly access stockpile information while meeting with the customer.

E-mail has so far been the application with the largest impact among mobile users, but it is an area characterised by tough competition among few players. With their e-mail handling software, Danish Excitor has been able to penetrate this market and was, in 2008, pointed out as one of eight most important players in the market for mobile e-mail by Gartner.

Excitor

Excitor was established in 2001 and develops and sells software that gives employees secure access to e-mail, documents, calendar and contacts on their mobile phones and PDA's. Excitor's software gives the company a chance to manage and support many different mobile units centrally with a high level of security.

The solution supports all conceivable mobile operating systems, works in all networks and is operator independent. Furthermore, the company can get statistics on data and speech which provides control of user behaviour and traffic costs and thereby makes it possible to negotiate deals with operators.

Excitor's e-mail solution has already integrated been sold to companies like Arla Foods, Ernst & Young, Svenske Handelsbanken and Siemens.

Year of establishment: 2001

Raised venture capital: 22,4 million DKK

Investors: Nordic Venture Partners

Number of employees: 70

Website: www.excitor.com

New players that offer "line-of-business" solutions which make business processes more efficient by making them mobile, have good opportunities for market penetration.

The tough competition between telephone operators enhances their focus on making business more efficient while minimizing costs. This has created room for new players that offer solutions to enable operators to handle their customer service and invoicing easily and with low costs. An example of this is CDRator, which develops and sells a fully integrated customer handling system for the telcos.

CDRator

CDRator was established in 2001 as a software house to develop and sell a platform for invoicing and organising customers in the telecom industry, enabling the telcos to register new customers, settle and invoice, render customer support, building website with self-service, etc.

CDRator delivers tailor made systems, which are easy and cheap for the operators to integrate and streamline their administrative processes around to save time and resources in servicing customers. The solution is integrated with the company's existing systems and gives a high degree of process automation so that employees can handle 15.000 customers individually rather than an average of 3.500 customers which is typical for companies in the telecom industry.

CDRator's customers are mobile operators like Telmore, which was the first mobile operator in the world to utilise the internet as the only channel for sale and distribution.

Year of establishment: 2001

Number of employees: 105

Website: www.cdrator.com

Possibilities on the mobile platform have made many players interested in getting a mobile dimension in their product, e.g. media and content producers. However, the many different terminal platforms and the numerous possibilities for how content can be presented on the mobile phone imply that many content producers and media companies choose to outsource the assignment to companies focused in this area. A number of companies serve as gateways for mobile content, e.g. Danish Unwire.

Unwire

Unwire was established in 1999 and offers a platform enabling content producers and owners such as media companies, advertising agencies, telcos and companies in the financial sector to supplement their business with mobile solutions.

Unwire delivers mobile solutions for two areas. First of all, Unwire offers a solution to handling payments related to mobile services like text messaging, MMS and WAP. Secondly, Unwire offers a platform to offer services to end users, e.g. mobile campaigns, competitions, games and interactive TV.

Unwire can handle a wide crowd of customers ranging from one-man businesses, needing simple invoicing solutions to large media companies that have customers in many countries with a broad range of content of which they want to distribute to their customers.

Unwire delivers solutions to customers such as Danmarks Radio, TV2 Denmark, Egmont and Coca Cola, and are also behind the SMS ticket system in Greater Stockholm local traffic, a solution that handles millions of SMS-based tickets in Stockholm each year.

Year of establishment: 1999

Investors: LD Equity

Number of employees: 75

Website: www.unwire.dk

Mobile payment

In Denmark, payment via mobile phones is not as prevalent as in e.g. Sweden. 4 % of the Swedes pay through their mobile phone when internet shopping, whereas only 1 % of the Danes use their mobile phone for payment, cf. DIBS. A new bill that raises the maximum payment limit is expected to be a motivating force for more payments via mobile phones in the future.

The market is very heterogeneous and market standards have not been agreed upon yet. The most prevalent type of payment is Premium Rate SMS, where billing of customers is done through the operator. According to Juniper Research, this method is used in more than 90% of all transactions via mobile phones.

In Asia, consumers increasingly make use of their mobile phones in stores instead of credit cards. This tendency is also expected to gain acceptance in Denmark, as users become more conversant with the mobile phone as a mean of payment. In practice, users will have an account with a bank, and when making a purchase, the customer sends a text message to his/her bank who withdraws the money from the account. In future, "Near Field Communication" (NFC) will make it possible for customers to use their mobile phone as a physical credit card. This is, however, an expensive solution for both stores and financial institutions at the moment.

The market is dominated by large consolidated players such as operators and financial institutions. However, the lack of standards leaves room for innovation and new business models.

Mobility in relation to public services

Mobile technologies are expected to be an area of significant potential for new solutions for teaching and the health care sector. The Danish Ministry of Science and Technologies points out the options there are in serving and monitoring patients from mobile units. Solutions like this, which can help streamline medical processes and thereby reduce costs in the healthcare system, are expected to be in high demand in the coming years.

An example of how mobile technologies can be relevant in other sectors is Motto Captura, a software solution that can read out text photographed with the mobile phone camera. The idea that originates from an EU financed development project about mobile e-learning for people with dyslexia.

Motto Captura

Motto Capture is a software solution that enables reading aloud almost any text captured with the camera in a mobile phone. Motto Captura will support people who are dyslexic or visually impaired.

The software can be applied on specific mobile phones and PDAs and is installed directly on the phone and providing a high degree of user friendliness.

By using Motto Captura, people with limited vision can access the same information as people with normal vision, e.g. the bus schedule, text on tickets or important guidance information.

Motto Captura has been tested among students at a technical college with good results. Also in a test among unskilled workers at a contractor, Motto Captura has contributed to enhanced efficiency and independence among the unskilled and/or dyslexic workers and thereby greater work satisfaction and higher efficiency.

Read more on www.motto-captura.dk/information_links/udlandet.htm

5. CONCLUSION: PERSPECTIVES FOR MOBILE TECHNOLOGIES IN DENMARK

The market for mobile technologies is exploding these years. There are more than four billion mobile phones in the world, with more than one billion sold units each year. The phones become more and more technologically advanced, and combined with the increased speed and prevalence of the mobile internet, this opens for new business models and players.

The market is dominated by large, well consolidated global mobile phone manufacturers as Nokia, Samsung and Motorola and the national operators as TDC, 3 and Telia in Denmark. The mobile phone manufacturers have mainly set the agenda for the development of new technical solutions while operators have been important for the introduction of new services to the consumers.

The market for mobile technologies can be divided into three categories; sale of mobile phones, sale of infrastructure for mobile traffic and sale of mobile content and applications. The market for hardware and infrastructure is very mature and characterised by severe competition between large global companies. Thus, the new openings lie predominantly outside the consolidated part of the value chain, i.e. in other areas than traditional hardware producers and operators.

Most indications point toward the market for mobile content and applications exhibiting significant growth rates in the years to come. This, however, requires a more advanced use of the mobile phone than is the case today. The motivating forces for an increased use of the mobile phones for other things than talk and text messaging are partly socio cultural and partly technological. The mobile phones have become an integrated part of our life and in the future they are expected to work as "PCs on the move".

There are, however, still some barriers to how fast average users will use their mobile phones in a more advanced manner, e.g. user friendliness, battery lifetime, network speed/coverage and prices on data services.

The Danish industry for mobile technologies is characterised by a history of hardware production for the telecom infrastructure. Historically, Denmark has been able to build up a salient position in the form of world leading research and a highly educated workforce, and has therefore attracted some large, global corporations. However, in contrast to the other Scandinavian countries, Denmark does not have a national growth engine to act as a driving force for a strong and innovative industry within mobile technologies. Instead, the Danish mobile industry is largely driven by foreign players. Nevertheless there have been some positive side effects. Today there is a wide base of highly specialised competencies in Denmark and a number of successful, global companies, which can create positive spill-over effects in the production of content and applications for mobile units.

If new players are to have success they need to have business models that are built with an understanding of how to gain and control access to customers, their needs and where in the value chain there is room for new players.

One approach can be a business model that places new players in the strategic gaps of the value chain, e.g. applications for the business world (b2b). In this segment, new Danish companies as Excitor and CDRator have had success developing mobile solutions that contribute to making business processes more efficient in larger companies, both within and outside the telecom industry. Another example of a success in this segment is Unwire, which has built a platform that enables media and telecom companies to supplement their business with mobile solutions.

Another way of penetrating the market is through partnerships with large players, creating access to the market by leaning against a well known brand. This is a model used by the company Campfire which has developed a platform that enables content producers to get their content out onto the mobile phones.

The new Danish companies have been most successful with business models on the business-to-business market, whereas the business-to-consumer market has proved to be much more difficult to penetrate, partly because it requires large marketing budgets. However, Zyb is one of few companies to have managed to penetrate this market with a technology that satisfies an unmet need for mobile social networks, and therefore managed to create a large user base.

These Danish companies that have managed to build businesses in the market for mobile technologies so far have been good at focusing on the market and consumer needs rather than the technology. It remains a challenge, however, to create more successful Danish companies within mobile technologies. In terms of numbers, Denmark is behind the other Nordic countries with respect to how many companies have received venture capital. On average, only two Danish mobile technology companies have received venture capital each year, in the period 1998 to 2007. In the same period, the numbers in Sweden and Finland are 3-4 times higher. This is likely to be linked to the fact that there are investors in Finland and Sweden with particular focus on mobile technologies. The impact of Nokia and Ericsson, respectively, also accounts for some of the higher start-up activity in Sweden and Finland. Furthermore, several Danish investors point out that the investment opportunities in Denmark have historically been few.

One of the main challenges is that there is limited entrepreneurship with Danish specialists within mobile technologies, resulting in few start-ups. The large, global companies located in Denmark provide professional challenges as well as a dynamic working environment, which results in many skilled people who otherwise might have started new companies, opting safe employment in one of these large companies.

New companies can also be created to commercialize research from universities. However, this is impeded by the fact that many university graduates are educated within hardware and therefore typically are employed by the large companies. Another problem is that there is not yet a solid research and educational platform on content and applications in Denmark. On top of this, Danish venture investors hesitate to invest in new companies within mobile technologies. Investors generally express a profound interest in facilitating growth within mobile technologies in Denmark. However, it requires that they see the right business model that can create value for customers and has the capacity to create large revenues fast.

Initiatives such as research projects to develop new mobile technologies at Danish universities can help create a knowledge base within integration of content and mobility, and thereby create the foundation for new companies and business models. At the same time, many investors signal that we will witness a breakthrough for mobile technologies within the next 2 to 7 years.

The appetite for investments within mobile technologies is definitely present among Danish venture capital investors, given that the global market will deliver significant growth. However, in order to augment Danish entrepreneurship within mobile technologies there is a need for an increased awareness and interest with the industry's developers about the opportunities associated with starting a new business. Concurrently, investors need to raise sufficient amounts of capital to be able to invest in the opportunities that will arise. A consequence of these two effects could raise the annual number of venture capital investments from two, as it is now, to maybe five or six companies. In parallel, this will raise the demand for annual investments for Danish venture financed companies in mobile technologies from EUR 5.5 million to between EUR 16 and 20 million.

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21/10/2008