Definition of new Services in the area of Mobile communication NETworks (SMONET)

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Letter of Content

1 Executive Summary

The goal is to analyse the requirements of conception and integration work. A group of end users will be asked to define their needs. A first market survey for the definition of the competition framework will be carried out. The requirements will be separated for the various users (i.e. ASPs, platform providers and users) to specify their different needs. The capturing of the requirements regarding the services currently offered, future planned services as well as services required by the customers represents an important action of WP2.

The following points are mainly worked out for this deliverable:

- Vision Workshop
- Approach used to interview (mind-setting stories)
- Segments interviewed
- Interview highlights (how well did it work)
- General direction of vision workshop and interview results

This deliverable is aimed at an audience that needs to understand the new opportunities that arise from third generation mobile systems and the associated dynamic but complex third generation market that will be created. It addresses the most important enablers and drivers that will ensure that the vision of third generation becomes a reality; this vision is to provide global access and delivery of information services of all possible kinds to the mobile community at large. This deliverable leverages in-depth knowledge of current market developments and forecasts, and highlights key issues that must be addressed for the realisation of the UMTS vision and that are not normally discussed within the world's Standards Development Organisations; such issues arise especially in a cross-sector "converged" environment.

2 Introductory

In almost all decisions about telecommunication services and solutions, there is one important party missing: the (END)USER-CUSTOMER. In 1998, an article in the Harvard Business Review stated that ”customer satisfaction rates in the U.S. are at an all time low”. It would certainly be depressing if all we have accomplished since the 1982 publication of Peters and Waterman’s, ”In Search of Excellence” was the addition of a customer service customer satisfaction statement in the mission statements of our Fortune 500 companies. Five years ago we would have been pleased to state that customer satisfaction was being discussed in the boardrooms and had a chance to become a part of a business strategy. Now this is not enough. Delighting the customer must be a focal strategy. Every business, every executive, and every manager must assess how their ”domain ” contributes to customer value.

Incumbents, Telco’s, Cellco’s, ISP’s, ASP’s, Content-providers, even Vendors of Devices and Network equipment, they ALL have to change our view, and focus on the truly needs of the clients. Shares in leading network equipment makers fell this month again, as it became increasingly apparent the gloomier economic outlook would force enterprise and telecom customers to defer capital spending projects. The decline in sector shares followed a series of bearish analyst reports. The century of looking inside out is over. In 2002, the theme is all customer satisfaction. The year of the customer.

2.1 Inside-Out versus Outside-In

Not so very long ago people dressed up in their finest suits to pay a simple visit to the bank. They had no other option than to choose from a fixed set of products and services. No matter what their wishes were, or which company they went to. And not so very long ago customers actually accepted all of this. This approach, known as inside-out marketing, has characterized economic behaviour since the Industrial Revolution. Companies manufactured goods and sold their products to their customers. Incumbents provided connections and services to their customers. As a result, companies dictated their customers’ requirements and wishes and restricted their options. Now times are changed, customers do not accept the ‘technology push’, nor the ‘business boom’. As a result, they stop buying products and services. Marketeers are searching for improved methodologies to keep their businesses growing, with new existing customers, and with excellent Customer Care. The step before CR(M) is enhancing the User Requirements of all tools used in the communication from human to human, person to person.

2.1.1 Outside In view

On this point, we have to focus on the economical and technical topics for a next generation Communication Service Provider. First the old and new technologies, that should be (re)introduced in the new economy to fulfil the needs of the End-using Customer. What are the requirements for e.g. a CSP-network to serve that Customer? What are in the future the requested Value Added Services, and how rapidly will they get decoupled from commoditised ones? Is the New economy the same as new networks? Does the Customer needs a toolbox or a integrated solution?

The ‘now-a-days’ view of the Customer is only Outside-In, for network-requirements focussed on only the last two bullets, to be seen ‘Top down’ in the bullets below.

- Branding
- Product mix
- Value Chain & Branding Processes
- Customer Contact Strategy
- People
- Information Flow
- Applications
- Technical Infrastructure

2.1.2 The User in the Driving Seat

The evolution of smart devices (on the chairing cross of wireless remote controls, wireless mini-computers, mobile terminals and wireless game consoles) [1]leads to a individual integrated digital assistant, that includes authentication, digital certification, sense-recognition, et cetera. In another EC IST project, the Wireless Strategic Initiative (WSI, http://www.ist-wsi.org) the definition of such a 'bionic buddy' as Body Area Network is presented by the University of Twente (the Netherlands)[2]. Those smart devices are multi-media, multi-standard and multi-operator, able to find least costs routes and content-depending preferred suppliers. With such tools, the network-user really sits in the driving seat.

2.2 Network Requirements

The networks nowadays are anything but able to fulfil the customer's needs. Once the customer has managed to make a connection (setting up an account for the internet for example is not something everybody is capable of), he or she has to look really hard to find the services needed over a network which doesn't provide the performance required once you need it most. Customers are not interested in speed or bandwidth or quality of service… they only care about "Does it perform like I need NOW?" and – in managing forecast – "Will it operate tomorrow just as I expect now?". So from a network provider point of view it is urgent to start thinking about the true needs of the customer, which are not named as 'good network services' (although they are required to fulfil their needs).

The network provider has to become aware of its position along the value chain, meaning they are 'only' enablers for customers to obtain whatever service they want in whatever way they want. This goes against the development where network providers and content providers merge in an attempt to lock in the customers or the rigidity with which network providers keep customers in their own network. You can forbid it, but customers will more and more do what they like to do. They buy a small router to use one broadband connection for more participates. They use a Calling Line Identifier, to keep out the acquisition-calls. They take more virtual mail-addresses to live their anonymous life in the jungle of CRM. They buy for 10 Euro a dual-SIM accessory to use their favourite mobile phone on two network operators, just as they like. If you have for example a subscription with one mobile operator, it is not possible to switch to another local operator even if this other operator provides a better connectivity in the area you are at that moment. And if you want to switch to another type of network, you are completely lost. Try for example to call someone over the Internet on his mobile phone.

Ideally network operators provide customers a one door shopping possibility where they guide them in an easy way to the service they need and help them obtain it. This helping contains more than just providing the technical possibilities for connectivity, security, search engines and things like that. It also means the network operator has to closely co-operate with the other members in the value chain. If, for example, a reliable, creditable user wants a particular service, he or she should be able to obtain it at once and not go through a subscription procedure of several days. In order to do so, the next generation network operators should, besides operating as a – so to speak – 'trusted third party', know their customers really well in order to being able to provide the lifestyle services they really want.

The concern of loosing contact between network-operator(s), provider(s) and end-using customer(s) leads to the decission of the Next Generation Networks Initiative to start a IST-project for the definition of new services in the area of mobile networks. Outside-in thinking, the goal of this NGNi project is to analyse the user oriented requirements of conception and integration work. Using backcasting technic (take the year 2010 as starting point, and look back to now) we created some cases in which an end-user could recognize him- or herself. In each case we presented one integrated solution [1])[3] for the whole infrastructural environment between the (device of an) end-user and the other end-user(s) or

[1] Evolution of the Remote control to the Bionic Buddy, see Appendix <>

[2] More information at the Wireless World Research website: http://www.wireless-world-research.org

[3] Next Generation Networks are the integrated solution of smart devices, collaborating networks and intelligent portals together.

between the end-user and the required service or content. After that a group of end users had been asked to define their needs. A first market survey for the definition of the competition framework will be carried out. The requirements will be separated for the various users (i.e. ASPs, platform providers and users) to specify their different needs.

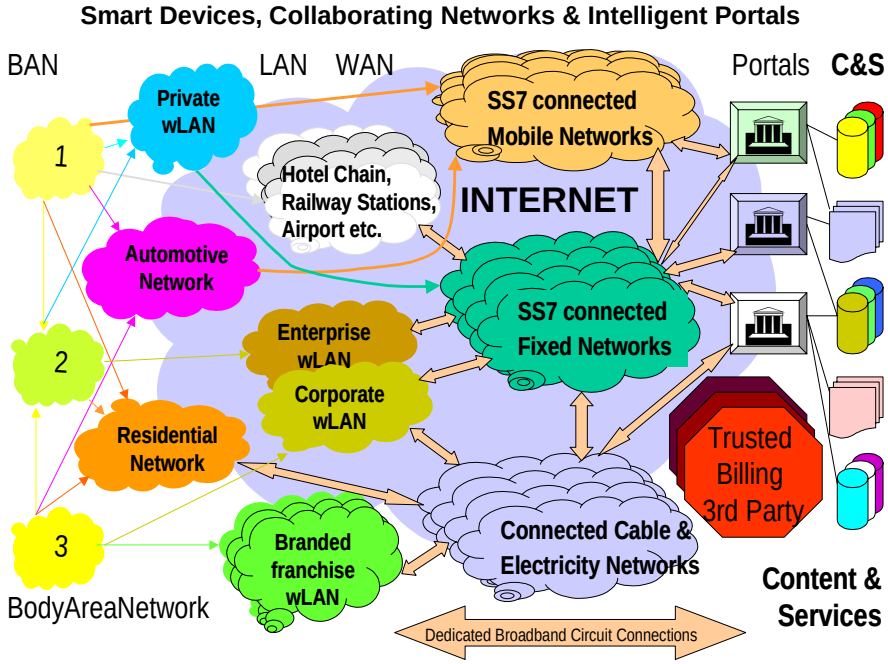

Figure 1: Smart devices, collaborating networks and intelligent portals © J.van Kokswijk

2.3 Content Requirements

In the transport of any content between terminal *a* to terminal *b*, three topics are important: the quality of storage and format of the content, the infrastructural specifications of all parts of the available infrastructure (including the "weakest" part of the transport-chain) and the possibilities of presentation of the content on a specific terminal or device. That means in a ideal situation of next generation networks that the content (managed by the Content Management Tool) of the Content Provider should be available in a format, dependent of the transport and/or terminal facilities. That means too that e.g. the infrastructure-specifications should be known before sending, and the presentation-specifications of the terminating device should be recognized, to present the content at maximum performance and quality as possible. This is a totally new way of thinking about delivering a service.

Being realistic, it will take years and years to reach a point that the Content Manager knows before in what quality the required content could be send and presented to a customer. To come so far it is strongly recommended that the infrastructure is registrated in specific content-requirements, e.g. by a code (an analogue small band channel is code A, an ATM broadband channel is code R, for example). The same for the terminals: an ordinary GSM-phone with SMS is code 1, a wireless PDA with barcode-scanner is code 17, an UMTS device with high fidelity headphone-sound is code 36, for example. In the process of this NGNI-project it should become clear if all parties are ready for accepting such a new concept for delivering a 'tailor made' service to the customer.

Data formats are (with increasing bandwidth requirements):

- **Binary** - a Yes or No, or 1 or 0
- **Word** - stating who or what
- **Sentence** - a collection of words and numbers

- **Text** - a number of sentences
- **Photo** - containing a still picture
- **Audio** - voice or music content. The type of content will influence required quality (e.g. phone, FM radio, CD quality audio)
- **Video** - containing moving pictures. The type of display will influence the required quality (e.g. thumbnail size, postcard size, TV size, beamer size)
- **3D Video** - containing a 3D moving picture show of the event.

Transferred to a kind of Mazlov pyramide model:

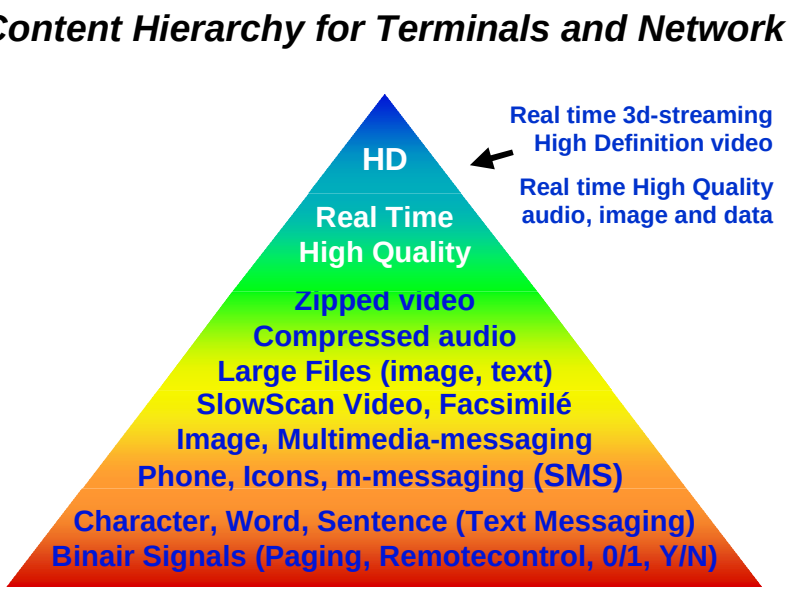

Figure 2: Content hierarchy for terminals and network © J. van Kokswijk

2.3.1 Vendor Requirements

What counts for the network providers also impacts the vendors. A user doesn't want to be hampered by the type of device purchased. There are for example very little mobile phones that function both in the US as in Europe. And things won't improve in the near future: the GPRS networks are device specific, so anyone with a Nokia phone won't be able to use a network designed for Ericsson.

In order to live up to the expectations of customers (obtaining any service they want in any way they want at whatever moment they want), it is needed the vendors are going to make use of truly open standards, both for the networks itself and for the connectivity between devices and networks. Especially the connectivity between devices will be an important issue. Vendors try to propel their own operating systems and things like that by making consortiums that use their own standards. These standards are hardly compatible with the standards used by other consortiums, resulting in restricted choices and possibilities for the customer. On top of that, some vendors even forge network operators to ignore some new technologies, by threatening them not to serve them anymore.

All those proprietary equipment generates for years and years a lot of money, thanks to the ignorance and generosity of the consumers… But those wealthy times are gone. The now-a-days consumer is a real CUSTOMER. He and she want to have a full service communication. In our technie words: the customer expect a multi-media, multi-access, multi-standard, multi-operator connection, for any device he or she uses at any place and at any time.

So… conclusion: yes! we need new technology, but not technology pushed. Yes! we need new services, but only servicing the end-user. And yes! we need 'state of the art' networks, but not driven by proprietary interests. What WE need is old and new technology to fulfil the needs of those users, who only expect that the correct, adequate tools for their action and reaction is provided by full service communication. Old technologies have to be updated and could be introduced in the new economy in combination with New technologies as a part of the customers' needs fulfilment.

2.4 Business Models

Knowing, we have to focus on the end-user customer, what business models can we use? There are several issues we have to address: not only the billing for a used part of the commercial runned infrastructure, but also the billing of the used content to the customer, the billing of the extra value of priority or of the discount value of delay, the ownership of the customer data, and the way we can use our knowledge of the customer to introduce new services.

Looking at billing, there is a user view and a technical view. From a technical point of view there is no difference between the transfer of a chit-chat email and the transfer of a concert (all bits and bytes). But for the user there is quite a difference, like hell and heaven. The user only sees the value he or she obtains from a service and wants to pay according to that specific value. This value, by the way, can differ by user. So you have to offer different ways of billing: for example based on airtime for a live concert (if you quit half way the concert because it isn't what you expected of it, you don't want to be charged for full), based on characters for email, on a bit for an alert, and based on temporal subscription for accessibility (telephone). Within these types of billing you can offer additional services, like guaranteed real time delivery of a document (/email) sent. Most important in all of this is that the user can decide for him-/herself what type of billing is appropriate. So if he or she wants to subscribe to the concerts, this should also be possible.

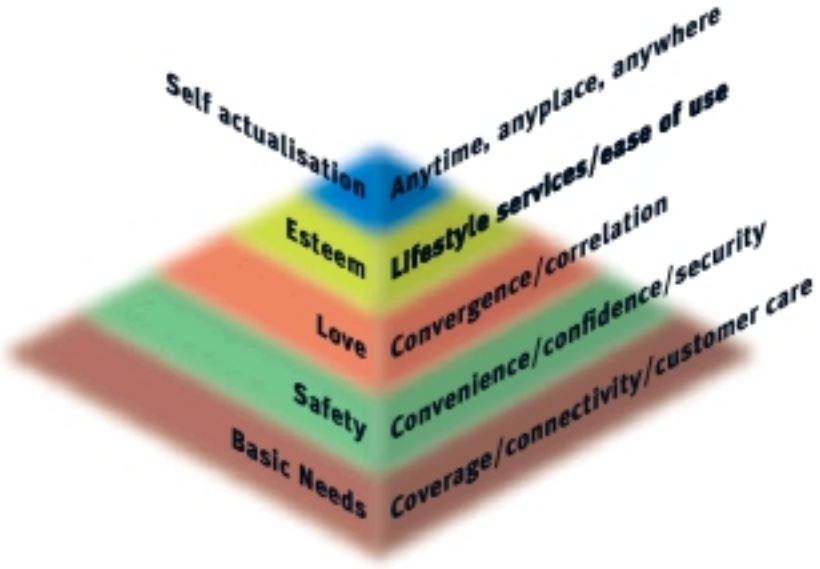

Figure 3: Pyramid of needs of the end-user © J.van Kokswijk

Another aspect of billing is the number of organisations involved in the delivery of a service: the network provider, the content provider, possibly a portal etc. The user doesn't want to be billed by each of them separately. One-call-makes-it-all… So at first (historical) sight the network provider looks like a logical party to take care of this. This is not the case: first of all because network providers are not banks (especially in case of large transfers of money this counts) and on the other hand this will give them a too powerful position towards the other parties in the value chain, creating preferred sites for the users of a particular network operator, dependent on the type of agreement that network operator has with these other parties. Secondly because the evolution of the user terminals, mobile devices and handheld computers certainly is going in a direction that all fixed and wireless devices are operator and network independent. Last but not least, the end user/customer does not trust the

network operators (any more) and is looking for a trusted third party or clearing house. This is why and where traditional banks come in to act as a trusted party. But… it is known that some global operators silently bought some essential bank facilities.

Last but not least a hot issue: Will there be a 'killer application' for next generation networks? Probably not. There will be killer (lifestyle) services however. To become them, those service providers must start by providing their customer(s) the basic levels of the needs pyramid (coverage, connectivity, customer care, et cetera.) and slowly work their way up. Probably erotics (contact, and for some even lifestyle) will be the first moneymaker for mobile services, soon followed by shame&blame (soap) and alerts (events in the lifecycle; concierge-function in the lifestyle). After this, services that enable the formation of "tribes" and emphasize life style issues are most likely to succeed. The use of location-based services can be very powerful in accomplishing this: it gives people the possibility to meet members of their own "tribe" wherever they are and whenever they want and to do the things they like most.

This in fact is a trend you already can see at the moment: the most successful companies are those who concentrate on lifestyle services instead of products. They implement the theories of Mazlov – related to the environment of tele- and data communication – in their business.

2.5 Final conclusions[4]

From now on new technologies are only introduced in the new economy, when they have a related position in the needs pyramid of the end user, so they could be pulled or – as a needs fulfilment - silently accepted by the customer:

- The value added services will very soon get decoupled from commoditised ones, only because the customer does not accept the regular telecom and internet commodity anymore.

- These updated old technologies and new technologies will be financed by the customer in a new way of billing.

- All content for mobile services on Next Generation Networks should be stored and managed in such a service-dependent, multi-format condition, that the user-in-the-driving seat could use any available device to access any local available network for the same service. The specifications of the available infrastructure and (the presentation on the) terminal depends the (format of the) delivered content.

- The evolution of Multi Standard Wireless Personal Devices and Body Area Networks could not be stopped by the incumbents, nor by the service providers. Ignoring the progress of network-independent mini-computers will be the same as ignoring the customer as end-user. The next generation mobile networks have to be a collaborative heterogeneous infrastructure, able to access, connect, converge, transport and deliver anything anytime, anywhere and anyway.

[4] Utrecht (NL), 15/11/2001: Thanks to the supporting team of Mark Hoogenboom, Frank Kroon, Petra van Krugten and Sjoerd Visser

2.6 Methods of capturing user requirements

Two user requirement collection approaches were used. With a group of NGN aware specialists a Vision Workshop was conducted to find common ground and decide on trends all percieve as essential. In addition, a number of out-of-the-box ideas was generated as well, which provided input for mid-term future descriptions of the NGN. These were used to feed the interviews with end users, as they need a perspective during the interview that is quite different from what is available today.

The choice of methodology of interviewing was to represent all target groups. The selection of interviewees was done by looking for volunteers in the circle of acquaintances of employees of Cap Gemini Ernst & Young. First the interviewees were selected from a scope of broad society oriented relations , from governments to incumbent, from software houses to international supermarkets. Secondly, they were asked to join and referenced to one or more of the five stories. They were interviewed by presenting them a story followed by a number of predefined questions. The story was send by email before the interview and the interview itself was conducted by telephone.

The stories were the result of a number of visionary workshops with employees of Cap Gemini Ernst & Young. Five stories in total where constructed.

Each interviewee was asked the same set of context questions (age, gender, marital state, working situation) followed by a number of story specific questions. The story specific questions had to address the following topics: security, privacy, place, time and use (price/performance proportion). The possible answers to these questions were predefined. The results are presented in a separate Excel spreadsheet.

The workshop was scheduled in a period of two weeks, with multiple sessions. The interviews were conducten in the course of one week.

2.7 Vision-Workshop

The Vision Workshop took the NGNI view on the next generation networks as a starting point. The following problem statements were addressed:

- If the Next Generation Networks are available, what criteria will and end user have to select (for connection and related service capabilities and quality)?
- What type of support does the end user need to select a connection, depending on the type of facilities that are required. Is fully automation the only way to make this work properly or what kind of manual influence should be open to the end user?
- The criteria used for selecting a connection and service will not only depend on cost, but also on context (i.e. what is the purpose of the end user activity at that moment for that request). Work can be high priority some of the time, resulting in selecting a costly connection. But for private time high priority situations may result in the same choice. In short, how is the end user profile and end user context used to influence the selection per event?
- Apart from the connection type, quality and cost, the user will choose for a data provisioning scheme. Depending on cost but even more so on the situation the user is in, the request for the amount and format of the data will change. What type of situations will result in what type of data requests? What are the format types? (e.g. text, audio, video, etc.)
- If a multitude of devices will assist an end user in life, how are these going to be synchronized? What depth of synchronisation is possible and practical?
- Which players are relevant in a NGN structure?

- The NGN structure does not allow a single player to be dominant. How do we expect the role of the current dominant players (MNOs) to develop?

- The NGN will provide allways-on for a person (not only for one of his devices). How does this influence the way people manage time, work, take breaks and have leisure time. In connection: how do organisations expect working hours to be defined? Related: how do we prevent a massive information overload?

- wLAN omnipresence will provide options for a close to nation wide coverage of wLAN facilities based on end user installations (any household can service up to a 100 mtrs around its house). This network has no owner, and provides virtually free access, if so configured. How does such a network influence commercial alternatives?

- Saturation of household WLAN may occur sooner then expected, as two or three households can share a single access point (reducing costs). If connectivity is transparant, this effect may occur on any connection (e.g. an end user uses the personal GPRS-PDA and through Bleutooth connects with the company UMTS-phone, getting a better connection and transferring the cost of it to the company). How is the calculating end user going to behave if options become very rich?

2.7.1 Results

The various problem statements have resulted in suggestions for solutions. These are presented below, where some issues have resulted in a combined answer.

2.7.1.1 User selection criteria

A user will start the selection process by expressing the desire to obtain a service. Services can be anything between reading e-mail, getting route guidance, or requesting a list of available services (a service directory).

The following list of criteria has been generated that end users will use to select a connection:

- **Service availability** over the connections available. This provides a service offer assessment (is it possible to obtain the service).

- **Price** per unit of measure, most likely in bits or bytes. This provides a total cost assessment.

- **Bandwidth** - number of bits or bytes per unit of time. This provides a minimum service transaction duration assessment.

- **Stability** and/or **availability** - what is the expected availability during the time an activity is in progress. This provides a service completion expectation assessment.

Please note that the user will not need any understanding of bandwidth, but will probably express a desire to obtain the service within a specific timeframe or within a specific response time. Based on the content required (amount of data) to deliver the service, bandwidth requirements can be derived.

The criterium on stability and availability has been added in the assumption that a user can be mobile in a fixed location (i.e. is not physically moving), or can be mobile in a continously changing location (i.e. in a vehicle like a car or train). In the first situation the stability and availability of a connection can be based upon a actual measurement: what is the measured transmission gain on several channels and how well is the reception between my transceiver and the other transceiver. If the user is in a moving vehicle, the appropriate channels for selection are only those that will remain available during the period required to fully comply with the requested service (i.e. complete the transaction). Obviously, virtual availability is possible if sessions between the user device and the service provider are set up in such a way that handover between connection channels is transparant.

If more options are available to provide the service, the user will either manually select the connection path or a selection is provided based on the user profile, containing selection preferences. Most likely this is lowest price and then best performance (speed), in that order, but this must be based on an individual user preference which can even vary due to context (e.g. in the case of an emergency). Lesser importancy of – just in time – delivering could focus to lowest price. Guarantee of delivering will be more important than best performance. High priority of contact could even overrule the best performance. Broadcasting advertisements to many could accept low guarantee of contact.

2.7.1.2 End user support to select

In most cases the device the user is using to obtain a service would automatically select a connection for the desired service, based on the connection criteria (see above) and user preference profile. On top of this the user is able to express context, which will further tune the selection process or may result in a specific profile to be used. End user profiles are based on context:

- **Emergency** in a very high priority service request needs to be satisfied as soon as possible.
- **Work** during work related activities.
- **Private** during personal activities.
- **Leisure** during personal or work releated in-activity periods (e.g. holiday, but also during a coffeebreak).
- **Advertisements** during access in a particular environment and situation (location, time-slot, only accepted for some kind of bonus, such as free airtime, more features, coupons, airmiles).
- **User defined** context, which allows the user to define individual relevant contexts and subsequent user profiles.

The context changes frequently. If the user is called at **work** by someone of the family, the context changes to **private**. At least, that is a sensible assumption. If the family runs a business, it is dependent on the contents of the call what the context is, and even there a mix of work and private messages can be exchanged, further diluting the context clarity.

The most likely approach to the context dynamics is that a user is stating which context he or she is mainly in, at a given moment in time. For instance, starting work at 9 AM will mean the user selects **work** as general context. Based on the context of a specific service (e.g. call home), the user can modify the context for that service. If in hindsight the service was requested within the wrong context, the user has a limited option to correct. The cost incurred because of using the service can be rerouted, ensuring it get billed in the right context, but the selection of the connection which delivered the service cannot be changed anymore as the service delivery is already completed. Althought service providers may have a different pricing scheme based on context, it is most unlikely they will accept changes of context *after* they provided the service.

Context related billing implies that the user has accounts per context. The **work** context services will be billed on the work account, which is probably paid for by the employer of the end user. Emergency services will probably be for free (i.e. paid for via a subscription), to ensure maximum chances on the service being provided.

Obviously, the context will also provide a mechanism to limit the selection of services. An employer will only accept a relevant set of services on the work account's bill, meaning that within a specific context only billable services are offered.

In short, the devices used for NGN services, must support a context selection facility that allows for:

- **General context** setting, which is the default and is changed by the user or other actors when relevant.

- **Service specific context** setting, which is valid only for one service request.

Please note that this context approach means that pushed services require to state their context. If an incomming call is private, and the end user is absorbed with work context activities, this context conflict must be evident before the connection is made. In practice the user will divert pushed services that do not fit the current context to a Rejected Service handler for the stated context. For instance, a private call during work will be diverted to the private voicemail. A work related phone call will either be accepted if the user is active in the work context and the disturbance is acceptable or will be diverted to the work voicemail, which may provide other facilities then the private voicemail (like converting the voicemail to an e-mail). Obviously, the end user has the ability to access all voicemails, private and work related ones, via a voicemail service. But again, the user may choose for a specific context while accessing voicemail, suppressing any voicemails not relevant for that context.

The setting of context is partially manually by the user and partially automatic by other actors. Entering the building of the employer, the work context will be set automatically. Leaving the building does not result in an automatic context change (as work may continue outside the building), but the device the user is using for services may very well verify context relevance if ambiguity is detected.

In general, a simple selection approach must be offered to the user, using context and the user profile. However, the user must be able to see all options and select manually, disregard the set or assumed context. This is an important feature, as technology may fail via the automatically selected connection, so the user must be able to overide any device selected connection and obtain the desired service via another channel. A basic assumption for the NGN is that is will be available most of the time, but not fault free all the time. This is a property of complex networks, even the current implementation of the internet is suffering from it, and should result in appropriate specifications to cater for unexpected down periods of parts of the network.

2.7.1.3 Data amount and format

Apart from context and user preferences for connections, the user must specify what type of information is desired. Must it be text, audio, video or can it be as limited as a number or Yes/No. The formatting of the information is based on:

- **Device capabilites** - what does the device the end user has available support.
- **Information requirements** - what does the end user wish to know.
- **Situation of the user** - what type of information can the user process.

This aspect of data amount and format is best explained with some examples. Imagine a manager with a surf board sailing hobby. He is mastering surfsailing a small surfboard, but the wind requirements for such a surf board are very specific. Too much wind is dangerous, insufficent wind means the surfboard will not float (and in fact sink with the sailer on it). The manager has a service that informs him about a number of locations he likes to surf on and the wind conditions at those locations. If winds are favorable, he will be informed. Now, if the manager is at home, a pushed e-mail may suffice. During work you probably would rather have a beeper go off, with location, wind speed and the estimation of the time that favorable winds will remain. This would fit on a single line of text. It can be ignored without disturbing work or it can be used to reschedule work to accommodate a sailing event later that day.

Another example is a genuine football fan. His club is playing an important match on Saturday, but family obligations make it impossible to visit the game or follow it on the local radio station. Informing this fan about goals (time, player, current score) or maybe even only about if they won (“Yes!” or “No!”), will satisfy basic information requirements of the fan. It is not the same as visiting the game, but it is better then missing it altogether. Moreover, if his team is winning, he may get away with excusing himself and switching over to another device that provides the service of replaying the goals. If things are getting very interesting, he may even permanently excuse himself and listen to the service that provides life audio coverage of the game. Instead of spoiling a family event with a football game that

can result in disaster if lost, the fan is able to accommodate the family event and only switch to the game when that proves to be more interesting then the family event.

Obviously, limiting the amount of data and the format, will allow low bandwidth connections to provide the service. In fact, the same service (e.g. “Follow Your Favourite Football Team”) can be offered in a variety of detail, selling the various formats separately.

Data formats are (with increasing bandwidth requirements):

- **Binary** - a Yes or No, or 1 or 0
- **Word** - stating who or what
- **Sentence** - a collection of words and numbers
- **Text** - a number of sentences
- **Photo** - containing a still picture
- **Audio** - voice or music content. The type of content will influence required quality (e.g. phone, FM radio, CD quality audio)
- **Video** - containing moving pictures. The type of display will influence the required quality (e.g. thumbnail size, postcard size, TV size, beamer size)
- **3D Video** - containing a 3D moving picture show of the event.

2.7.1.4 Synchronization issues

The NGN environment allows user to utilize a variety of devices to obtain services. A number of these services will modify information sets. For instance, listening to your voicemails via a phone means you heard them, changing their status from ‘new’ to ‘old’. If those same voicemails are in your e-mail inbox as a copy, you probably expect those to automatically change their status from ‘new’ to ‘read’. If you delete the e-mail version of the voicemail from your inbox, it can probably be deleted from your voicemail store as well.

The synchronisation of user information sets is a separate service, which will require intelligent agents that maintain the user information sets based on user activity messages. This means that an action on one device by the user will send a message to the relevant information set agents that the action took place. These agents than take appropriate action on the user information sets they govern.

Another synchronisation issue is modification of data in information sets. If the user changes the phone number of a person in the contact list of the mobile phone, this update should be propagated to all user information sets containing that contact.

In fact, two types of synchronisation are required:

- **User actions** on information sets.
- **Data modifications** in information sets.

Please note that a data modification can be seen as a user action as well. Still, the distinction is relevant because the **user actions** are initiated by the user and require an intelligent process to handle. Obviously, deletion of a voicemail may result in the deletion of the copy of this voicemail in the email inbox, but some users may prefer to store the email version of the voicemail instead for later retrieval or confirmation. User actions therefore do not propagate unmodified to all information sets.

On the other hand, **data modifications** should propagate completely. The list of contacts in a mobile phone should be the same as the list of contacts in say, the user contact list manager on a PC.

Furthermore, information sets can be modified by other actors, for instance by someone sending an email, which will end up as a new entry in the inbox which should show on any device that can be used to manage the inbox. A complicating factor is that due to differences in capacity in devices, the information sets will not always be exact copies. The contact list on a phone requires only phone numbers, in a PDA address and e-mail fields are desired too, on a PC a whole list of items can be relevant to store, including a photo of the contact. A list of emails in the inbox may very well have extremely long attachments on the PC, while these are not available on the wireless PDA.

Anyway, the user expects all versions of the same information set to be consistent, and expects all the user actions to be handled intelligently.

In practice, users will have to select the speed and accuracy of the synchronisation service. For instance, adding a lot of phone numbers on a PDA because you are visiting an exhibition in which a lot of new business cards are given to you, does not require immediate synchronisation with the contact information set on your PC if you know that the first instance you will use your PC is when you get back at the office. Synchronisation is then delayed up until the moment you have a low cost or even free connection through Bluethooth or infrared.

Please note that user preferences for synchronisation may change frequently and will most certainly be context sensitive (e.g. work synchronisation is handled differently than private synchronisation).

2.7.1.5 Players in NGN

Players in the NGN, either as enabler for the network or as active participant in an implemented network, are:

- **Semiconductor manufacturers** - create the basic elements and devices that combine into handsets, network equipment and other electronic devices needed to make a NGN work. The main trend that is relevant for the NGN is the integration trend, in which more functions or more standards are integrated into one device, allowing versatile use. For instance, implementing three frequencies and four protocols in one mobile phone chips, allows it to be used anywhere in the world, negating the need for a single global standard.

- **Equipment manufacturers** (network and handsets) - which support the integration of semiconductor products into devices, produce handsets with ever increasing capabilities. In addition, they develop the equipment to operate a network, like base stations, exchanges and such.

- **Network Operators** (connection) - which provide connection to a network. This can be based on a wire, fibre or wireless connection.

- **Portal developers** (access, authentication and navigation platforms) - which provide access, authenticate the user and support navigation through options, services and all other facilities a user needs to activate, tune and maintain the NGN environment.

- **Service developers** (software) - which develop the services for end users. Service may be general (e.g. reading e-mail or messages in general), or can be very specific (e.g. access the company knowledge management area).

- **Agent developers** (intelligent software assistants) - which develop a special category of services: those that make the NGN work as a single entity, even when it consists of separate components connected to each other. Agents are needed to inform services of actions taken by the user or by other services. Agents will detect, and resolve, inconsistencies in user information sets.

- **Content providers** (including enrichment and aggregation) - which acquire, enrich or aggregate content that is delivered to end users via services.

- **Billing providers** - which provide facilities to pay for requested services. Either via a subscription approach, a pre-paid approach (debit) or credit approach (to be settled later via a bank account or credit card).

Each of these players is a crucial part of the NGN. Obviously, several hybrid organisations can emerge, playing more then one of these roles, but in practice it is expected that the only way to make a profit in the NGN is to choose for a role and then excel in it.

2.7.1.6 MNO dominance changes

The current dominance of the Mobile Network Operators (MNOs) in the acquiring of the 3G licenses and the subsequent desire to exploit this high speed wireless network, is expected to be temporary if at all existent. The staggering investment needed to acquire the 3G license will limit the ability of these organisations to invest in promoting and developing the services on the 3G network. Without such promotion it is not likely a lot of revenue is generated. Typical for any new technology is the time required to get it accepted by a critical mass. Even though this critical mass acceptance time has show to decrease drastically in history, it does not imply that acceptance is generated by doing nothing. Moreover, the required investment to get to a critical mass may be the same amount of money, it only needs to be spent in less time.

By nature, the NGN will allow no or only limited dominance of any operator to provide connectivity. The mechanism of multiple standards, providing the end user with a choice for a connection per service, will deliver a healthy competition ensuring no over priced connectivity in general. Per channel and in particular per service, pricing may vary. Value based pricing is a good option, in which users that are in a hurry to get something pay additional fees for extra bandwidth.

The investments done in 3G technology, the licences and the implementation, may prove to remain problematic if the NGN is offered too soon. On the other hand, an expensive 3G network, with high fees as a result, may not be able to develop the wireless data market at all. Recently (15-11-2001), the University of Technology Delft (NL) researched for the Dutch Ministry of Telecommunication c.a. (“Ministerie van Verkeer en Waterstaat”, http://www.minvenw.nl) the expected total costs of the Dutch UMTS networks, and announced in their report that the costs of licences will only be 10 to maximum 23 percent of the total costs of such a 3G network. That means that a lot of extra money is need to do the investments for construction, operation and marketing.

All in all, we expect that the NGN is such a fundamentally better offer then any 3G MNO can offer with their single wireless channel, that implementing and developing the NGN should be pursued with the utmost vigour.

2.7.1.7 Personal Always-on issues

Although the NGN will bring a lot of good to the world, it also will fundamentally change the way people manage their activities and time. Recently the problems with RSI are making companies aware that using technology that looks safe may not be safe after all. Naturally, having facilities like mobile phones made it possible to work from virtually any location, resulting in quite a number of people that seem to work all day. That this increase in connectivity is not neatly followed by an increase in activity management capabilities must be part of the reason of the worrisome number of people that burn out.

In fact, when the NGN allows people to be always-on, not just their mobile phone, but also their mail and access to all types of information and services, some absorption time is needed for people to get acquainted with the possibilities and their drawbacks. This is a natural phenomena for any new technology. Some will be scared by it, some will be thrilled. Although the natural path of cause and effect cannot be changed, the NGN initiative is able to provide insights into the impact of being always-on as a person. Instead of waiting and see what people will come up with as appropriate behaviour, it is advised to assist them in finding it. Some obvious issues can now be named in hindsight when looking at the introduction of PCs and videogames:

- **Social disrupter** of family life, as family members were offered a complete new leisure tool that was mainly for individual use.

- **Overdoses of visual stimulation**, as mainly children can sit for the PC, videogame or TV screen for hours, in which even cases of epileptic seizure are known.

- **RSI issues**, as repetitive use of a selection of muscles and joints, mainly to operate the keyboard and mouse, result in stress induced illnesses (please note that this issue has not been fully researched and cause and effect are still in debate).

Using these hindsight issues to find similar issues in the NGN environment, a potential list of NGN issues can be created. Please note that these issues are based on extrapolations and assumptions, most have not been researched sufficiently to provide a conclusive answer on whether it is a problem or not. Potential NGN issues are:

- **7x24 Working hours** for organisations must be accompanied by appropriate means to manage work-time and nonworking-time, to prevent employees trying to meet 7x24 working day expectations as well. Currently the flexible hours are already leading to a misty definition of a working day, increased flexibility will further complicate this issue.

- **Private time reduction** because you can be found (located) and contacted virtually everywhere. There may be no place to hide to do things that are quite normal to do now.

- **Social context modifications** that may be close to earth quake type of changes if work and personal life is changed dramatically in a short time frame.

- **Radiation issues** which were under debate in the 2G environment already and probably will need to be re-iterated for 3G and wLAN environments.

- **NGN illiteracy**, in which those who do not participate in the next generation network will be deprived of essential services they are accustomed to today. As an example the ATM of banks is relevant, because senior citizens are no longer welcome at the banks' teller in the office (cash services tend to be fully automated through the use of ATMs now). In the NGN network physical money has even less relevance, and it will probably not be possible to pay for pay-per-view on television without a NGN billing service.

Obviously, these potential issues are just the drawbacks of the NGN coin, which has noumerous benefits as well. They are listed here not as a suggestion to reconsider the NGN, but to enrich the effort with finding solutions or paths towards solutions for evident potentially problematic areas of the NGN.

2.7.1.8 Poor man's WLAN

The principle of NGN suggests that users have a fair collection of devices they will use to manage their life, both work and personal. Each device needs access to the network, and will use one of the available channels to do so. Out-house and out-of-the-office environments will provide this access to the network as a service and charge a fee. In-house and in-the-office environments will probably provide an access service for free, collecting all traffic and passing this on to a channel that is available for all inhabitants of the building. In practice, homes will be equipped with a wireless LAN, which connects to the network through facilities like ISDN, ADSL or cable modem. For some homes glass fibre is an option. Analogous to the homes, offices will have wireless facilities for their employees, creating an internal network that can be used by employees free of charge. The company provides access to outside facilities through a central facility, probably high speed copper or glass fibre connections.

The poor man's wLAN is then an agreement with individuals to use their wLAN for free or for extremely reduced fees, or an offer from companies to use their wireless access facility as long as you are in the building. In particular for shops, cinemas, museums and the like, such an offer will attract customers.

Taking this idea one step further, it means that as soon as five people in a block of ten houses have wLAN facilities, the street is effectively provided with network access. Simple schemes between

neighbours can be that one buys the hardware, and the other pays for the subscription. Using a Napster like feature, many free wLAN access points are combined to a parasitic wireless grid, of course without any service level.

Areas where free wireless NGN access is provided, which are not physically detectable but the devices will select them by default, will then have a magnetizing effect on users. As soon as you see a group of people furiously working their wireless devices, you know some free NGN access must be available on that spot for sure. Heavy duty users quickly synchronize large data sets for free, and then walk on continuing with what they were doing before the bumped into the free zone.

The calculating consumer, of which there will be a lot, will influence the cost and billing structure for paid services. Above a certain threshold, consumers will rather wait for an opportunity to free access then pay for access. If time is not their top priority, paying will not be either.

2.7.1.9 Unexpected early saturation (also for UMTS by sharing)

Most people will end up with a number of devices they use in the NGN environment and a selection mechanism for access to the network that is based on best price. Unexpected early saturation for devices (handsets) is not foreseen, on the contrary, if synchronisation is properly addressed, the number of devices one single user can handle will expand exponentially. You may select your phone after you got dressed based on the colours of your clothing, much like what Swatch proposed to do with watches some years ago.

For connectivity and actual data transport saturation may be achieved unexpectedly early. This is mainly a result of the expectation that NGN services will allow the user to select the amount of information based on context (what am I doing), processing capability (what can I do with it when I get it) and price. Instead of watching a football match live, which will require high speed access to the network for about two hours, the football fan can engage in other activities like walking the dog or sailing a boat, to be interrupted only for instant replays of goals. Those goals will require only 30 seconds of high speed wireless access per occasion. The way people will prefer to enjoy events like football, can change drastically if the number of ways for enjoyment are expanded.

It will be impossible to predict end user behaviour in this matter. Therefore, the NGN should be rolled out in an incremental manner, allowing all parties involved to adapt to actual use and end user behaviour. Hence, the NGN will be a dynamic network with very dynamic use and extremely dynamic cost structures. Consequently, it will be a complex network.

2.7.2 Which specific benefit would you like to offer to your customers?

- Best choice of connection based on criteria and context
- Connection use optimization by data amount and format specification

2.7.3 Marketing Strategy

- “Get Connected” slogan for becoming always-on as a person
- Don’t choose one provider, choose them all and use the best for any given situation and moment

2.7.4 Unique Selling Point

- Dynamic use of criteria. Low cost when needed, high connectivity available when required. Compare it with driving an Opel Kadett in the weekends and a Jaguar XJ Executive during office hours, without having to own the two cars.

2.7.5 How could the system look like?

- Description of the DILO of the end user (day in the life of)

2.8 Interviews

2.8.1 Types of interviews and segmentation of interviewees

The interviews of the end users were performed by telephone, based on stories send to them earlier by e-mail or read to them by the interviewer. The interviewees were segmented based on age, gender, home situation and working situation.

2.8.2 General description of results

Most of the interviewees were in the age between 21 and 40, as this is the most interesting group to

probe for short to midterm developments. The interviewees were very clear about some points: they were positive about the services offered in the stories, willing to pay for them (although a lot of criteria had to be met, dependent on the context of the story, before they actually wanted to take the service), privacy is an essential part for all services (even in the case of a medical emergency people are cautious to supply personal information like medical history) and people don't want to be specifically part of a (lifestyle) group. Side note on this last point is that a significant larger number of people without a professional job preferred to belong to a lifestyle group (33%; no distinction between age) then people with a professional job (0%).

In general people want to be able to communicate anywhere all the time, but only when they are in control about the subjects (e.g. no work related communication while on a holiday) they are contacted about, the persons who contact them (no anonymous contacts, even in the case of a dating service!) and the places they are contacted (almost everybody indicates they want to be left alone when walking on the beach or in a forest, no matter what the subject is). Already with the limited number of electronic services today people are experiencing the stress of communication overload (80% of the interviewees). Both the development of intelligent filters (which can distinguish between different contexts) and an attitude change are seen as important to diminish the stress.

The interviewees feel very strongly about the fact that they are the only one controlling their own data: only in the case of the football service (< 20%) and in the case of the medical emergency (50%) they think it could be useful to them if data was passed without their explicit permission, but even then they want to have some control: only data relevant for the service should be passed and in case of the medical emergency they want someone trusted (like their partner) to authorise the transmission.

Entertainment services are merely seen as ad-hoc services and the majority don't want the prices to be differentiated according to presumed added value: they want to be in charge when they use the service and not pay for other people (who are charged less for the less important issues) if they only use the higher priced issues.

The urge for control is expressed best in the case of the daily diary service offering: if the parents want the service at all (50% think it is a worthwhile service), they want to be the one receiving the alerts about new episodes and things like that and not their kids, while the interviewed youth (small number) wants to subscribe to everything and is willing to pay for it.

2.8.3 Structure of the stories and interview questions

First some general q's, then content q's

2.8.4 Results

- People want to stay in control all the time and not be bothered with services or information they don't need/want. So the NGN services must be highly personalised, very secure and not based on push services.

- People want to have access to information on a lot of different places, on a lot of different devices on a lot of different moments. This demands a high level of synchronization and communication between channels and devices of the NGN.

- People experience a big difference between business context and private context, so the NGN should provide intelligent filters that can recognize the context you are in.

- People want to be able to use services on an ad-hoc base (rather then on a subscription base) and therefore the NGN should facilitate an easy, independent (trusted third party), way of payment.

2.8.5 Studies

- Description of the analysis done by CGEY and how CGEY derived the results (include market analysis stories)

2.8.6 Questionnaires

- See Appendix (incl. of the five stories and questions)

3 Current Situation

For this chapter material was used from the paper “The 3G Goldrush” by Dimitry Mayer. He extensively researched the issue of 3G service innovation. Even though the 3G environment is only one of the parts of the NGN, the issues raised by Mayer are relevant for any wideband wireless environment and consequently most of the suggestions for addressing the issues are true unchanged.

(Editors note)

“The next generation internet will be as reliable as the telephone is today, as powerful as a PC, and as portable as a mobile phone!”

Rudi Lamprecht, Executive Officer Siemens AG

The next decade will see the emergence of 3G networks to fully realize mobile multimedia services. Enabling anytime, anywhere connectivity to the Internet is just one of the opportunities for 3G networks. 3G will bring more than just mobility to the Internet. The major market opportunity builds on the unique characteristics of mobile to provide group messaging, location-based services, personalized information, and entertainment experiences. Many new 3G services will not be Internet-based - they will be truly unique mobility services. Both mobile and Internet penetrations are now on the exponential portion of the classic “S” demand curve illustrated in Figure 4.

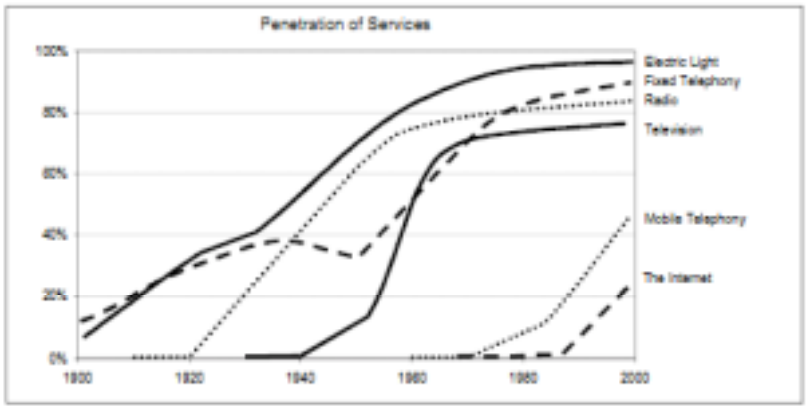

Figure 4: Source US Bureau of Census (1996)

Most forecasts of 3G subscribers and revenues simply assume a dramatic uptake of mobile Internet services. This is more a statement of faith than a reflection of reality. 3G service revenues will only materialize if 3G networks deliver compelling services that satisfy subscriber needs. Adding mobility to the Internet is a necessary but not a sufficient condition for success.

The Internet was in existence for about three decades before it entered the current phase of mass-market acceptance. The trigger was the introduction of interfaces such as Mosaic and the World Wide Web that transformed the Internet into a user-friendly environment. The PC was merely a cheap alternative to mini-computers until the introduction of mass-market applications such as spreadsheets and word processing. Mobile was a limited alternative to fixed telecommunication services until sufficient coverage to make the service practical for use in daily activities, is essential for the mass market to consider using it, and has only become a true mass-market commodity with the introduction of prepaid services.

The success of 3G will not just come from the mere combination of two existing successful phenomena: mobility and the Internet. The real success of 3G will have to result from the creation of

new service capabilities that genuinely fulfil a market need. Meeting market demand is not just a question of technological capability and service functionality. Creating and meeting market demand requires services and devices to be priced at acceptable levels. This requires economies of scale to be present. The ability to benefit from economies of scale is one of the strongest market drivers for 3G services. The statistics paint a relentless picture. Mobile communications is on target to reach one billion subscribers worldwide by 2002-2003[5]. It took mobile communications over 10 years to reach the billion mark compared with 130 years for the fixed networks[6] (see Figure 5).

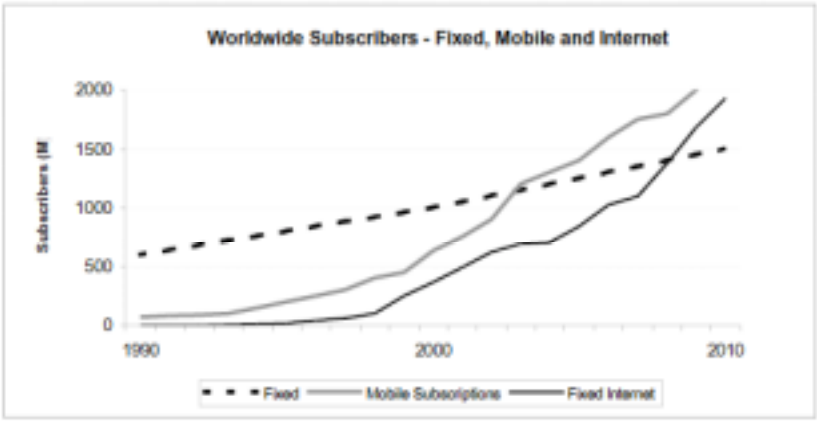

Figure 5: Source World Telecommunications Development Report (1999)

3G technology is an attempt to combine the best of two world into one technology: Internet and mobile communications. The International Telecommunication Union's (ITU) World Telecommunications Development Report 1999 predicted that there would be more mobile than fixed subscribers world-wide by 2007. More recent industry estimates (July 2000) suggest a crossover point as early as 2002. There is no lack of information and analysis on the 3G opportunity. Worldwide forecasts for mobile communications subscribers, for example, are abundant and often vastly different. Definitions and methodology vary; and due to the great uncertainty in the market, most analysts do not attempt to forecast beyond five years.

3.1.1 UMTS explained

The original vision for 3G, as exemplified by the ITU's FPLMTS14[7] concept, envisaged the provision of tightly integrated voice and high data rate services to a hand-held wireless terminal device. 3G was to be a global standard, facilitating international roaming. It was essentially a market-driven approach, conceived before the implementation of second-generation (2G) networks. Now that 2G networks have been deployed for nearly a decade, the concept of 3G had to be modified. The success of 2G expanded the cellular market beyond all expectations. And the success of the Global System for Mobile communications (GSM) fundamentally altered the characteristics of that market. GSM developed into a near-global system, providing widespread international roaming between all continents, and delivering both voice and data services to a hand-held terminal. Operators throughout the world invested heavily in 2G technologies to satisfy market demand.

Introducing 3G into this environment requires a change of focus. The need to protect existing investments in different 2G technologies has shifted the drive toward a single global standard (which are in practise three standards integrated in one handset). When you add the significant event of the

[5] Dain Rauscher Wessels, 2000.

[6] Source: ITU, World Telecommunications Development Report 1999.

[7] The International Telecommunication Union's Future Public Land Mobile Telecommunications Systems (FPLMTS)

emergence of Internet, the additional capabilities of 3G become more focused on the provision of high data rates to deliver multimedia services. The emergence of the Internet as a mass-market content resource had justified the need for such high data rate capabilities and has since shifted the emphasis to packet-switched, Internet Protocol (IP)-based core networks. The solution was the introduction of the IMT-2000 family of systems concept for 3G. One consequence of that solution is that a single global standard does not exist yet. However, the progress of technology, operational deployments, and market requirements will continue toward convergence.

However, the market for 3G is radically different from earlier generations of mobile communications, which owe their success to the addition of mobility to voice communications. The market now takes mobility for granted. Simply adding mobility to data communications will no longer command a sufficient premium to justify the introduction of 3G. 3G will have to satisfy market expectations that are determined by developments in the fixed Internet world that is now delivering high-speed access to content. Both the access and the content are perceived by consumers are low cost to obtain and access. Market expectations for 3G are related to 2G and wire line communications. Any new generation is referred to as a 'new' generation because it is presumed to be capable of more than was possible with the previous generation. 3G is not called 2.1G and that is for a reason. However, the mobile communications industry supports their expectations on the format they are known with: availability is what made wire line and 2G as big as it is now, so why should this not work for 3G? To answer this question we will discuss the different aspects that make 3G a new generation in mobile communications.

3.1.1.1 UMTS in-depth [8]

First, we discuss some more background information of the technology related with 3G to get a better understanding of the matter that is subject of further discussion in this thesis. Four transmission systems play a role in the evolution from GSM to the third mobile communications generation (3G), namely: HSCSD, GPRS, EDGE, and UMTS/IMT 2000.

3.1.1.1.1 HSCSD

The HSCSD (High Speed Circuit Switched Data) system bundles several frequencies of the established GSM mobile communications standard scheduled for voice communication. It makes many times the capacity available, making fast transmission rates possible for sending and receiving data. In a GSM network, eight phone conversations can be conducted in parallel simultaneously over a single channel. Background information: GSM belongs in general terms to the class of technologies known as TDMA (Time Division Multiple Access), whereby several mobile communications calls are transported on a time-shifted basis.

This means that with GSM, each phone conversation is assigned one of eight timeslots or timeframes. The time "gaps" for transmitting the other calls are so short as to be imperceptible to the call partners. A limited transmission rate of 9.6 kbps (kilobits per second) is achieved on each line connection using the GSM standard. Bundling the GSM data channels using the HSCSD system quadruples this figure, so with four timeslots the maximum rate is 38.4 kbps. HSCSD is generally only suitable for a transitional phase. This is because, just like GSM, the HSCSD operates on a circuit-switched basis. This means that while the data connection is online the transmission link is switched from one end to the other exclusively for the relevant interacting partners, regardless of whether a large amount, little, or even no data is being sent. And HSCSD also means the more capacity a provider makes available for transmitting data, the less remains for voice telephony.

3.1.1.1.2 GPRS

General Packet Radio Service (GPRS) permits packet-switched (instead of circuit-switched) data transmission at high speed for the first time based on GSM mobile communications. GPRS is an

[8] Information presented in this paragraph was subtracted from the report: " Mobile Commerce: a Technology Roadmap.. " as published by Technology Rating International, Amsterdam (2000).

expansion of GSM. The RAN (Radio Access Network) remains identical (except for a software update and new hardware module for packet-oriented communication) – a significant development step toward 3G, which is why GPRS is also classed as being “2.5G” technology. Instead of having a virtually “permanently switched” and so relatively expensive nailed connection, the digitised contents (text, images, tones, software etc.) are broken down into small data packages, compressed, and coded. These data packages are then sent to the recipient in “packaged” form more or less in the “gaps” arising in voice communication. With the GPRS standard, charging is no longer based on length of transmission time; the basis instead is the volume of data exchanged or the type of service, for instance. It means terminals can be “always on” and display arriving messages immediately. Depending on the coding, much faster data transmission rates can be achieved per timeslot with GPRS than the 9.6 kbps with GSM. Provision has been made for four coding schemes in all, the scheme with the largest bandwidth achieving a theoretical maximum of 21.4 kbps per timeslot. This means GPRS will make around 100 kbps available.

A distinction is also made between different quality levels (Quality-of-Service: QoS), offered to suit different requirements and usage situations. Less time critical applications (such as downloading multimedia files not required immediately) can manage well enough with a lower level Quality-of-Service than called for in situations where data has to be exchanged in real time without any delays. With the GPRS standard also, mobile communications providers have to decide how much capacity to make available for data services. Extensive mobile data use could easily lead to overloads in the GSM network with bottlenecks in voice communication.

3.1.1.1.3 EDGE

EDGE stands for Enhanced Data rates for Global Evolution. Based on the GMS standard, EDGE permits faster data rates – and so is another “intermediate step” from GSM technology toward UMTS. The performance enhancement in terms of throughput rate is achieved by a new, higher-grade modulation system. When these modulations are also applied in combination with coding techniques (as in the case of GPRS), it is possible to achieve data rates of up to 384 kbps. However, this maximum rate can only be offered over a very short range. EDGE presents some interesting prospects for the mobile future as it can also be used with the D-AMPS TDMA mobile communications system widely employed in the USA. Market harmonization through the matching of standards is in the offing – promising positive effects and significant cost savings (cheaper terminal production, faster return-on-investment for mobile services, for instance).

3.1.1.1.4 UMTS/IMT 2000

UMTS is the name given to a totally new performance dimension in mobile communications. UMTS is the cornerstone of what is called the third mobile communications generation (3G) for voice and data communication, both packet- and circuit-switched. UMTS employs separate frequency bands so is free from the bottlenecks of GSM systems. With fast transmission rates, UMTS will pave the way for a wide array of multimedia services, and make possible mobile, location-specific, and parallel applications such as paying online over a mobile phone while still talking on it. In the 3G segments, there are several competing modulation and coding systems all subsumed by the International Telecommunications Union (ITU) under the IMT 2000 standard as a “family of standards”. The IMT 2000 UMTS mobile communications standard offers two transmission systems: Wideband CDMA (abbr.: W-CDMA), which will assume the favourite’s role as the 3G transmission system, and TD-CDMA as an additional transmission mode. What is new about the W-CDMA coded multiplex system is the ability to assign the transmission rates from the total available bandwidth extremely flexibly and so very economically – tailored to momentary demand, secure, and in the appropriate Quality-of-Service.

3.1.2 Third generation (3G)

There is a lot of confusion in the media about what 3G really offers. The current literature cannot supply clear definitions and terminology. For this thesis, we will first define the different aspect of 3G. What is 3G and where do we have to place it in relation with other terminology like: GPRS, Bluetooth, Wireless broadband, 2½G, 4G, CDMA, Mobile Commerce, Mobile internet, M-business, etc. 3G is the next generation mobile technology that enables mobility by providing communications possibilities.

Third Generation (3G) is the mobile phone system that will be introduced commercially in the next years. 3G stands for *high data rates, always on, IP based network, localization* and off course *mobility*.[9]

3G is about the technology used to operationalise a UMTS enabled network. Getting a network up and running is not all there is in a commercialisation process. The usage of the network must create revenue and its possibilities to offer services based on or use the 3G networks as a complementary asset. In 3G terminology software is needed to make use of the possibilities and offer relating services. The interface between 3G and services are called applications. Numerous articles, reports and documents are available that discuss 3G mobile services and applications. Yet, in all this literature, there is no clear definition of the two terms. The labels “service” and “application” often seem to be interchangeable - even within the same document.

3.1.2.1 Services and Applications

First, I would like to introduce a clear distinction between services and applications that are based on the terminology the UMTS forum[10] published. The UMTS Forum is the world-wide organisation the largest MNOs in the three economic areas formed to align the different 3G standards to one compatible 3G standard: UMTS.

Services are the portfolio of choices offered by service providers to a user.
Services are the entities that service providers may choose to charge for separately. They will be key differentiators between providers in the 3G environment. Users are likely to select their preferred 3G services providers based on the options available in that product portfolio. *Different users will choose different service options. They may elect to subscribe to a personalized mobile portal offering banking facilities. They may later decide to add unified massaging. Such service options will affect user’s bill.*

Table 1: Service definition

Under these definitions, commercialisation of 3G will most commonly be a set of applications forming a service. More strictly, it will be the combination of a large number of applications (e.g., security, certification, transaction recording and interchange, application execution environments, etc.) that an services provider deploys to enable a range of services. Services are entities that mobile networks deliver from the user’s perspective. Applications are entities that enable the delivery of services over mobile networks. Applications are usually sourced from third party suppliers but may also be created by mobile services providers. Some applications could be sold by services providers into the corporate market creating a separate revenue stream, or the application cost could be bundled within the service charges.

[9] Source: The UMTS Third Generation Market – Phase II: Structuring the Service Revenue Opportunities, Report No. 13. UMTS Forum, London (2001)

[10] Source: The UMTS Third Generation Market – Phase II: Structuring the Service Revenue Opportunities, Report No. 13. UMTS Forum, London (2001).

Applications are service enablers – deployed by service providers, manufacturers or users.
Applications are invisible to the user. They do not appear on a user's bill. A banking service, for example, would require a secure transaction to be implemented by the services provider. A unified messaging service would require voice recognition and text-to-speech applications, deployed on the network or in the terminal device. Individual applications will often be enablers for a wide range of services.

Table 2: Application definition

Nevertheless, the main market demand is for services (Table 1), not applications (Table 2). Defining the universe of services used to be trivial. A simple distinction between voice services and data services was often sufficient. In the 3G world, defining a unique set of distinct categories of services is a difficult task. These difficulties reflect the wealth of opportunity opened up by 3G. They are a cause for celebration, not despair.

3.1.2.2 Service Categories

UMTS forum identifies six service categories that represent the majority of the demand for 3G services over the next five years.[11] The six service categories are defined determinedly from a user perspective and are intended to reflect the perception of the market. Technological distinctions have been deliberately ignored in the service definitions. There is a compelling logic behind the six service categories that are illustrated in Figure 6.

Rather than the voice-centric environment, that has dominated the mobile world to date, 3G will be an always-on data environment. Enabling anytime, any place connectivity to content on the Internet will clearly be an important role for 3G. Users will be able to add mobility to their fixed Internet experience. **Mobile Internet Access** for the residential market segment and **Mobile Intranet/Extranet Access** for the business segment (Table 3 and Table 4).

[11] Source: The UMTS Third Generation Market - Structuring the Service Revenues Opportunities, Report No. 9. UMTS Forum, London (1999).

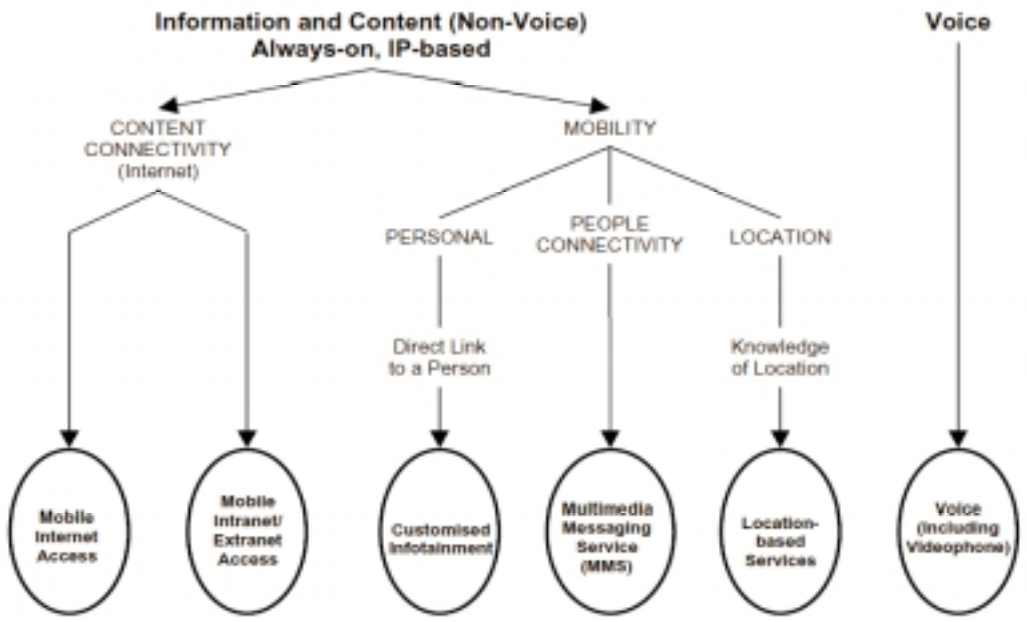

Figure 6: Service categories

Mobile Internet Access
A 3G service that offers mobile access to full fixed ISP services with near- wireline transmission quality and functionality. Includes full web access to the Internet as well as file transfer, electronic mail (e-mail), and streaming video/audio.

Table 3: Mobile Internet Access definition

Mobile Intranet/Extranet Access
A business 3G service that provides secure mobile access to corporate Local Area Networks (LANs) and Virtual Private Networks (VPNs).

Table 4: Mobile Intranet/Extranet Access definition

However, mobility is not the only benefit provided by cellular networks. Mobile cellular networks have two distinctive features that distinguish them from the fixed networks. The mobile terminal is associated with a person rather than a place, and the network knows the current location of that terminal. These are powerful features, particularly in the multimedia environment of 3G. Association of a terminal with a person allows the provision of a whole range of Internet-based content services tailored to the needs of the user and delivered through mobile portals. NTT DoCoMo's I-mode service is an early indicator of the potential of such **Customized Infotainment** services (Table 5). These services based on mobile portals are a major opportunity for 3G services providers. Mobile portals encourage loyalty through the ability to personalise the selection of available content and commerce capabilities.

Customized Infotainment
A consumer 3G service that provides device independent access to personalised content anywhere, anytime via structured access mechanisms based on mobile portals.

Table 5: Customized Infotainment definition

Association of a terminal with a person also creates the opportunity for messaging services amongst closed user groups or specific communities of interest. The dramatic growth in short message service (SMS) traffic in GSM networks illustrates the demand for such messaging capabilities. The always-on characteristic of 3G networks will enable instant messaging capability, and the high data rates available will add image and video capability to create a **Multimedia Messaging Service** (Table 6).

Multimedia Messaging Service
A consumer 3G service, that offers real-time, multimedia messaging with always-on capabilities allowing the provision of instant messaging. Targeted at close user groups that can be service provider – or user-defined.

Table 6: Multimedia Messaging Service definition

Knowledge of the current location of a mobile terminal (which may be associated with a person or a machine) is already generating a rich portfolio of **Location-Based Services** (Table 7). Again, the combination of always-on connectivity and multimedia capability available with 3G adds a new dimension to this service category. Location technology not only enables specific Location-based Services but also enhances other service offerings such as Customized Infotainment and will be a major driver for the creation of new applications.

Location- Based Services
A business and consumer 3G service, that enables users or machines to find other people, vehicles, resources, services or machines. It also enables others to find users, as well as enabling users to identify their own location via terminal or vehicle identification.

Table 7: Location-Based Services definition

Voice will inevitably continue to be an important service offering in the 3G environment. High data rates will allow the addition of videophone capabilities to traditional voice services.

The IP environment of 3G will allow the delivery of multimedia communications within the **Rich Voice** service (Table 8).

Rich Voice
A 3G service that is real-time and two-way. It provides advanced voice capabilities (such as Voice over IP, voice-activated net access, and web-initiated voice calls), while still offering traditional mobile voice features (such as operator services, directory assistance and roaming). As the service matures, it will include mobile videophone and multimedia communications.

Table 8: Rich Voice definition

Inevitably, the boundaries between these service categories are somewhat artificial, and there is considerable overlap between the categories. Whether an individual service offering falls into one category or another could be the source of protracted (and ultimately fruitless) debate. The service category definitions provide a framework for analysis of market demand and discussion of industry trends. They encapsulate the essential differences between the mobile and fixed environments—differences that create enormous opportunities. They incorporate the major learning's that have already emerged from the introduction of data services in the 2G environment. The framework cannot include radically new service categories that have yet to be invented or implemented.

3.1.3 Perspectives on Industry

The 3G environment represents both a major challenge and a major opportunity for the mobile industry. The radical shift in emphasis from voice to non-voice services will have significant impact and repercussions on the fundamental structure of the industry itself. Before we will get into an analysis of 3G in the next chapter, I would first like to discuss the viewpoints elaborated by the mobile communications industry. In this section, we will give a quick overview of the implications of the workings of the 3G concepts as viewed by the ITU. The ITU is a world-wide organisation sponsored by every major communications provider world-wide and publishes conceptual guidelines about 3G. The reason to summarise these guidelines in this chapter is to supply a conceptual framework about the impact of 3G on the industry.

3.1.3.1 Evolving Industry Structure

The mobile industry was built on the premise of providing anytime, anywhere connectivity for voice communications. It has been phenomenally successful in providing mobile voice services. But the introduction of mobile data services within the traditional industry structure and the 2G circuit switched environment has not met with equal success. The always on, packet switched, high data rate capabilities delivered by 3G provide the technical capability for the deployment of compelling non-voice services. Such services, however, change the ground rules for mobile services providers. The new industry structure has to accommodate a shift from transport to content provision, new relationships between services providers and users, and a plethora of new players and partnerships. The shift to content provision enables new revenue streams, which will be shared in a variety of ways between the new players in the market. However, much of the additional revenue generated by 3G services will come through increased usage rather than through new sources of revenue. This section illustrates how the new industry structure is evolving with the introduction of new players, new revenue streams, revenue sharing relationships and usage drivers.

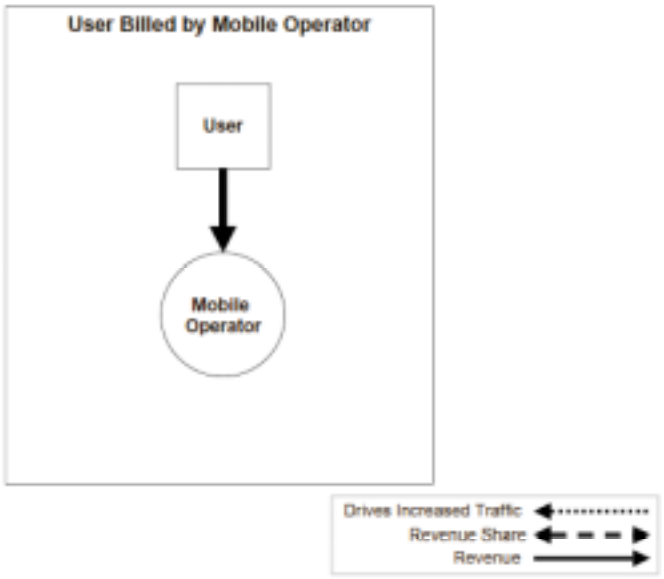

Figure 7: The introduction of Wireless Application Services Providers (Source: ITU 2001)

The description maps the chronological development of the industry in simplified terms. It is intended to be illustrative rather than comprehensive. The purpose is to provide insight into both the revenue forecast methodology used in this market overview and the apparent complexity of the new world of 3G service provision.

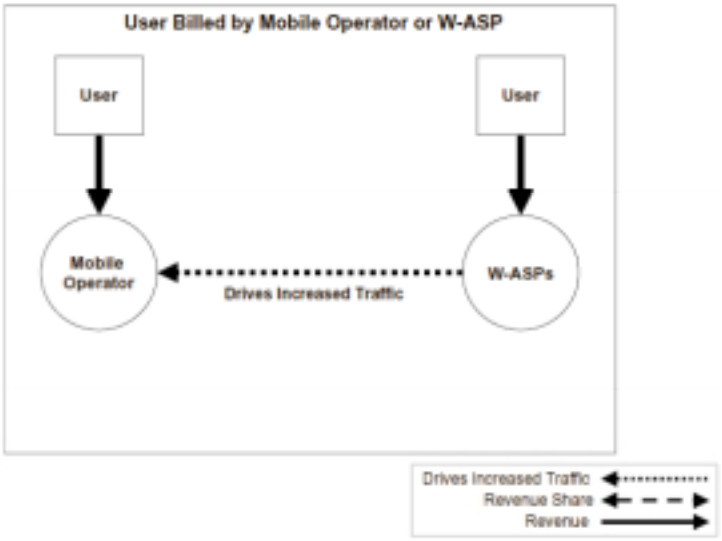

Figure 8: Traditional voice-only scenario (Source: ITU 2001)

The method of back casting could be useful to get more experience with the steps to make progress with 3G to 4G.

3.1.3.2 Voice-only Service – An Historic Perspective

The traditional service offered by mobile operators delivers voice connectivity between users. It involves a simple and direct relationship between users and the mobile operator as illustrated in figure 3. In general, the user is billed directly by the mobile operator, and the mobile operator retains "ownership" of its subscriber base. Mobile operators in this context can be either network operators or airtime resellers.[12] In either case, there is effectively a one-to-one relationship between the user and the operator and essentially, only a single service is provided.

3.1.3.3 Today's Environment

Cellular users today may have relationships with entities other than the mobile network operator. This is illustrated by considering the example of vertical mobile data applications in 2G systems. Although mobile data services have not been particularly successful in the 2G environment, they have encouraged the entry of a new player in the market – the Wireless Application Services Provider (W-ASP). W-ASPs can be considered a variant of airtime resellers in the voice-only scenario in that they have a direct relationship with their own subscriber base. W-ASPs bring an additional dimension to the marketplace and the structure of the industry. As illustrated in Figure 8, W-ASPs can offer services directly to users, building up their own subscriber base and obtaining revenues from subscription fees. They do not necessarily have revenue-sharing arrangements with mobile network operators.

The mobile network operator's benefit indirectly through increased traffic on their networks. The emergence of new players with their own direct relationship with users is an important feature of the evolving industry structure. Such players do not always represent a direct revenue stream for mobile network operators, but they can contribute significantly to operator retained service revenues by driving up usage.

3.1.3.4 Tomorrow's Environment

The introduction of 3G not only further increases the variety of players involved in the provision of services but also provides many more options for mobile services providers. In the Partnership model, players such as mobile network operators and content providers enter into well-defined relationships. In the Ownership model, the mobile services provider extends its traditional network operator role to encompass other functions within the value chain.

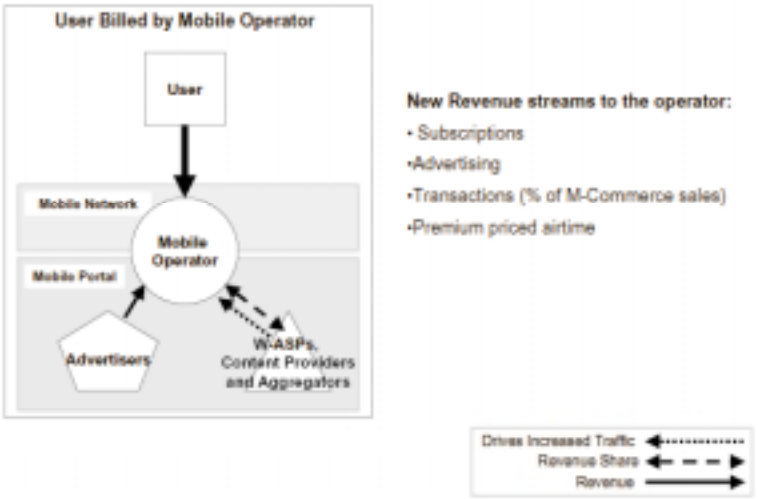

Figure 9: An example of new 3G revenue streams through partnerships (Source: ITU 2001)

[12] Airtime resellers are sometimes called Wireless Service Providers in this context.

In the largely Internet-driven 3G environment, there will be a strong focus on content provision as well as access and transport services. Content provision is a new role for mobile network operators that makes new services and revenues possible. Content may be provided by mobile network operators through acquisition, alliances or partnerships with new players such as WASPs, content providers or aggregators. One example of such a partnership relationship is illustrated in Figure 10.

This scenario opens up the possibility of new revenue streams for the mobile network operator. Operators may be able to charge users subscription fees or premium-priced airtime for access to certain services and could retain a proportion of m-commerce transaction charges. Service-related advertising represents an entirely new revenue source. No clear business model for such partnerships has yet emerged although many variations are being tested. Revenue-sharing arrangements with partners will undoubtedly feature in this scenario, but these are still largely undefined. In most cases, the primary benefit for mobile network operators will be the increased traffic, reduced churn, and user stickiness engendered by the new service offerings.

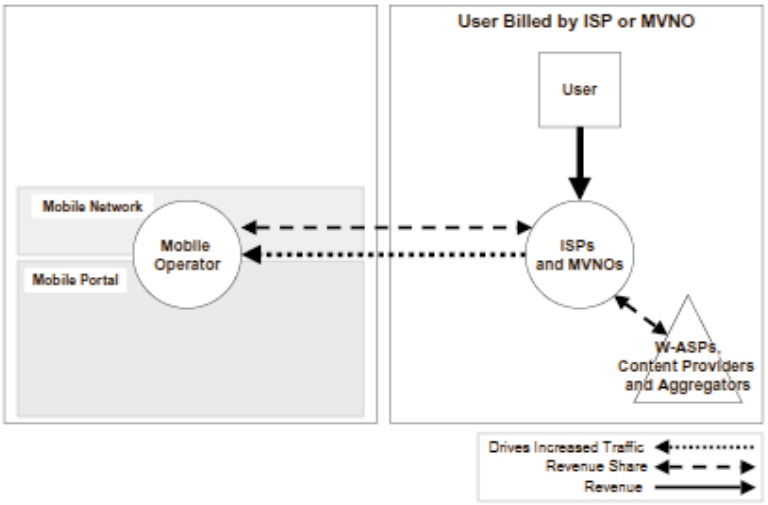

Figure 10: New services providers in the 3G environment (Source: ITU 2001)

The example illustrated in Figure 10 is not the only scenario. The new services can introduce new players who also have a direct relationship with the customer. In this scenario, illustrated in Figure 11, the mobile network operator is providing connectivity but has no direct contact or relationship with the user. The new players, who are services providers such as ISPs or Mobile Virtual Network Operators (MVNOs), have their own partnership arrangements with ASPs and content providers and their own customer base. The mobile network operator is essentially operating in a wholesale capacity and may or may not share in the revenues received by the MVNO. The mobile network operator benefits from increased traffic and may or may not share these benefits with the MVNO. Again, clear business models have yet to emerge.

In practice, the scenarios illustrated in Figure 9 and Figure 10 will co-exist. This creates a very complex industry structure where the mobile network operator can function as both a retail provider and a wholesale provider, depending upon the services offered and market segment targeted (Figure 11).

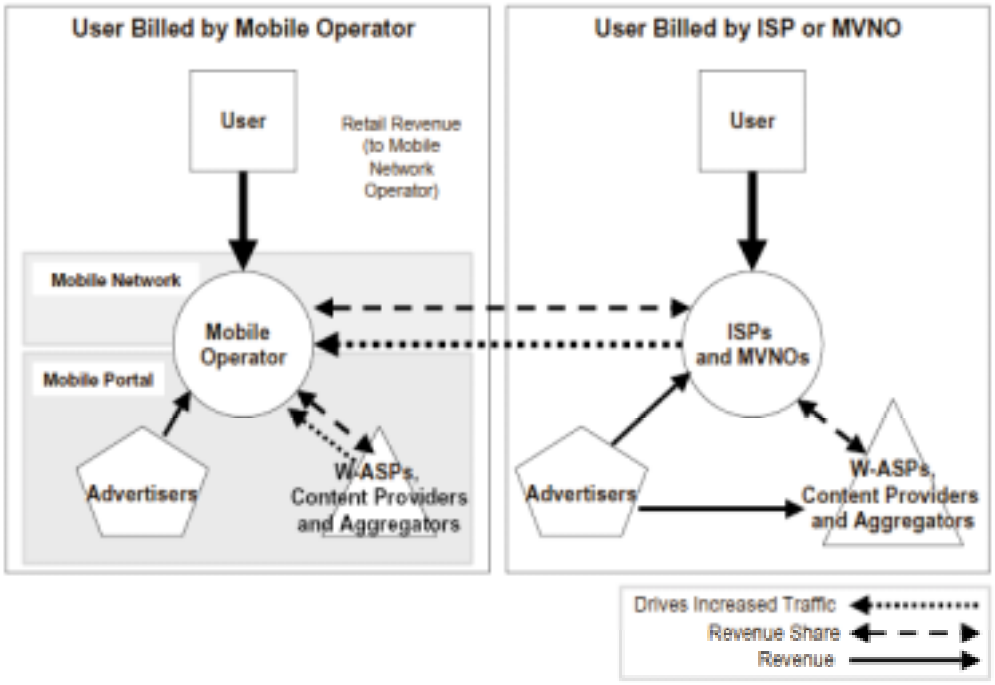

Figure 11: Multiple roles for 3G network operators (Source: ITU 2001)

Although this structure is complex, there are only two ultimate sources of revenue – users and advertisers. These revenue sources have to feed all the players involved. Advertising is effectively a new revenue source for the mobile industry. But the bulk of the revenue will still come from users – either from new subscribers to the mobile network operators' services, from increased spending by existing subscribers on new services, or from new user communities contained within the customer base of ISPs and MVNOs.

The proportion of the revenues retained by mobile network operators and services providers will depend on their revenue sharing arrangements with their partners. Such revenue-sharing arrangements are still being negotiated on a case-by-case basis. Transaction-based services enabled by some m-commerce applications introduce additional complexity to the required revenue-sharing arrangements as they can involve a direct revenue link between the user and the content provider (see Figure 11).

3.1.3.5 Access and Portal Focused Approaches

The Access Focused and Portal Focused approaches introduced earlier in Figure 5 represent examples of different positioning of the services provider along the 3G value chain. These business approaches and the roles of other types of players in the industry are shown in figure 9.

In the Access Focused Approach, the services provider is effectively acting as a pipe, providing access and transport services together with the ISP function. Revenue streams correspond to the historic relationship illustrated in Figure 7. The Portal Focused Approach involves investment by services providers to enable the provision of content-based services. However, this model contains the potential for significant additional revenue through the provision of Customized Infotainment services to a services provider's subscriber base. Customized Infotainment services rely heavily on subscriber profile data, which will require particular attention when there is a high proportion of prepaid subscribers. The revenue streams correspond to those shown in figure 7. Services providers have the option to seek additional revenue through the "wholesale" arrangements shown in Figure 12, depending on their capacity constraints and commercial priorities. 3G services providers adopting either the Access Focused or Portal Focused Approaches could offer Mobile Specialized Services.

Services providers will have to invest in appropriate additional functionality depending on the specific service being offered.

3.1.3.6 Mapping the Services Universe

Many reports have been produced which discuss the potential of 3G services. But there is very little consistency between service definitions, and each report seems to contain a different set of “services” within its proposed portfolio. Services proposed in the literature range from the very specific (e.g., downloadable ring tones) to the ultra-broad (e.g., m-commerce). Some “services” relate to revenue streams (e.g., advertising) whilst others refer to enabling applications (e.g., voice-activation). The definitions that distinguish services from applications, together with the service framework introduced in chapter two are an attempt to bring some order to this confusion. They provide a logical and consistent basis for discussion, analysis and comparison.

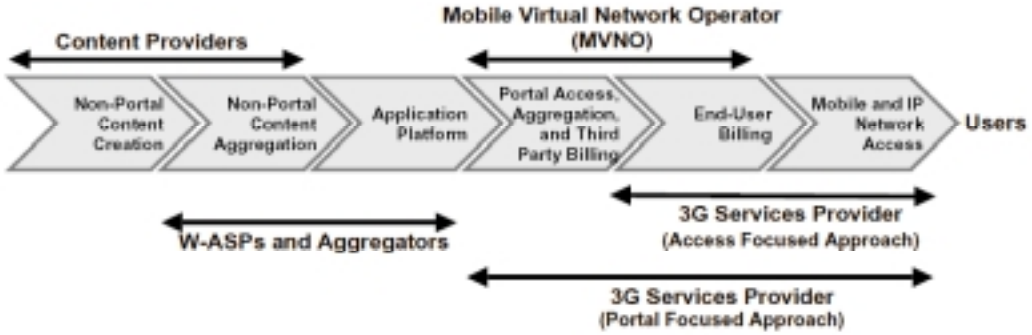

Figure 12: Critical value chain functions provided by 3G industry players (Durlacher, 2000)

What 3G is and how it is structured and delivered to an end-user is getting hopefully a little bit clearer with the previous paragraphs. In an attempt to give you more insight into the many possibilities and currently ideas of services and applications I did some extensive desk research on the various analysts reports and constructed the following list of opportunities that are enabled by 3G.

Conferencing

Mobile Video

Mobile Video telephony

Simple Voice

Teen Video Chat

Video Conferencing

Voice Over IP

Voice Portal

Voice-Activation

Messaging

E-mail / Messaging

E-mail Receipt

E-mail Transfer

Instant Messaging/ Message Aggregation

Machine-to-Machine

Mobile Chat (Non-Real Time)

Mobile Instant Messaging (MIM)

Mobile Postcard

Multimedia Messaging

Short Message Service (SMS)

Streaming Audio/Video (Non-Real Time)

Unified Messaging

Access / Networking

Application

Synchronization

FTP Transfers

Internet

Intranet

Mobile VPN

Web Browsing

Location-based Services

Car Navigation

Localized Info (Current User Location)

Localized Info (Future / Planned Location)

Location Sensitive (Billing/Routing)

Location-Based M-Commerce Navigation/Location

Telematics

Tracking / Personal Security

Virtual Mouse /Directional Wand

Entertainment

Downloadable Ring Tones / Graphics

Entertainment

Internet Games

Mobile Music

Online Dating

Online Gambling

Financial Services

Financial Services

Financial/Banking (E-cash)

Mobile Cash

Mobile E-Bill

Mobile E-Salary

Stock Trading

Information Services

Alerts

Dictionary Research

Directories

Emergency Services (E911)

Flight Reservation

Info Services

Instant Weather Forecast

M-information (user statistics)

Multimedia (real time streaming)

Telemedicine

Distance Learning,

Education

Personal Information Management (PIM)

Restaurant Guide

Town Page (Yellow Page)

Virtual Home

Environment (VHE)

Mobile Commerce

Advertising

B2B Business Data Applications

eWallets & Shopping Enhancements

M-Commerce Transactions

ME Commerce

Micro-Payments

Mobile Retailing

Transaction Processing

The listed names of 3G services are presented here to give an idea of the many possibilities that are made possible technologically. Whether these 'ideas' can be transformed into a viable business models is yet the question. The main point is to give 3G a more hands-on feeling besides the concept itself. [13]

[13] The data used to construct the list of service opportunities for 3G are the following reports: 'Service Evolution from GSM/GPRS towards 3G/UMTS. GSM Association. Cannes (2000)', ' Business Redefined: Connecting Content, Applications, and Customers. Cap Gemini Ernst & Young. (2000) ', 'Enabling UMTS Third Generation Services and Applications, Report No. 11. UMTS Forum, London (2000) ', 'Mobile Commerce report. Durlacher Research Ltd. (2000). Mobile eBusiness B2B Survey 2000/2001. Cap Gemini Ernst & Young (2000) ', 'Mobile E-Business. Gartner Research (2000) ', 'Mobile Internet: For the Long Haul. Morgan Stanley Dean Witter (1999) ', 'The UMTS Third Generation Market –Structuring the Service Revenues Opportunities, Report No. 9. UMTS Forum, London (1999)'.

3.2 Common elements

Common to all wireless innovations today is the fundamental uncertainty about which services will be a success and which can best be avoided. Innovation in uncertainty is a major issue for the NGN. In this chapter, Mayer provides extensive insights into the way innovation can be addressed.

(Editors note)

"Innovation has become the industrial religion of the late 20th century. Business sees it as the key to increase profits and market shares. Governments automatically reach for it when trying to fix the economy. Around the world, the rhetoric of innovation has replaced the post-war language of welfare economics...yet there is still much confusion over what it is and how to make it happen."

(Economist, 1999).

The management of radical or radical innovation poses a unique set of challenges for management. 3G technology exists, but it is still not operational. Yet, the technology consists of not only an operational network, but also of handheld devices to operate with the network, currently mobile phones. The applications to use the network and the devices exist partially. Services to deliver content are abound, but a business model to create sustainable revue does not exist yet, except the current 'voice' and 'SMS' services. However, the delivery of the currently available services is not significantly improved with 3G.

Currently the MNOs face tremendous pressure to commercialise 3G. The question raises how to organise the commercialisation? The previous chapter discussed the more practical managerial implications to reduce the triple-headed uncertainty of market, timing and product. Christensen (1997) stated that large companies have to deal with their lack of capabilities to embrace disruptive innovations due to the size of the market, uncertainty level of technology and inability to attract entrepreneurial behaviour. This chapter discusses the subject of innovation and its implications for an organisation to embrace this to be able to commercialise 3G.

3.2.1 Innovation theory

Innovation is traditionally defined as the successful implementation of creative ideas (Stein, 1974; Woodman, Sawyer & Griffith, 1993). Contemporary economic theorists have tried to address the concept and related issues with varying success. This is despite widespread recognition of the fact that innovation is crucial to the success of an economy at both the micro and macro levels (Leavy & Jacobson, 1997).

Over the last decade, a great deal of attention has been directed at the study of the actors, the institutions, and the relevant linkages that together are considered to constitute different models of innovation. An understanding of models of innovation, including their diffusion throughout the economy and society, is very important. In addition, an understanding of what shapes these developments is critical.

Damanpour (1991) has viewed innovation as a continuous and cyclical process involving the stages of awareness, appraisal, adoption, diffusion and implementation. However, it is also possible to view innovation as an outcome, where an innovation is the tangible product. For conceptual reasons, it is possible to divide this outcome view of innovation into radical and incremental innovations. Pavitt (1991) describes radical innovations as revolutionary or radical changes. On the other hand, incremental innovations are conventional or simple extensions of a line of historical improvements.

Moreover, Drucker (1986) has attempted to clarify such discussion by suggesting that innovation is not explicitly the improvement or technical modification of a product. Instead, innovation is the “creation of new value and new satisfaction for the customer."

Leavy and Jacobson (1997) note that theories of innovation (much like those concerning entrepreneurship) have tended to focus on a single level of analysis. They note the aforementioned work of Drucker (1986) as an example of this at the firm level. The three paradigms that were described above also compete against one other for prominence in research on innovation. Moreover, they even criticize themselves in this regard: Leavy (1997) has previously concerned himself with factors governing innovation at the firm level too, while Jacobson (1994) established an interest in innovation at the regional or national level. Innovation at the sector level (Nelson, 1992) and at the global level (Niosi & Bellon, 1996) has also been completed.

In order to understand what is needed for successful 3G innovations, it is worth considering some basic models of innovation and related innovation paradigms. In this context, the subject of analysis is to establish an understanding on how innovations occur in general. For this purpose, analysis can start with three competing basic explanations of the innovation phenomenon, which are (Sundbo, 1995):

3.2.1.1 The entrepreneurship paradigm (Sundbo, 1995)

This paradigm describes innovation activities that occur at the level of individual firms that have gained favourable market position due to the development of a particular innovation. This happens without any systematic previous approach to the innovation process. Rather, there is a "market forced" effort to introduce a new product, process or service into various markets in order to retain, and possibly enlarge, the volume of activities, or to facilitate new business opportunities. The focal point of this paradigm is the entrepreneur - inventor whose actions drive the innovation process. Innovation is seen as a key to obtaining a better position in the market and generation of extra profits, and is often generated in a relatively unstructured manner. However, in recent years, quite a few innovators – entrepreneurs have adopted a more formal and systematic view towards innovation activity and long-term business strategy.

3.2.1.2 The technology - economic paradigm (Sundbo, 1995)

This paradigm is usually associated with innovation policies of large companies, which are users of so-called "mass-technologies". The key feature of this paradigm is the significant involvement of engineers and technicians in the development of new technologies under a company umbrella. Engineers and technicians are not involved directly in defining the company’s business development strategies, apart from technical input, but were given the task to solve particular technical issues. There are several ways these individuals approach a problem, e.g. in-house R&D, cooperation with other companies who are facing the same issue, buy-in of a solution from someone else, etc. It is important to note that these options require varying levels of internal R&D competencies for utilizing, developing, exploring and absorbing new technologies.

3.2.1.3 The strategic innovation paradigm (Sundbo, 1995)

Its emphasis is on firm strategy, market conditions and broad firm competencies. An Interface between entrepreneurship and innovation as factors that influence the innovation process and as such significantly determine the market performance of a firm. This approach to innovation is multifunctional and represents a combination of internal competencies, long-term marketing strategies, market developments, the identification of new market opportunities or new market approaches, the creation of technological alliances and partnerships, and the fostering of networks, etc. Innovation is viewed as both technological and non-technological, i.e. it can be an entirely new artefact, process, production activity, or a marketing innovation. The key feature of this paradigm is a strategic manager or management team who are able to recognize new possibilities in the market and exploit them by using internal resources together with other available elements. In this context, the strategic behaviour of enterprises contributes to the economic growth of a country.

These new insights have important implications for the firm. Innovation is not simply driven from formalized research and development but depends on access to information, to technologies and to the skills needed to implement them effectively. Increasing the capabilities of firms to learn and to be aware of superior technological opportunities is as important as making sure firms have the resources to innovate (Metcalfe, 1998). In this regard, a significant amount of innovation originates through design improvements, 'learning by doing' and 'learning by using'. This process, along with R&D, results in the accumulation of knowledge and experience, i.e. the development of competencies and human capital.

3.2.2 Technology cycles

Much is written about incremental versus radical innovation and market pull and technology push (e.g. Morone, 1993; Deschamps and Nayak, 1995; Gomory, 1989). In competitive, technology-intensive global markets, competitive advantage can only be built through a combination of different types of innovation, by creation of product substitutes, architectural innovations as well through continuous incremental innovations (Abernathy and Clark, 1985; Iansiti and Clark, 1994; Brown and Eisenhardt, 1995a; Sanderson and Uzumeri, 1995). To better understand the structure of the innovation process we first must understand technology cycles. Clarifying technology cycles helps untangle the relative timing and importance of incremental, architectural and radical innovation.

Technology cycles are composed of technological discontinuities that trigger periods of technological and competitive ferment. These turbulent innovation periods are closed with the emergence of an industry standard or dominant design (Tushman and Anderson, 1986; Anderson and Tushman, 1990; and Utterback, 1994). The emergence of a dominant design ushers a period of incremental as well as architectural technological change, which at some point is broken by the next substitute product. This subsequent technological discontinuity then triggers the next wave of technological variation, selection and retention (see Figure 13).

What organizational architecture is appropriate for radical innovation? In dramatic contrast to incremental or architectural innovation, radical innovation emerges from entrepreneurial, skunk works types of organizations. These entrepreneurial units are relatively small, have lost decentralized structures, experimental cultures, loose jumbled work processes, strong entrepreneurial and technical competencies and a relatively young and homogeneous human resource profile. These entrepreneurial units generate the experiments, the failures and the variation.

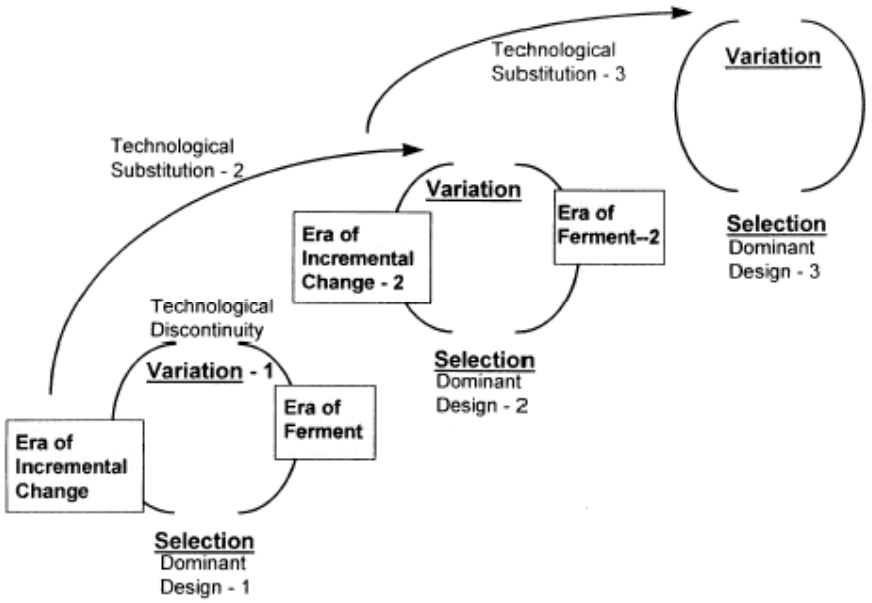

Figure 13: Technology cycles over time (Abernathy and Clark, 1998)

These units explicitly build new experience bases, knowledge systems and networks to break from the industry standards (Burgelman, 1994; Nonaka, 1988; Eisenhardt and Tabrizi, 1995). Architectural innovation does not require different core technologies, but rather takes existing technologies and link these technologies in novel ways. Architectural innovation is not build on new technological breakthroughs, but rather on integrating competencies from both efficiency and entrepreneurial units and in building distinct organizational architectures to bring this new product to new markets. While technological simple; architectural innovations are often not initiated by existing companies because of the difficulties in developing organizational linking competencies (e.g., Henderson and Clark, 1990; Henderson, 1995).

The certainty of today's incremental advance often works to destroy the potential of tomorrow's architectural and/or radical advance. A management team of a mature company must not only protect and legitimise the entrepreneurial units, but also keep these units physically, culturally and structurally separate from those more mature units (e.g., Cooper and Smith, 1992). But this difficult: industry after industry, those mature firms with the competencies to unleash architectural or radical innovation choose to close off internally generated learning and reinvest in the past: their core capabilities (Barton, 1992; Utterback, 1994; Kearns and Nadler, 1992; Foster, 1986; Morone, 1993; Hamel and Prahalad, 1994; and Rosenbloom and Christensen, 1994).

In the case of the 3G commercialisation, the cycle is positioned at technological substitution from 2G towards 3G. Again, the era of incremental innovations of the 2G-technology shift towards the variations of the new technology cycle. An era of ferment is coming and a dominant design shall arise. The firms that commercialise 3G have to cope with these eras and must use the awareness of the technology cycle to their strategic intent. In chapter, three we concluded that a system of complementary products – services must be build to use the characteristics of a network environment as an advantage to gain hold of the dominant design. Collaboration with other parties to gain hold of such a system and form the future dominant design is eminent for growth of the 3G markets.

3.2.3 Perspectives on organizational inertia

The observation that established organizations find it hard to change the combinations of people, assets and offerings they support has produced a lot of academic research. A critical question the literature seeks to address is: *"Why is it so hard to let go of the old in order to focus on the new?"* One factor is routinization. People tend to repeat actions that have led to success. Actions associated with failure tend to be eliminated. Because discovering bright future prospects requires experimentation and as a result causes possible failure. A second factor that causes inertia in organizations relate to the tacit knowledge embedded in an organization's routine behaviours. Overtime, operating procedures become embedded in a complex set of beliefs, values and reinforcing processes making them both hard to detect and difficult to disentangle. Moreover, it is difficult at a strategic level to analyse the inner workings of routines carried at a local level (Nelson and Winter, 1982). Effective local learning may make the problems invisible at a decision making level (Levintal and March, 1993).

The implications of all this are that adaptive processes tend to lag behind environmental challenges unless these processes are proactively managed. Further, adaptive processes tend to influence local conditions more than that they provoke system-wide change, unless the organization goes into a crisis resulting from external shock. Apple Computer, for instance, was pushed to make major strategic shifts in the late 1990s only because the company was struggling for its survival. With luck and preparation, you can avoid having to change under pressure of major external push (Venkataraman and Van de Ven, 1993). Whether an organization is capable of changing at all is a question raised in a school of thought known as population ecology. Scholars working in this tradition apply the idea of natural selection that originated with Darwinian evolution to change in organizational populations. Although their point of view has changed a bit, they originally viewed organizations as unable to alter their portfolios of activities to any meaningful extent (Haveman, 1992). Most firms argued that they seek efficiency rather than undergo the high costs of generating variety in their portfolio through the pursuit of new business models. This is because investing in variety leads to unpredictable performance, increasing the probability that key stakeholders, such as investors and customers will withdraw their support. Enough loss of support and the firm cannot survive (Hannan and Freeman, 1977; Aldrich, 1979).

Resource dependence theorists, who see change as an essential tool for organizational adaptation, which they believe to be possible but also highly political, offer an alternative perspective. The role of a strategist is essentially to obtain resources through negotiation. In their view, firms are driven to respond to the external environments in ways that allow them to gain essential resources. They are therefore highly constrained in the actions they may take and are continually engaged in political negotiations to acquire more resources. More than in population ecology, resource dependence theory sees managers as capable of responding to challenges from the environment and of trying to shape the context in which their firms do business by influencing those who own important resources.

Christensen argues that patterns of resources dependence stemming from past success can seriously hamper an organization's effort to respond to those contingencies that will be critical for its future (Christensen, 1997). Burgelman (1996) relates a similar finding based on his study of the Intel Corporation. He reports that lower level operating managers, when given the discretion and incentives to do so, made decisions that had a de facto exit effect on Intel's participation in DRAM technology, even though senior executives were still supporting the technology. The negative consequences of exiting a business are also sometimes so alarming that even the recognition that one would be better off without a particular line of business is insufficient to provoke a change (Harrigan, 1981).

At a human level, calling an end to an ongoing project or business is a difficult and often painful thing to do. It can lead to dysfunctional behaviour. For instance, managers might persists in throwing good money after bad ideas in a futile attempt to rescue a failing project. This is known as escalation of commitment (Staw, Sandelands and Dutton, 1981). McGrath (1999) argues that looking at entrepreneurial ventures as experiments or options instead of as do-or-die business attempts can deliver lower cost failures with greater learning potential. The powers that be in any organization must recognize that both creating an eliminating business models are essential. Those projects or programs that do not work out or that have come to the end of their productive existence needs to be redirected. Otherwise, learning is blocked and effectiveness weakened.

3.2.4 Barriers to innovation

Innovation goes hand in hand with technology, determining the processes by which an organization transforms labour, capital, materials, and information into products and services of greater value. All firms have technologies, the concept of technology therefore extends beyond engineering and manufacturing to cover a range of marketing, investment, and managerial processes. Innovation refers to a change in one of these technologies.

There is an important distinction between what Christensen (1998) calls sustaining technologies and those that are disruptive. Most new technologies foster improved product performance. Christensen calls these sustaining technologies. Some sustaining technologies can be radical in character, while others are of an incremental nature. What all sustaining technologies have in common is that they improve the performance of established products, along the dimensions of performance that mainstream customers in major markets have historically valued. Most technological advances in a given industry are sustaining in character. According to Christensen (1998) even the most radically difficult sustaining technologies hurried the failure of leading firms.

Occasionally, however, disruptive technologies emerge: technologies that result in worse product performance, at least in the near term. Disruptive technologies bring to market a very different value proposition than had been available previously. Generally, disruptive technologies under perform established products in mainstream markets. However, they have other features that a few customers value. Products based on disruptive technologies are typically cheaper, simpler, smaller, and, frequently, more convenient to use (Christensen, 1998).

The distinction between the types of innovation of 3G is dependent of the perspective used. From the perspective of the MNOs 3G can be seen as a sustaining technology even though it is disruptive. From the perspective of the Internet – or entertainment industry is it clearly a disruption. 3G offer services that these industries have experience with, but 3G lacks the performance. Internet is much faster than mobile Internet, imagine: playing games on a mobile device is hardly comparable to the current computer possibilities. One can conclude that 3G is a substitute with some disadvantages, like price, weight, costs, but 3G offers more than substitution, 3G has features not known to other technologies or combination of technologies. Therefore, we can conclude that as a result organising

the commercialisation of 3G is a difficult challenge and the barriers Christensen identified for disruptive innovations apply. Christensen (1997) concludes in the Innovators dilemma that there are four barriers to innovation of disruptive technologies for existing firms. The barriers are:

3.2.4.1 Companies depend on customers and investors for resources.

The theory of resource dependence, which states that while managers may think they control the flow of resources in their firms, in the end it is really customers and investors who dictate how money will be spent, because companies with investment patterns that don't satisfy their customers and investors don't survive. As a result, these companies find it very difficult to invest adequate resources in disruptive technologies-lower-margin opportunities that their customers do not want-- until their customers want them. With few exceptions, the only instances in which mainstream firms have successfully established a timely position in a disruptive technology have been those in which the firms' managers set up an autonomous organization charged with building a new and independent business around the disruptive technology. Such organizations, free of the power of the customers of the mainstream company, ensconce themselves among a different set of customers-those who want the products of the disruptive technology.

3.2.4.2 Small markets do not solve the growth needs of large companies.

Disruptive technologies typically enable new markets to emerge. However, while a $40 million company needs to find just $8 million in revenues to grow 20 percent in the subsequent year, a $4 billion company needs to find $800 million in new sales. No new markets are that large. As a consequence, the larger and more successful an organization becomes, the weaker the argument that emerging markets can remain useful engines for growth. Many large companies adopt a strategy of waiting until new markets are "large enough to be interesting." This is not often a successful strategy. Those large established firms that have successfully seized strong positions in the new markets enabled by disruptive technologies have done so by giving responsibility to commercialise the disruptive technology to an organization whose size matched the size of the targeted market. Small organizations can most easily respond to the opportunities for growth in a small market. The evidence is strong that resource-allocation processes make it very difficult for large organizations to focus adequate energy and talent on small markets, even when logic says they might be big someday.

3.2.4.3 Markets that do not exist cannot be analysed.

When applied to sustaining technological innovation, these practices are invaluable. Such reasoned approaches are feasible in dealing with sustaining technology because the markets' size and growth rates are generally known, trajectories of technological progress have been established, and the needs of leading customers have been well articulated. Because the vast majority of innovations are sustaining in character, most executives have learned to manage innovation in a sustaining context, where analysis and planning are feasible. In dealing with disruptive technologies leading to new markets, however, market researchers and business planners have consistently depressing records. In fact, based upon the evidence from the disk-drive, motorcycle, and microprocessor industries, the only thing we may know for sure when we read experts' forecasts about how large emerging markets will become is that they are wrong. It is in disruptive innovations, where we know least about the market, that there are such strong first-mover advantages. Companies whose investment processes demand quantification of market sizes and financial returns before they can enter a market get paralysed or make serious mistakes when faced with disruptive technologies. They demand market data when none exists and make judgments based upon financial projections when neither revenues nor costs can, in fact, be known.

3.2.4.4 Technology supply may not equal market demand.

Disruptive technologies, though they initially can only be used in small markets remote from the mainstream, are disruptive because they subsequently can become fully performance-competitive within the mainstream market against established products. This happens because the pace of technological progress in products frequently exceeds the rate of performance improvement that mainstream customers demand or can absorb. Therefore, products whose features and functionality

closely match market needs today often follow a trajectory of improvement by which they overshoot mainstream market needs tomorrow. In addition, products that under perform today, relative to mainstream customer expectations, may become directly performance-competitive tomorrow. When the performance of two or more competing products has improved beyond what the market demands, customers can no longer base their choice upon which is the higher-performing product. The basis of product choice often evolves from functionality to reliability, then to convenience, and, ultimately, to price.

The distinction between the types of innovation is for 3G dependent of the perspective used. From the perspective of the MNOs 3G can be seen as a sustaining technology even though it is disruptive. From the perspective of the Internet – or entertainment industry is it clearly a disruption. 3G offer services with which these industries have experience with, but 3G lacks the performance. Example: Internet is must faster than Mobile Internet. Playing games on a mobile device is hardly comparable to the current computer possibilities. Sending e-mail is less sophisticated as e-mail on a computer. Conclusion: 3G offers what already exist and those are better. Yet 3G offers more than substitution, 3G has features not known to other technologies or combination of technologies. I will use the perspective of disruption for the way to deal with 3G.

Can we now conclude that existing firms cannot handle disruptive technologies? I think not, but disruptive innovations like 3G cannot be managed, if I can use this word to describe the process, with conventional methods just like the other activities of the firms. New organizational processes have to be defined to support the opportunity seeking and turning these opportunities into products that match customers demand. Christensen (1997) concludes in the book 'The Innovators' Dilemma' that disruptive technologies must be dealt with by organizations that are dedicated to the disruptive technology, and the size of the firm has to match the size of the market. Translated to 3G this implies that due to the non-existing nature of the market firms' size must be accordingly very small. The reason of existence of the firm must only be the market and the customers that are part of the emerging market created by the disruptive technology. 3G can best be explored, innovated, exploited in an embryonic or era of ferments it is now in by a firm that is small, flexible and dedicated to their market.

3.2.5 People

Who is going it undertake the commercialisation of 3G? Which skills are required of the people involved? There are two categories identifiable for 3G; needed are specific skills to stimulate the creativity to invent (improved) business models for 3G and to realize them. A second category is referring to the skills needed to manage the uncertainty and deal with all the characteristics of an emerging market. For the subject of this thesis we will go into the second characteristic. Who is able to steer an autonomous, flexible unit with an entrepreneurial drive: an entrepreneur. What is an entrepreneur?

The term 'entrepreneur' means different things to different people. Various authors have documented the historical development of the term (e.g., Gartner, 1998; Hisrich, 1986; Livesay, 1982; McMullan and Long, 1983). The earliest reference of the term has been traced back to Richard Cantillon's work (1734). To him, entrepreneurship was self-employment with an uncertain return (McMullan and Long, 1990). Gartner (1990) identified two distinct clusters of thought on the meaning of entrepreneurship. The first group focuses on the characteristics of entrepreneurship (e.g., innovation, growth, uniqueness, etc.) while the second group focuses on the outcome of entrepreneurship (e.g., creation of value).

The first cluster dominates and the definitions often referred to is from Schumpeter (1934). To Schumpeter an entrepreneur is a person who carriers out new combination, which may take the form of new products, processes, markets, organisational firms, or sources of supply. Entrepreneurship is therefore the process of carrying out new combinations.

There is a lot of discussion on the definition of what entrepreneurship exactly encompasses but for the point I wish to make in this section the state definition is clear enough. Entrepreneurship is the person of skills of a person that make some thing 'new' and in some extent is the driving force behind exploration. Moreover, exploration is precisely what the commercialisation of 3G entails.

3.2.6 Conclusion

The organisation of innovation of a radical technology poses various dilemmas: a structure for exploitation of current technology and flexibility for the exploration for new technology to find ways to exploit. The MNOs in Europe need the revenue derived from 3G. Exploration for the right business models is necessary. Academic literature suggests that the search for 'the new' must be done outside and away from the current business structures. An autonomous unit with a strong entrepreneurial drive is needed. Christensen (1997) poses the following barriers for radical innovations:

- Companies depend on customers and investors for resources.
- Small markets do not solve the growth needs of large companies.
- Markets that do not exist cannot be analysed.
- Technology supply may not equal market demand.

Due to the uncertainty about the outcome of the commercialisation process, it is wise to engage in various options to deal with the uncertainty. Developing a variety of business models with a variety of services enhance the probability of success. The process of commercialisation is complex and highly uncertain. The success of 3G is determined by reducing uncertainty about the commercial potential in the short term. Getting from 2G to 3G is technologically a giant leap. 3G is much more complex to operate as a network than 2G networks, as a result the costs are multiples higher. The investments needed to operationalise a 3G network do not limit the 3G developments if the uncertainty level of 3G is reasonable. The mobile communications industry is already deploying a transitional technology to make the road to 3G less bumpy. GPRS is often called 2½G and offers some features of 3G technology.

According to the subject discussed in this chapter two distinctive arguments were made; needed for commercialisation of 3G are autonomy and furthermore entrepreneurship is needed to cope with the limitations of large company structures.

A success factor of a commercialisation process is to be aware of the barriers that must be faced. These barriers must be challenged to commercialise 3G. The next chapter discusses concludes the various organisational challenges of 3G derived from the previous chapters into a clear overview. The organizational challenges are then moulted in to a conceptual model for MNOs to commercialise 3G.

3.3 Mobile Service and Application Service Provider

The mobile service provider is not a part of a 3G provider, but can best be seen as an agent. This agent ensures services work and can be delivered via a channel to the end user. If more channels are available, a best choice is made. Hence, the current discussion within MNOs about which service should be provided, will be moved up a layer and needs to be answered there. The views of Mayer on the service provisioning by 3G operators is therefore valid unchanged for a mobile service provider residing above all connectivity providers.

The Application Service provider is a hidden entity for the end user, but plays an instrumental role in making the NGN work. Mayer makes a clear distinction between services and applications: services are for end users, applications are for entities in the network. Services are sold to end users, applications are enablers for the network. However, both type of services will need to be economically viable, either by making money or by providing an environment that can generate revenue.

Below the discussion on this topic by Dimitry Mayer, again taking the 3G environment as basis, even though the views are relevant for any NGN player.

(Editors note)

Those who do not study the past are doomed to repeat it.

Santayana

Rats are different from people. They learn from experience.

Anonymous

"As the century closed, the world became smaller. The public rapidly gained access to new and dramatically faster communication technologies. Entrepreneurs, able to draw on unprecedented scale economies, built vast empires. Great fortunes were made. The government demanded that these powerful new monopolists be held accountable under antitrust law. Everyday brought forth new technological advances to which the old business models seemed no longer to apply. Yet, somehow, the basic laws of economics asserted themselves. Those who mastered these laws survived in the new environment. Those who did not, failed." (Shapiro and Varian, 1998).

It looks like a prophesy for the next decade, but this actually is a description of what happened a hundred years ago when the twentieth century industrial giants emerged. Using the infrastructure of the emerging electricity and telephone networks, these industry giants transformed the US economy; just like silicon valley entrepreneurs are drawing on computer and communications infrastructure to transform the world economy. Although, the business environment is changing rapidly and seems chaotic, economic laws do not change that fast (Shapiro and Varian, 1998).

In this chapter, we discuss the characteristics of a network economy. The legendary case of the rise and fall of Netscape offers a good example of what the basic premises are for 3G. Netscape dominated the emergence of the browser market with Netscape Navigator. Netscape was fundamentally vulnerable because its competitor, Microsoft, controls the operating system of which a web browser is but one component. This is a classic problem of interconnection. Interconnection battles have arisen regularly over the past century in the telephone, the railroad, the airlines, and the computer industries, among others and now again in the telecommunications industry. 3G is both hardware as software based and therefore are inexorably linked. Not the hardware or the software is of much value without the other: they are only valuable because they work together as a system.

"A major trend is a shift from value creation, limited or solely dependent on actual technology, too value creation based on exploiting the benefits of technology where the barriers of value creation are not limited by technology possibilities but by network economics" (Shapiro and Varian, 1998).

3.3.1 Technological change

The academic world developed three different lenses through which can be looked at technological change. Interestingly, these three lenses operate at three different levels of analysis and sometimes seem to look past one another (McGrath, 1997).

The first perspective of technological change can be thought of as technology driven. A firm achieves competitive advantage by capitalizing on a proprietary position with respect to a dominant design or standard. Huge profits can accrue to such firms if they can preserve their proprietary position. Technological change is driven by more or less random developments in the technologies themselves that lead to substantial market shifts. The process is commonly viewed as moving through a technology cycle of radical change, ferment, closure on a dominant design and incremental improvement until the next discontinuity (Tushman and Anderson, 1986).

A second point of view on technological change is based on the idea of firm-level resources as significant drivers of technological progress (Dierickx and Cool, 1989). In this point of view, competitive advantages derive from the path-dependent accumulation of idiosyncratic, firm-specific knowledge, resources and routines that yield technologies. Because it takes a long time to build up significant technological competence, it is not easy for competitors to follow quickly. The goal of managers in this case is to shape the evolution of technological progress in ways that suit a firm's particular competences (Nelson and Winter, 1982; Winter, 1995). An important distinction between the

two perspectives is that in the competence-driven viewpoint, firms are the key drivers for the evolution of technology, while the technology-driven perspective changes in technologies are the key driver.

A third perspective of technological change focuses on the demand-pull aspects of technological evolution. This demand-driven perspective emphasizes linkages between technologies and needs. Advantage emerges when a firm deploys technology to solve problems for customers and in doing so generates numerous need satisfying transactions (Kamien and Schwartz, 1975; Adler, 1989). The existence of needs or problems motivates both basic and applied research, which is followed by development, commercialisation, diffusion, and adoption of the innovation and a set of consequences that set the stage for subsequent rounds of technological progress. Although this approach has been found to work well empirically with technologies that are familiar to customers, customers find it very difficult to articulate needs that they have never considered.

The viewpoint used for this thesis is the technological perspective. The focus of this thesis is on the process to cope with technological change. We focus on how to deal with the technological change and not primarily, on what caused the technological change.

3.3.2 Information

The term information is used broadly in this chapter. Essentially, anything that can be digitised, encoded as streams of bits, is information. We focus on the value of information to different consumers. Some information has entertainment value, some has business value, but irrespective of the sources of value, people are willing to pay for information. Information is costly to create and assemble. The cost structure of an information supplier is compared to the supplier of physical goods unusual.

3.3.2.1 The costs of producing information

Information is costly to produce but cheap to reproduce. Books that cost hundreds of thousand of Euros to produce can be bound and reprinted for a fraction of that amount. A million dollar movie can be copied on videotape for a few cents. In economic terms: that the production of information involves high fixed costs but low marginal costs. This kind of cost structure has major implications. 20-percent mark up on a unit cost makes no sense if unit cost is down to zero. Information must be priced according to consumer value, not production cost. Value based pricing leads to differential pricing because people vary widely in their valuation of particular information.

For 3G this means that the different services that deliver information must be valued at a level that the customer perceives as appropriate. The nature of an emerging technology is that it addresses new markets and new consumption that, before the product or service is on the market, do not exist. Establishing an appropriated value perception is impossible. For the commercialisation of 3G, services have to be developed of which it is conceptually impossible to find out whether they will create value for consumers and create a market. The strategy that companies are bound to follow is to deal with this kind of uncertainty. Innovation is exploring the opportunities of a technology and for radically different technologies; this process is often trail and error. Organizing for an exploration process like trail and error is learning and adapting to the experiences very quickly. It is not only value that determines the price. Consumers use an estimation of alternatives and their price to estimate if an information product is worth its price. A good example is the CD, prices are at € 20, while consumers can create it themselves without quality decrease for about € 2.

3.3.2.2 Intellectual property

If the producer of an information good can reproduce cheaply, others can copy it cheaply. There are all kinds of legal grant of exclusive rights to intellectual capital via copyrights, patents and trademarks, but these do not control the information. Enforcing the intellectual property rights can often not be done. The case of Napster is an example of the inability to control information. Napster itself is down, but many other applications, which are sometimes even better that Napster, have taken over the place of Napster. Not only the content can be copied but also the enabler of content, the applications, can be perfectly copied and easily altered.

The aim of intellectual property rights is to maximize value instead of maximizing the protection. Translate to the Napster case; trying to banish Napster it created more competition of Napster. The current activity to make Napster a distribution channel, and a revenue stream for intellectual property, is maximizing value instead of minimizing.

3.3.2.3 Information as an 'Experience Good'

In economic terms: a good is an experience good if the consumers must experience it to value it (Nelson, 1970). Virtually any new good is an experience good, and marketers have developed strategies such as sampling, promotional pricing and testimonials to help consumers learn about the new good. A problem with information goods is that it is an experience good every time it is consumed. How do you know whether De Telegraaf is worth € 1,25 until you read it? Answer: you do not. Information businesses like print, music, movie industries, have developed various strategies to help consumers to overcome their reluctance to purchase information before they know what they are getting. First: the possibility of browsing: you can look at the headlines of a newspaper, hear music at a radio station and watch previews of a movie. However, browsing is only part of the story. Most media businesses overcome the experience good problem through branding and reputation. The main reason you read De Telegraaf is that it has been useful in the past. The tension between giving away your information, to let people know what you offer, and charging them for it to recover from costs is a fundamental problem in the information economy.

3.3.2.4 The economics of attention

Now information is available so quickly, so ubiquitously and inexpensively it is not surprising that everybody is complaining of information overload. The Nobel prize-winner Herbert Simon spoke about this when he said: *"a wealth of information creates a poverty of attention".*[14] The problem is not information access but information overload. The value of information is produced by an information provider comes in locating, filtering and communicating what is useful to the consumer. The concept of an information provider on the Internet is the same as the newspaper: they provide access to information, which they pre-select, and shape in the form they expect us to value them as valuable.

3.3.3 Technology

From the information side of 'information technology', lets turn to the technology side, which is the infrastructure that makes it possible to store, search, retrieve, copy, filter, manipulate, view, transmit and receive information. Infrastructure is to information as a bottle is to wine: the technology is the package that allows the information to be delivered to end-users. In our case, the content and applications are not useful if the 3G network is not functioning properly.

Today's pace of change and the rise of the information economy are driven by advances in information economy and infrastructure, not by any fundamental shift in the nature or magnitude of relevant information itself. The value of the Internet lies in its capacity to provide immediate access to information. With the Internet, information suppliers can distribute up-to-date information dynamically from databases and other repositories. Infrastructures that can reduce cost and increase value is tremendously important. The improved information infrastructure has increased our ability to store, retrieve, sort, filter and distribute information, thereby greatly enhancing the value of the underlying information itself. Content providers cannot operate without infrastructure suppliers, and visa versa.

3.3.3.1 Systems Competition

Systems show up everywhere in information technology: operating systems and applications software, CPUs and memory chips, disk drives and controller cards, videocassettes and the video tapes and in our case the 3G network and the 3G handsets. Usually one firm cannot hope to offer all the pieces

[14] Shapiro, Carl and Varian, Hal (1998), Information Rules: a strategic guide to the network economy, Harvard Business School Press.

that make up an information system. Instead, different manufacturers using very different production and business models make different components. Traditional rules of competitive strategy focus on competition, suppliers and customers. In the information economy, companies selling complementary components are equally important. When you are selling one component of a system, you cannot compete if you are not compatible with the rest of the system. Many of our strategic principles are especially designed to help companies sell one component of an information system.

The dependence of information technology on systems means that firms must make focus not only on their competitors but also on their collaborators. Forming alliances, cultivating partners and ensuring compatibility (or lack of compatibility) are critical business decisions. Firms have long been faced with make/buy decisions, but the need for collaboration and the multitude of cooperation arrangements has never been greater.

The history of the Microsoft-Intel partnership is a classic example. Microsoft focused almost exclusive on software and Intel on hardware. They both made numerous strategic alliances and acquisitions that built on their strength. The key for each company has been to commoditize complementary products without eroding the value of its own core strengths. Therefore, Intel has entered into new areas like motherboards and chipsets to improve their performance, thereby stimulating for its core product: microprocessors. Microsoft followed the same strategy with the ISV (Independent Software Vendors). It is in the interest of each company to create multiple sources for its partners' piece of the system to prevent the emergence of a strong rival for its own piece. This tension arises repeatedly in the information technology sector.

3.3.3.2 Lock-in and switching costs

Users of information technological goods are notoriously subject to switching costs and lock-in: once you have chosen a technology, or a format for keeping information, switching can be very expensive. Most of us have experienced the switching costs of switching from one computer to another: data files are unlikely to transfer perfect; incompatibilities with software tools often arise. Switching costs are significant. Lock-in into legacy systems is commonplace in the information technology industry and also for the network economy. Such lock-ins is not absolute; new technologies do replace old ones, but switching costs can dramatically alter firms' strategies and options. In fact, the switching costs are a strategic choice made by the producer of the system. Lock-in arises whenever users invest in multiple complementary and durable assets specific to a particular information technology system. In replacing an old system with a new, incompatible one, you may find it necessary to swap out or duplicate your entire complementary components of your system. These complementary components may include a range of assets: data files, various pieces of durable hardware, training and human capital. The switching costs can be astronomical, just imagine the costs for a company to change from Intel to Apple equipment, not only the hardware and software components, but the training and the costs of human capital can take astronomical numbers. Today's choice for state-of-the-art is tomorrow's legacy system. An example most know and are locked in into is Microsoft's Windows desktop operating environment.

Using the switching costs and related lock in effects as a strategy for growth, we can look at the momentum that boosted the growth of mobile phone penetration. This was based on GSM, the 2G technology, and was primarily caused by reducing switching cost to nearly zero. Although most users did not own a mobile phone, the concept of getting a telephone free when buying a contract, attracted many consumers.

To understand lock-in, the first step is to recognize what constitute true switching costs. Switching costs measure the extent of a customer's lock-in to a given supplier. The supplier also bears some costs when acquiring a new customer. These may be small, such as creating a new entry in a database or as large as forming a team of support personnel. Both the supplier and customer's costs are important. Adding them up give the total switching costs associated by a single customer; these costs are the key to installed base. The total cost associated with customer C switching from supplier A to supplier B is the cost that must be borne by customer C and supplier B to place the customer in a position with supplier B comparable to the one that customer C had with supplier A. It sounds odd to look at the switching costs borne by the supplier additional to the costs of the customer, but this is essential for a sound analysis of whether it is worthwhile to acquire a new customer. Indeed very often

new suppliers will help subsidize customers who are switching brands. Nowadays in the Netherlands, giving away a free phone and in addition 60 or more minutes free calling is getting normal.

How much would you spend to attract new customers? The answer depends on the costs that you and your customer both bear. Is the total of the switching costs lower than the discounted flow of profits per user than you can afford to subsidize the customer until the margin is getting too small. The main problem with switching is that switching costs cannot be measured because the customers vary often widely in their switching costs, but the principle still applies. Table 9 summarizes the classification of lock-in (Shapiro and Varian, 1998).

Type of Lock-In	Switching costs
Contractual Commitments	*Costs of breaking a contract and contract specific investments.*
Durable purchase	*Costs of replacing equipment and durable goods specific investments.*
Brand specific training	*Learning a new system, both direct costs and lost productivity.*
Information and databases	*Costs of converting data to new formats.*
Specialized suppliers	*Costs of funding of new supplier and costs of dependability to suppliers' specific capabilities.*
Search costs	*Costs of searching for a buyer or seller.*
Loyalty programs	*Costs of any lost benefits from incumbent supplier, plus possible need to rebuild cumulative use.*

Table 9: Types of lock-in and associated switch costs (Shapiro and Varian, 1998).

Sellers and partners face lock-in too. The fact is that anyone who makes investments that are specific to a particular supplier, customer or partner, is subject to lock-in for the economic lifetime of those investments. The key point is that investments are in writing if the customer or partner walks. It is not uncommon for suppliers and customers to be locked-in to each other at the same time. Such bilateral or two-sided lock-in can lead to a certain balance. Lock-in is inherently a dynamic concept, growing out of investments made and needs realized at different points in time. Switching cost vary over time.

The easiest way to start into the cycle is at the brand selection point that is when the customer chooses a new brand. The first time a customer picks a brand, that customer will have no preference based on lock-in. Brand selection is followed by a sampling phase, during which customer actively uses the new brand and takes advantage of whatever inducements were made to give it a try. Customers that do more than sampling move into the entrenchment phase. This is when the customer really gets used to the brand, develops a preference for that brand over others and perhaps becomes locked-in to that brand. The customer goes into locked-in phase if the switching costs become expensive.

3.3.3.3 Positive feedback, network externalities and standards

For many technologies, consumers benefit from using a popular format or system. When the value of a product to one user depends on how many other users there are, economists say that this product exhibits network externalities, or network effects. Communication technologies are a prominent example: phones, e-mail, Internet, fax machine and modems all exhibit network externalities. Technologies subject to strong network effects tend to exhibit long lead times followed by explosive growth. The pattern results from positive feedback: as the installed base of users grows, more and more users find adoption worthwhile. Eventually, the product achieves critical mass and takes over the market. The Internet exhibits this pattern. The first e-mail message was sent in 1969, but until the mid

1980s, only computer freaks used e-mail. However, when Internet began to take off in 1989 email traffic started growing, it doubled every year from 1989 until 1995. After 1995, it started growing even faster.

Network externalities are not bound to communication networks. They are also powerful in virtual networks, such as networks of users. Growth is not only a strategy for achieving production economies of scale, but also economies of scale for the demand side, generated by network effects. The key challenge is to obtain critical mass. Once the customer base is large enough the market will build itself. Technological superiority is not enough to win. A variety of tools to achieve the critical mass stimulates the positive feedback (Cusumano, Mylonadis and Rosenbloom, 1992).

In competing to become the standard or to achieve critical mass, consumer expectations are critical. The product that is expected to become the standard will become the standard. Self-fulfilling expectations are a manifestation of positive feedback economics and bandwagon effects. Customer expectations are so important in the area of information infrastructure and while technology is changing so rapidly, the timing of strategic moves is even of greater importance in the information industry than in others. Moving too early means compromising on technology and failing without sufficient allies. Moving too late can mean missing the market entirely, especially if customers are locked-in into rival technologies. A frequently used strategy to establish critical mass is to assemble a group of strategic partners. For this purpose, partners can be customers, complementors or even competitors. Having a large visible customer aboard can get the bandwagon rolling by directly building critical mass. Having suppliers or complements on board makes the overall system more attractive. Having competitors onboard can give the customers the assurance that they are not locked-in.

The 3G playing field is influenced by the standardization processes. UMTS is the standard for the 3G networks, but the interfaces between the different players are not yet standardized. For example, WAP is the HTML version for mobile phone. WAP 2.0 exists but different rivals are rising: XML, xHTML, cHTML. These are just a small selection of examples of the different protocols and interface standards used in relation with 3G[15]. The dominant standard does not exist yet.

3.3.4 Conclusions

3G is an information technology product. The previous chapters revealed the economics of network dependent technologies. 3G is the follow-up of 2G which as well is dependent on network economics. The difference between 2G and 3G is in the value proposition and the increase in complexity to create this value. The difficulty for the mobile communications industry is that there is no dominant platform for 3G services or applications. Construction of a certain platform is highly complex due to the complexity of the technologies, the convergence of industries and markets.

3.3.4.1 Value proposition

The value proposition of 2G is based on connectivity between two telephones. The connection type is peer-to-peer. The resources to establish this connection are solely controlled by the MNO. The success of mobile connectivity made the penetration rate rise very sharply for a couple of years until the last year. In the second quarter of 2001, sales of mobile phones stabilized and so did the penetration rate of mobile users. Aspects common to a situation in a market where sales and market growth stabilize often enhance competition and aggressive pricing strategies are used if clear value difference between competing products is absent. In our case, the value proposition becomes less visible to the customer the mobile phone becomes a commodity item. For example: for most mobile users it does not matter which operator they use, they offer almost the same services and quality. Connectivity became a commodity service and as a result offers declining competitive advantage. Differentiation is more difficult to establish, which causes prices to decrease if market growth slows down. This explains the decrease of the average revenue per user (ARPU) the reviewed research reports and the RSM conference on M-commerce showed as a major issue for the whole mobile communications industry.

[15] Mobile Internet for the long haul, Morgan Stanley Dean Witter (2000).

3G offers a different value proposition: instead of offering connectivity to another user, it offers connectivity to a network of users. The value proposition shifts from connectivity to access to services. Information anywhere, anytime may be the new value proposition. Getting the information to the user, who perceives it as valuable and therefore is able to pay for it, is a more complex task than the current 2G-business model. The difference has several aspects; crucial is the way the value is delivered by making use of a more dynamic and fragmented value chain.

The economics of the value of information anytime, anywhere can be explained with transaction costs theory. Transactions costs theory as developed by Williamson (1975) is based on the critical dimensions of a transaction. Transactions costs theory is initially designed to explain why certain transactions are coordinated by market structures instead of organizational structures or visa versa. 3G makes the acquisition of information possible that other wise would not be so easily acquired. The availability of information for the receiver is valuable, because the alternative is much more costly. The most valuable aspect of 3G is that the availability of information increases independent of location or time. To overcome the location or time to get hold of the same information represents the benefit. Saving time makes 3G services more valuable and for some situations invaluable, because it makes transactions possible which were not possible before.

3.3.4.2 The value chain

A value chain is traditionally defined as a sequence of activities that form and add value to a product. Porter's well-known value chain describes the internal processes of a company. However, it is also possible to use a value chain to describe the activities that take place as a product passes through different actors in the market, on the way to the end user. For 3G the situation is more complex. Instead of using a traditional sequential view of the value chain, I use a more dynamic representation of the current value creation process. Because market conditions are changing rapidly, players in the value chain are constantly repositioning themselves in their market areas and/or moving to or between different market areas. It is difficult for a single company to offer end-to-end solutions on its own to customers, which means that partnerships are crucial to their survival. Companies are tangled in a complex network of interrelationships, which can be visualized as a value-creating network: the mobile value network as indicated in Figure 14.

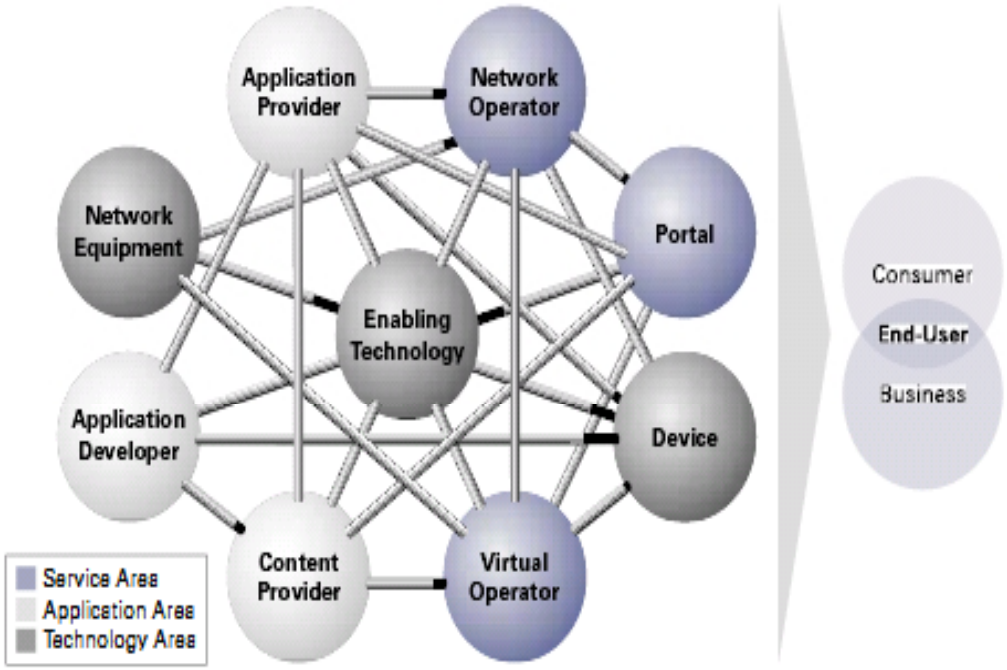

Figure 14: Mobile value web (Source: Durlacher, 2001)

The mobile value network is highlights the increase in value chain complexity. Figure 11 is merely illustrative as a network that interrelates to create value. The three streams represent the three areas of 3G: technology, applications and services. Technology enables the operational 3G network. The application area functions as the interface between the technology and information. The third area, services, is what delivers the value to the end-user by combining optional external resources with the technology and application area.

In the current market for mobile communications (2G) the technology area is the creator of value for the end-user. With the transition from 2G to a next generation mobile communication IP (internet protocol) and higher bandwidth enable wireless Internet. The technology area will then be part of the value creation by connecting to the larger IP based network and make the advantages of this network available. The availability of connectivity is not where the emphasis is on. The emphasis is primarily on the gains for the end user to have a connection. With 2G the gains are by the connection itself, talking through the phone connection with someone else. The relation between the actual technology and the created value is very close together.

The service -and application technology areas change the value creation with 3G. The service area makes the capabilities of the technologies possible, makes the 3G-network function and gives access to the network and the possibilities of the network. The applications area creates value by realizing the opportunities of the 3G. The change in focus from technology towards value is eminent for an information product like 3G.

This chapter showed that the transition of 2G to 3G might be more than just another improvement of existing technological possibilities. 3G may be radically different and may change the business landscape. 3G technology forces the convergence of industries and the convergence of markets into one mobile communications industry and market. 3G technology is the combination of three technologies: Mobility, Internet and Computing. Even though 3G technology is not that extremely different from its predecessor, the effect that it has on the (relating) mobile communication industries is eminent. The conclusion can be drawn that 3G is more related radical than incremental, what in effect has more inherent uncertainties.

Radical innovations are highly uncertain and feasible business models do not yet exist.

4 To-Be Situation

When the NGN network is available, the user will perceive an omnipresent network. In this network anything can be always on, leading to a new era of using computers. On top of this, the connection channel will be transparant, and the connection selection will be based on:

- Context user (type of activity, …)
- Information requirement (amount, format, …)
- Criteria (cost, bandwidth, provider, …)

This implies that no connection provider has a monopoly or dominance, as users may adapt their requirements to the situation they are in, one of which is the amount they are willing to spend for bandwidth. Pay-per-service is going to be an important mechanism, in which for high speed delivery a high price is acceptable as the end user has low bandwidth alternatives (providing a lesser service quality).

Users will require a vast amount of low price bandwidth if the ubiquotous use of intelligent devices will in fact take off as expected. In particular the service activation and service delivery are important, as one device can activate the service (e.g. a remote controlled wireless premisis survailance system), while the result is delivered elsewhere (e.g. a wireless monitoring device for a security employee).

Key aspects currently not resolved yet are:

- User authentication issues
- Micro-billing (i.e. how to make a 10ct value transaction possible)
- Roaming billing (including specification on the cost beforehand to feed selection process)
- Synchronisation of essential data
- Security / encryption (based on PKI like facilities).

Please note that without solving these key aspects, the NGN may be feasable and may even work, but it will not be used.

4.1 Common approach

Educating the user seems the most obvious approach if so many issues are going to change. Never a new technology took of by itself, usually a lot of marketing is required. Instead of making this a marketing issue only, which requires short term revenue to be interesting for any provider, the issue of NGN should be seen as a educational challenge as well. Making people and society understand what will become available, ensures early appriciation.

Facilitating all types of providers that are part of the NGN is an important task for governmental bodies. A very important issue here is regulating power of the governments in handing out spectrum. The spectrum licences for 3G mobile internet did not help getting this technology in place faster, on the contrary, and the best approach is to tax the revenue and not the potential of a technology.

Stimulating showcase implementations, by funding pathfinder projects and joining in on pilot projects is an approach that regulators can use to ensure the industry is properly activated.

Promoting the concept via a wide range of promotional channels will assist in an easy acceptance. In fact, introducing some of the NGN facilities via schools and general infrastructure facilities like

electronic licence plates and such, will ensure that a majority of the population of a country is touched by NGN services regularly.

4.2 Business Model approach

4.2.1 Target Group Marketing in the NGN Environment: B2Who?

In the NGNI environment it is very interesting to take a closer view at who actually is delivering services to who. Often in marketing a distinction is made between the target groups by using the terms *business-to-business* (B2B) and *business-to-consumer* (B2C). B2B means the delivery from companies to other companies, for instance the delivering of semi manufactured products. B2C is used when companies deliver services to consumers, for instance providing consumers with an internet entry by an internet service provider or selling books. Most of the time the context of the delivery has a massive character when information is the delivered product and an individual character when a physical product is involved.

There are at least two other marketing models of interest in the NGN environment, in which two parties communicate with each other. These are C2B (*consumer-to-business*) and 121 (*one-to-one*). In this case individuals communicate with each other or with a company. Ad in this case it if very difficult to see the target group as one whole group behaving all the same, which you can easily do when speaking of B2C and B2B. It could be possible that today the individual end-users are not seen as a target group because of their unpredictable and intangible behaviour, but this is an advised against point of view.

4.2.2 The Value Chain

When delivering NGN services, no matter it is B2B, B2C, C2B or 121, all parties need to settle up in a way when it come to pay for the service It is of no doubt, there need to be clear agreements for who is going to get what en when. Let's take a closer look at this.

4.2.2.1 Analyses of the NGN Value Chain

The networks of companies that will be a party in the NGN Environment will be very complex and will consist of a great amount of parties for sure.

Already today renowned brands, software companies and big telecom companies collect ecosystems of partners for jointly delivering the right services and applications. Effective start-ups quickly find their place in these ecosystems. They can add value in B2B models by realizing parts of applications and services. The ecosystems become more and more granular because of the increasing amount of individual players, small companies and start-ups who concentrate on a growing amount of small areas.

Examples of players in an ecosystem in the NGN environment are:

- Producers of component-based software;
- Suppliers of database systems;
- Content providers;
- Customer *care* software companies;
- Billing supplier;
- Network providers;
- Suppliers of security components;

- Providers of platforms for collection and distribution of content;
- Providers of paying facilities (for instance mobile payments).

As an example: the chain starts off with the mobile network provider. They deliver capacity for mobile internet providers who on their turn add the necessary internet technology and internet services. Content supplier deliver basic information like weather information or traffic or route information. This information will be combined with hardware- and software products, delivered by platform suppliers, in order to make it work for the end-user. These applications are developed by software developers and can be tuned to specific and dynamic needs of an individual. In certain cases security component will be added as well. Finally a mobile service provider could offer customer relationship care and billing

4.2.2.2 Billing and Paying the Services

The way the services will be settled is dependent of the way the parties in the value chain settle up with each other. When it comes to deliver, slacking and paying for the products and services that add the value.

In the NGN environment the value chain will mostly deliver information, communication and transactional services. For example: inquiry or receiving location based traffic jam information, look at a news page, inquiry of stock share price, downloading of MP3-music. Fitting payment models will be based on use, activities or transactions of the end-user. But in the NGN environment it is not always the end-user is also the payer for the service or product. The earnings could also originate form marketing budgets, advertising budgets and budgets for preservation of clients and one-to-one marketing.

More and more is to expect that the end-user will pay for the use of the network, especially when the provider will be better equipped to accept internet payments. A variant here is the end-user who pays a fixed amount of money per month. In return the end-user can use the net unlimited. An example is the supplier of music who offers MP3-music on payment of 10 dollar per month no matter what the size of the purchase is.

4.2.2.3 Purchasing, Delivery and Payments Between Parties

This all introduces a considerable amount of uncertainties when talking about the final revenues. And at the same time parties have to invest (for instance hardware and software) in the beginning, while it is still not sure the service or product will be profitable.

Of course parties prefer to have instant agreements on delivery and payments with only the parties direct before or after them in the chain. Furthermore they prefer to have an instant payment after delivery. For the next party this means that they have to invest or lose a fly to catch a trout.

But in ecosystems this principle of immediate gratification will not work. In ecosystems payments for the intermediate result will be done when the end-user pays for the end result. And here the importance and necessity of involving trust and collaboration is shown. In some cases parties have to let go the current way of delivery and payments in order to be able to join in the value chain.

The spreading out of the incoming money, revenue sharing, can be done in several ways. At least two ways are possible:

- Revenue sharing based on a percentage of the incoming money;
- Revenue sharing based on a fixed sum of money per transaction or use.

When revenue sharing is based on a percentage every party will be scaled by the added value they bring in. Of course the total percentage will be 100%. The benefit of this way of revenue sharing is that every party shares in the profit, at least when the party at the end of the chain managed to get a good price for the product or service. It also has the advantage that it is still possible to play around with the price a bit. Everybody shares the risk when it turn out that the price has to be lowered a bit in order to

make the product sell. It is up to the parties to decide whether or not they still want to join in the chain. As long as the price is still above the costs of making the product, this is all right. Are the incomes lower then the costs the parties can decide to step out or take the investment they have to do, for instance because of the image or market position they want to achieve.

Every party is able to define their own margins when revenue sharing is based on a fixed sum of money. Furthermore it is beforehand clear what the amount of money will be. In this case the en-user has to pay the price. If the end-user id not willing to pay this price the transaction, service or product is not viable.

5 Appendix

5.1 Glossary

2G Second Generation Generic name for second generation networks, for example GSM.

2G+ Second Generation enhanced Name given to 2G networks enhanced with GPRS or EDGE.

3G Third Generation Generic name for third generation mobile networks.

3GPP Third Generation Partnership Project. A co-operation between regional standards bodies to ensure global inter-working.

AAA Authentication Authorisation Accounting

Always on The device has capabilities to send and receive data when **on**, not requiring any logon per transaction.

Applications Applications are service enablers; deployed by services providers, manufacturers or users

B2B Business to Business Term used to identify a business to business transaction.

B2C Business to Consumer Term used to identify a business to consumer transaction.

Bluetooth Wireless industry standard Short-range radio link standard. Uses licence-exempt spectrum @ 2.45 GHz to provide 1 Mbps.

BTS Base Transceiver System

CAMEL Customised Applications for Mobil networks Enhanced Logic. CAMEL specifies how features normally associated with Intelligent Networks can be integrated into a GSM network. The greatest benefit CAMEL provides is to allow information on the caller's location to be passed from the network to an Internet web site.

CD Compact Disc Initially used to store music, now used for data and increasingly films/movies.

CN Core Network. Physical infrastructure linking wireless base stations. Predominantly circuit-switched, core networks will increasingly become packet-switched.

DAB Digital Audio Broadcasting A digital radio technology used for radio broadcasting in a number of countries.

DECT Digital Enhanced Cordless Telecommunications. A wireless technology used for short range communications, for example cordless telephones.

DHCP Dynamic Host Configuration Protocol. An IP-based protocol that allows the automatic configuration of an IP address to a host.

DVB	Digital Video Broadcasting A digital radio technology used for television broadcasting in a number of countries.
EBPP	Electronic Bill Presentation and Payment With EBPP, the process of creating and delivering the bill and the process of paying the bill are connected through integrated systems and common databases.
EC	European Commission
e-commerce	Electronic Commerce. Term used to describe transactions that take place on-line where the buyer and seller are remote from each other.
EDGE	Enhanced Data rates for Global Evolution. A further enhancement to TDMA systems which allows for data speeds up to 384 kbps.
EDI	Electronic Data Interchange. The exchange of standardised document forms between computer systems for business use. EDI is part of electronic commerce.
EDIFACT	Electronic Data Interchange For Administration, Commerce and Transport. EDIFACT or UN/EDIFACT (full acronym) comprises a set of internationally agreed syntax standards, directories and guidelines for the structuring and exchange between independent computer systems of data that can be generated in character format. The UN/EDIFACT rules are published in the United Nations Trade Data Interchange Directory (UNTDID).
EMI	Electro Magnetic Interference
E-OTD	Enhanced-Observed Time Difference
ETSI	European Telecommunications Standards Institute. One of the standards body for Europe. EU European Union A community of 15 European nations comprising the European Economic Community.
FDD	Frequency Division Duplex. One technique used for wireless communications where the up link and down link are at different frequencies.
FER	Frame Error Rate
G5	Messaging. G5 Messaging is designed with a fallback to Group 3 fax and Internet e-mail as core capabilities. With a single keystroke, a message may be sent to multiple recipients using any mix of Group 3 fax, Internet e-mail and full G5 Messaging.
GIF	Graphics Interchange Format
GIS	Geographic Information Systems. GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations.
GPRS	General Packet Radio Service. Technique used to upgrade current TDMA mobile networks. Allows a subscriber to gain up to eight 14.4 kbps channels. Also introduces packet switching.
GPS	Global Positioning System A US satellite-based positioning system.
Group 3 fax	The most recent standard for fax devices which accounts for about 99% of all fax machines built since 1980. Group 3 actually refers to two recommendations defined by the ITU known as T.4 and T.30.

GSM Global System for Mobile communications The most popular standard for 2G mobile networks.

H.323 An umbrella recommendation from the ITU that sets standards for multimedia communications over Local Area Networks that does not provide a guaranteed QoS. These networks dominate today's corporate desktops and include packet-switched TCP/IP and IPX over Ethernet, Fast Ethernet and Token Ring network technologies.

HiFi High Fidelity

HIPERLAN/2 High Performance Radio LAN Type 2. Wireless LAN (specify by ETSI/BRAN) in the 5 GHz IMS Band with a bandwidth up to 50 Mbps.

IANA Internet Assigned Numbers Authority

ICT Group Information and Communication Technology Group. A working group in the UMTS Forum.

ID Identification

IETF Internet Engineering Task Force. An engineering and protocol standards body that develops and specifies protocols and Internet standards, generally in the network layer and above.

i-mode Proprietary HTML-based mobile information service offered by NTT DoCoMo in Japan. The i-mode service is similar to WAP.

IMSI International Mobile Subscriber Identity

IMT-2000 International Mobile Telecommunications. ITU initiative for a global standardised 3G wireless network.

IP Internet Protocol The dominant network layer protocol used with the TCP/IP protocol suite.

IPDR Internet Protocol Detail Record Organisation

IPv4 Internet Protocol version 4 The version of IP in common use today.

IPv6 Internet Protocol version 6. The emerging standard, which aims to rectify some of the problems seen with IPv4, not least the address space.

ISDN Integrated Services Digital Network. A telephone service that offers high speed digital services for devices connected to a telecommunications network.

ISM Industrial Scientific and Medical

ISP Internet Service Provider. A company or organisation that provides access to the Internet to users.

ITU International Telecommunication Union

JPEG Joint Picture Expert Group Standard for the compression of still pictures.

MAC Media Access Control Part of the physical layer of a network that identifies the actual physical links between nodes.

m-commerce	Mobile Commerce. Similar to e-commerce but the term is usually applied to the emerging transaction activity in mobile networks.
MIME	Multipurpose Internet Mail Extensions. A specification for the transfer of non-text files with regular Internet e-mail.
MMAC	Multimedia Mobile Access Communication systems. MMAC systems will provide high-speed, high-quality mobile communications via seamless connections to fibre optic networks, enabling the use of multimedia services anywhere and at anytime. MMAC services are targeted for launch around 2002 in Japan.
MMI	Man Machine Interface. A term used to describe the environment that encompasses the activities surrounding a user and their interaction with a device.
MNO	Mobile Network Operator
MP3	Music Player. The term has become synonymous with the MP3 player which delivers CD quality music, It is the MPEG-1/2 audio layer 3.
MPEG	Moving Picture Expert Group Standard for compression of moving pictures and sound. MPEG-1, 2, 4 are used.
NAI	Network Access Identifier
NGN	Next Generation Networks
PC	Personal Computer. Common term to describe the personal computer, usually based on a common architecture.
PDA	Personal Digital Assistant
PSTN	Public Switched Telephone Network. The network, or groups of networks, consisting of switches and transmission that provide the bulk of switched services to the general public.
Push Service	A service that has the ability to disturb the end user and request attention. A voice call on a mobile phone is such a pushed service, but an SMS is too
QoS	Quality of Service. Subjective and objective metric sets that quantify the performance of a network and its suitability for use with some applications and services.
RADIUS protocol	Remote Access Dial-In User Service protocol. An access server authentication and accounting protocol. The RADIUS authentication protocol is documented separately from the accounting protocol, but the two can be used together for a comprehensive solution.
Release 2000	Release from 3GPP. Term applied to the group of specifications due to be released in early 2001 which will concentrate on the core network. Also known as Version 5.
Release 99	Release from 3GPP. Term applied to the group of specifications forming the first phase of release specifications by 3GPP mainly concentrating on the radio access network.
RF	Radio Frequency

RSVP Resource ReSerVation Protocol. The RSVP protocol is part of a larger effort to enhance the current Internet architecture with support for QoS flows. The RSVP protocol is also used by a host to request specific QoS from the network for particular application data streams or flows. RSVP is also used by routers to deliver QoS requests to all nodes along the path(s) of the flows and to establish and maintain state to provide the requested service.

SA Selective Availability. An artificial error introduced into satellite data by the US DoD (Department of Defense) to reduce the possible accuracy of a position to 100 metres for commercial users.

Services Services are the portfolio of choices offered by services providers to a user

SIP Session Initiation Protocol. A signalling protocol for Internet conferencing and telephony. SIP was developed within the IETF MMUSIC (Multiparty Multimedia Session Control) working group, with work proceeding in the IETF SIP working group.

SLA Service Level Agreement

SLP Service Location Protocol An emerging Internet standard for automatic resource discovery on IP networks.

SME Small to Medium Enterprise Term used to describe a company that has less than 500 employees.

SMS Short Message Service The service that enables the sending and receiving of short text messages of up to 160 characters.

SS7 Signalling System No. 7

SWAP Shared Wireless Access Protocol. SWAP is the name given by the Home RF Working Group to its specification for data and voice wireless communication. SWAP is a combined protocol from the TDMA-based DECT protocol for voice communication and CSMA/CA (Carrier Sense Multiple Access / Collision Avoidance) based IEEE 802.11 protocol for data communication.

TAP3 Transferred Account Procedure version 3. TAP is the process that allows a visited network operator (VPLMN) to send billing records of roaming subscribers to their respective home network operator (HPLMN). TAP3 is the latest version of the standard and will enable billing for a host of new services that networks intend to offer their customers.

TCP Transmission Control Protocol. A transport layer protocol that offers connection-oriented, reliable stream services between two hosts. This is the primary transport protocol used by TCP/IP applications.

TDD Time Division Duplex: One technique used for wireless communication where the up link and down link use the same frequencies.

TIFF Tag Image File Format A widely used format for storing image data.

TOA Time of Arrival

TV Television General term used to describe the broadcasting and reception of video and audio.

UDP User Datagram Protocol

UMTS	Universal Mobile Telecommunications System. UMTS is a modular system that incorporates several technologies that realise the convergence of existing and future mobile and fixed networks, including the Internet. The UMTS concept embraces also all applications and services that can be offered to the end-user. UMTS is a member of the IMT-2000 family of systems.
UMTS Forum	Cross industry body Non-profit, independent forum that gives guidance to standards and other bodies in terms of market requirements and issues to be solved to allow for a smooth deployment of UMTS. UMTS Forum's "Extended Vision" embraces all elements of the value chain beyond the standards (specified by 3GPP/ETSI) for 3G mobile networks.
USIM	Universal Subscriber Identity Module. The module that identifies, and is unique to, the mobile subscriber.
UTRA	Universal Terrestrial Radio Access
VHE	Virtual Home Environment. The term used to describe the concept of offering a subscriber the same services and facilities that he experiences on his home mobile network.
VoIP	Voice over IP. The generic term used to describe the techniques used to carry voice traffic over IP.
W3C	Worldwide Web Consortium
WAN	Wide Area Network
WAP	Wireless Application Protocol. Used to allow the transmission of simple web pages in 2G networks. Consists of a protocol stack that covers layers 4 to 7 of the OSI model. Uses IP but replaces TCP and HTTP with UDP. Web pages are written in WML.
WLAN	Wireless Local Area Network
WML	Wireless Mark-up Language
xDSL	Digital Subscriber Line. A group of technologies that allow higher speed access over standard wired lines to a telecommunications network, for example ADSL, which offers up to 512 kbps in one direction and up to 8 Mbps in the other (A= Asymmetric).
XML	eXtensible Mark-up Language. An open standard for describing data from the W3C. It is used for defining data elements on a web page and business-to-business documents. By providing a common method for identifying data, XML supports business-to-business transactions is expected to become the dominant format for electronic data interchange.

5.2 List of Figures

5.3 List of Tables

5.4 Questionnaires

5.4.1 My Daily Diary

5.4.1.1 How the heroes of your kid live: any time, any place, any way and they never die

This story is about kids. In particular about they way the like to play with more lifes at the same time, each of those life's intended to discover and explore new experiences. One time this kid is fantasising about being a police officer, a moment later it may play 'doctor and patient'. The kid can even think it has become a dinosaur and start to behave as a dinosaur. A kids hero comes and goes, but most of the times the hero returns. The fantasy of kids is endless and almost continuous. This behaviour of fantasising continues from birth till the end of adolescence. For the lucky ones it sometimes continues (Quote: 'working should be the same for adults as playing for kids.') but most of all human start a more introvert secret fantasy life after the age of, say, eighteen.

Kids needs anchors and heroes. They need role models too, and usually kids mix role models and heroes freely. Starting with a teddy after birth, they associates themselves continuous with a particular hero. This hero is changing during growing up – just like evolution - and is made to fit its purpose. Some specific heroes become anchors and give the child's a feeling of safety. Some heroes not accommodate this evolution and are discarded. Not many fourteen years olds watch Sesame Street and see Bert and Ernie as their heroes anymore, something that was a natural thing to do when they were just eight. Even their father or their mother could be a hero, but growing up they have to let go of this view of their parent and choose other 'anchor-person', role model and set of heroes. Special in bad, unsure moments (such as illness, pain, anxiety, divorce) – like the pyramid of Mazlov –kids refind former trusty anchor-heroes to find their roots back.

In each of the fantasy life's kids are living, they can try out a new facet of their daily experience. Living that hybrid life of experiences and fantasies is a safe way of acquiring new experiences. Anything may happen in this fantasy without any harm done. Their diary is then the best secret store of all experiences, the good ones and the bad ones. In case of troubles in their fantasy life, they can just leave it. In case of happy fantasies, they go on for more. Each time, they like to 'load' a new phase of that particular life. That could in any place or time: in bed just to fall in sleep, or early in the morning, to start the day with. It could be to absorb and process the impressions acquired on school, or to deal with the troubles with their parents.

The kids' diary is secret, but kids like to share some experiences in one of the 'virtual' life's they live with close friends. Sometimes even with others, via the internet or SMS-phone. In those situations, imagining that the world resembles a cartoon, is very important for kids and adolescents. Cartoons are real-like, but not a real world. Cartoons are a fantasy life, that may convert later to a virtual life. Obviously, all that happens in cartoons will never happen in real life, at least, that is what kids think. That is probably the main reason why comic books and cartoons are so popular. From the point of view of these young customers, there could be many presentations of their hero's, in many forms of existence and in many qualities of performance. Their hero can be presented by a particular logo or ring tone on the mobile phone, by a tune in midi or MP3 format, by a daily cartoon in a newspaper or comic-magazine, by cartoons on television or videotapes, or by audio stories on CD or cassettes.

Kids assemble all papers, images, gadgets and other stuff of their heroes and models, e.g. in their room, in a box or a scrapbook, and – more and more – on the hard disk of their PC. It's like a daily diary, a multimedia diary full of imagines and experiences, necessary in order to grow up in this crazy rush world. In the adolescence phase of their lives, people find their heroes in the virtual world, where they present themselves with avatars or pictures of their heroes. Anyone can become an anonymous person and pretend to be whoever they want to be at that particular moment. Moreover, it will be a small world as soon as we can convergence between all available channels and content providers. Because then a kind of coordination between all the adventures of the heroes of today and actual experiences will be available any time, any place, any channel, any device, in the order and fashion the kid prefers. Kids could hop and zap between all available content, as much and whenever it likes without the need of a 'content reboot' every time a new channel or device is used.

For instance Pokemon, available by regular television, by Cartoon Networks, on videotape, as a Nintendo game, in Comics, on CD-rom, in audio- and videocassettes, by tradingcards and via the WarnerBros internet portal. The solo existence of stand alone and off-line games, CD's and cassettes will be replaced by online games and streaming audio which are always available through any of the channels offered, personalized stored in a multimedia diary full of imagines and experiences. The billing for using on-line audio, video and games should be spread in such a fashion that it results in about the same value feeling as a parent has when buying those content off-line. Same price, better experience. All easily connected to the fantasy world of children.

5.4.2 Daily Diary Questionnaire

5.4.2.1 General Questions

- What is your age:
  - ❑ 10-20
  - ❑ 21-30
  - ❑ 31-40
  - ❑ 41-50
  - ❑ 51-60
  - ❑ 61-70
  - ❑ >70
- What is your gender
  - ❑ Male
  - ❑ Female
- What is your family situation:
  - ❑ Single
  - ❑ Family without children living at home
  - ❑ Family with children living at home
- Are you a student?
  - ❑ Yes
  - ❑ No
- Do you have a professional job?
  - ❑ Yes
  - ❑ No

If Yes:

- Do your activities mainly consist of
  - ❑ Processing information
  - ❑ Processing goods?
- Are your working hours mainly:
  - ❑ Fixed
  - ❑ Variable
- What is your role:
  - ❑ On the shopfloor
  - ❑ Management
  - ❑ Top Management
- Is the location where you do your work:
  - ❑ Mainly fixed
  - ❑ Mainly non-fixed (flex place)
  - ❑ Mainly mobile
- Is there a group of people you prefer to be part of (e.g. your favorite soccer club, "coca-cola kid", Nike)?

Please verify if the interviewee is a parent or a kid and then select the approriate questions below.

5.4.2.2 Scripting interview questions for <u>parents</u> of kids 0-16 years:

- Do you imagine / expect a kids multimedia diary, full of imagines and experiences?

- When it was possible, would you facilitate your children to use the feature of being able to watch all episodes, adventures, photographs and other audio visual stuff of their virtual hero (like Pokemon) on their mobile handset, anytime, anywhere, anyplace?
- Would you want to subscribe to the whole package of episodes and information?
- Do you want to be alerted when a new episode starts?
- Do you want that the kid is alerted when a new episode starts?
- Do you want to be alerted when a new game-level is available?
- Do you want to be alerted when a new issue is published?
- Do you want that the kid is alerted when a new game-level is available?
- Do you want that the kid is alerted when a new issue is published?
- Do you want to be alerted for other special situations? What kind of situations?
- Do you want that the (fragment of the) episode is repeated as many times as the kid likes?
- How much money would you like to pay for these services?
- Would this be an ad-hoc service for you or would you like to subscribe to the service?
- Is it OK for you when the price is lower in the beginning and should be raised when the episodes are more important? For instance: are you willing to pay a higher price for the episodes played in the finales and a more higher price for the final episode?

5.4.2.3 Scripting interview questions for kids 14-18 years:

- When it was possible, would you use the feature of being able to watch all episodes, adventures, photographs and other audio visual stuff of your virtual hero (like Pokemon) on you mobile handset, anytime, anywhere, anyplace?
- Should you upgrade your mobile handset to a wireless handheld computer, to be used also as multimedia diary full of imagines and experiences?
- Would you want to see (subscribe to) the whole package of episodes and information?
- Do you want to be alerted when a new episode starts?
- Do you want to be alerted when a new game-level is available?
- Do you want to be alerted when a new issue is published?
- Do you want to be alerted for other special situations? What kind of situations?
- Do you want the (fragment of the) episode repeated as many times as you like?
- Should you pay for your selves, and if so, how much money would you like to pay for these services?
- Would this be an ad-hoc service for you or would you like to subscribe to the service?

- Is it OK for you when the price is lower in the beginning and should be raised when the episodes are more important? For instance: are you willing to pay a higher price for the episodes played in the finales and a more higher price for the final episode?

5.4.3 Dating in Cyber Space

5.4.3.1 The Technology to Flirt Anonymously

Is there anyone still out there that remembers the hesitation to approach that person that stood out in the crowd – your loved one, only she didn't know that yet. The cautious way of getting somewhere close to where she sat, the occasional glance – hoping to establish eye contact and a positive confirmation of your existence – as you didn't want to be caught snooping or worse: staring, by your friends. What to say, it all seemed so trivial, while you wanted to make a sophisticated impression.

In today's society these mind-boggling deliberations no longer constrain us. And as always it's the young generation that is leading the way. The Chat and Dating sites have become so popular with the teens and twens of our society that the first sites emerge addressing the elderly: people over 30 and daring sites even for people over 40. Extending your friendships is now supported by modern technology. Technology enables us to keep up our defenses until we are ready to lower them bit by bit as we get to know the person on the other end. Embarrassment is limited to a discontinued communication with someone you don't really know and probably won't recognize in the street. Nowadays our relationships evolve in a number of stages: from impersonal contacts (communities of interest) through personal contact on distance (email) to close physical contact. People will expose themselves as they start to feel comfortable with the other. At any stage it is possible to stop the process and to retreat in the anonymity of the community. The identities used up to that point can be dropped and the process could start from scratch. This process has been on going for a number of years already. Email addresses at Hotmail, Yahoo or any other free Email provider are being used frequently for some time and abandoned at a moment the messages received get out of control. Assuming a new identity is easy in cyber space.

Dating Service Providers stress the precautions advisable while participating in their dating service; take it slow, have chaperones nearby, be contactable. Isn't that an echo from the past – your digitized parents coming back to haunt us? No – it is reality kicking in and the advice is accepted.

Essential first step is the community to look for your pal. There is no shortage of them. There should be something to distinguish communities based on:

- Special interests: Brands (Tommy, Nike, etc), Sports (football), Movies
- Social status (student, single, divorced, single parent)
- Location (country, region, city)
- Lifestyle (Television Network)
- Internet Service Provider membership
- Age (10s, 20s, 30s, etc)

Now with all these chances it shouldn't be a problem to find a pal and to explore levels of commitment between you. Or is there? We have a few questions for you to see whether further improvements are possible.

5.4.4 Dating in Cyber Space Questionnaire

5.4.4.1 General Questions

See first questionnaire

5.4.4.2 Dating in Cyber Space Questions

- Do you have experience with any of these media:
  - ❑ SMS
  - ❑ Chat Box
  - ❑ Community Portal
  - ❑ Telephone
  - ❑ Traditional Dating Service (advertisements, telephone, off line matching)
  - ❑ Electronic Dating Service (on line matching) using
  - ❑ Chat service for people sharing a specific interest
  - ❑ One-to-one option
  - ❑ Email communication with possible date
  - ❑ Further Personal Communication
- What kind of communication devices would you consider useful to establish a date:
  - ❑ Desktop computer'
  - ❑ Laptop
  - ❑ Telephony
  - ❑ Mobile phone SMS
  - ❑ Personal Digital Assistant (e.g. Palm, iPAQ, PSION)
  - ❑ Any Computer with an Internet browser (Internet café, your neighbour's)
- Tick situations or locations you would consider appropriate to contact or be contacted by (possible) friends:
  - ❑ At home
  - ❑ At work
  - ❑ In a hotel
  - ❑ During shopping (i.e. in a shop)
  - ❑ In a car while driving it
  - ❑ In a car or other vehicle as a passenger
  - ❑ In an airplane
  - ❑ While waiting (e.g. on the airport)
  - ❑ While walking on the sidewalk, on the beach or in a forest
  - ❑ …
- Do you think it is essential that you can block any messages / dating attempts from strangers?
  - ❑ Yes
  - ❑ No
- Tick moments you would consider appropriate to contact or be contacted by (possible) friends:
  - ❑ Office hours
  - ❑ In the evening on working days
  - ❑ In the weekend
  - ❑ On a day off
  - ❑ On a holiday
  - ❑ …
- Would you like to pay for services like mentioned above and what part of it is essential to you to make it worthwhile?
- Would you consider it a benefit to be able to contact someone you see anonymously?
  - ❑ Yes
  - ❑ No
- What type of information you want to keep a secret always, some of the time or never (e.g. name, location, gender, age) and what makes you decide to give away this information?
- How important is to you to ensure you are the only person who can authorize anybody to obtain your data knowing that your refusal will generate less contacts?

5.4.5 Work Fifty Years, 24 Hours a Day, 7 Days a Week

5.4.5.1 Communication Overload is not a choice, it happens to you

Working in an information-heavy industry, people face the challenge of being properly informed, conduct themselves' in a service-oriented manner and keep track of everything that is going on. The future seems filled with a permanent work pressure, as new facilities will enable you to work all day, all days, all year. Obviously, it is important to think about these things before they materialize and make us unhappy.

Today, it proves to be impossible to keep track of everything that is relevant. In addition, you have to choose which events popping up all day will get your attention. And what information is the current nomadic worker going to keep? Disk size is limited and hard copy information is piling up rapidly.

5.4.5.2 The Plethora Of Communication Channels

Communication channels used to be simple. Either you spoke to people, face to face or on the phone, or they provided you with information on paper. This has changed in just a few years time. Apart from mail and meetings, you get voice-mail, SMS[16] (messages on your mobile), you get e-mail possibly through several accounts and there is the World Wide Web to inform you about virtually everything. At the same time the type and content of the communication interaction has changed as well. You do not only get the things you need, you get much, much, more.

Imagine you went on a short holiday; say only a week, and upon your return you find your inbox filled with loads of messages. You have to schedule half a day just to tidy up your inbox and start working again. Furthermore, you may have kept in touch during your short holiday by SMS, a communication channel that does not have a link to your inbox. All those messages evaporate over time if you do not manually ensure they are copied and stored somewhere.

Overall, communication used to be simple to understand, but it has lost its structure over the last couple of years. The amount of messages is staggering, the contents, time-to-live and importance is fluid and you may not even have a fixed physical place to store all of it. The truly nomadic individual working from a flexible workplace will probably find that the trunk of the car is the most obvious storage facility for all paper-based material. It is one of the few places that is frequently visited. Sadly, the communication overload leads to chaos.

5.4.5.3 Imagine…

Imagine you are the person invited to help fix this potential problem of people getting overloaded without being able to prevent it, frustrated by an unjust sense of inadequacy and a feeling of incompetence while they not. Naturally, this fix is needed to prevent people from getting seriously ill due to the overload, resulting in loss of productivity (a business consideration), loss of income (a family consideration) and loss of joy in their work (a personal consideration).

Think of **behavior** that you would suggest or prescribe. Think of **rules** to live by that will prevent overloading. Think of **facilities** people should have to manage the staggering amount of messages. Think of **devices** they can use to assist them in their fifty years of working productively, pleasantly and without the risk of burning out by overloading.

[16] SMS is the Short Message Service found on most mobile phones. They cannot exceed 160 characters and many people are struggling with the user interface to make them work (to find uppercase and lowercase for instance). In practice they can best be seen as a very short e-mail.

5.4.6 Communication Overload Questionnaire

5.4.6.1 General Questions

See first questionnaire

5.4.6.2 Communication Overload Questions

1. Are you personally experiencing (early) signs of message and communication overload? If yes, please provide one or two examples.

2. What, in your opinion, causes the stress (e.g. the feeling you haven't worked enough yet, the feeling you miss critical information, the lack of privacy, the feeling of inadequacy because you can't keep up with all the new developments)?

3. Do you think overload can be stopped by installing intelligent filters, by an attitude change or by a combination of both?

4. Tick **facilities** you would consider helpful in preventing an overload

   - ❑ Filter messages (only those that pass the filter will be offered to you)
   - ❑ All messages (voice, mail, SMS - through any channel) should be offered in one single inbox
   - ❑ The inbox with your messages must be available no matter where you are
   - ❑ Your business messages are only available during your business hours
   - ❑ Messages in your inbox will expire (auto-delete) after x days
   - ❑ Messages that are no longer valid or relevant can be revoked by the sender
   - ❑ A phone call is preceded by a sender and subject (like e-mail) before you pick up the phone
   - ❑ Intelligent agents looking for information on a particular subject
   - ❑ …

5. Tick **devices** you would like to be able to use to manage messages and communication

   - ❑ Personal Computer at home
   - ❑ Personal Computer at work
   - ❑ Any computer you happen to run into someplace (e.g. from a colleague or in an internet café)
   - ❑ A personal device, no larger then a pocket book (e.g. a PDA)
   - ❑ A mobile phone
   - ❑ Your TV at home
   - ❑ Any TV you happen to run into someplace (e.g. in a hotel)
   - ❑ …

6. Tick **locations** you would consider appropriate to manage your inbox (filled with personal and business messages)

   - ❑ At home
   - ❑ At work
   - ❑ In a hotel
   - ❑ During shopping (i.e. in a shop)
   - ❑ In a car while driving it
   - ❑ In a car or other vehicle as a passenger
   - ❑ In an airplane
   - ❑ While waiting (e.g. on the airport)
   - ❑ While walking on the sidewalk, on the beach or in a forest
   - ❑ …

7. Tick **moments** you consider appropriate to manage your inbox (filled with personal and business messages)

   - ❑ Office hours
   - ❑ In the evening on working days
   - ❑ In the weekend
   - ❑ On a day off
   - ❑ On a holiday
   - ❑ …

5.4.7 Football and Other Sports

5.4.7.1 Context

Imagine, the Next Generation mobile Network is installed and allows you to receive voice, data and (moving) pictures without any problem. Also the mobile devices are that mature that they provide you with quality pictures. So, from now on it doesn't matter where you are when your favourite football match will be played, you are able to watch that game because of your mobile handset and the Next Generation Network (NGN). No more dangerous drives in rush hour to be at home in time, you can simply stop what you were doing and watch the game. But do you appreciate that kind of features? Or do you think this is a ridiculous idea, which will bring society even more in a deadlock the mobile network already has brought about? And last but not least are you willing to pay for it?

5.4.7.2 An Example – Football and Other Sports

(Derived from the first interview)

There is this Dutch guy, let us call him Jan, who loves to watch all kinds of sports, but is especially mad about football. As soon as the 22 sportsmen and their ball appear on the screen and he is in the neighbourhood of a television set, he is lost for the rest of the world. He is the kind of man that wants to know what is going on during the match and when it is not possible for him to watch it, he wants to listen to it, as a next best. His wife offered more than one time to tape the game, but that was not necessary, he didn't want to watch the game afterwards, when he already knew what the outcome of the game was. By the way, it happened more and more that because of work he was not able to watch the games. His job is transporting money for banks and stores and since the stores had prolonged their opening times he had to work up until late in the evening. Most of the times his favourite match had already started when he arrived home.

And now here is the new era, the NGN, which allows him to watch football games on his mobile handset, anytime and anyplace as long as the batteries have enough power. Jan is a realistic guy and he knows that watching the game while working will not work out in a proper way. So, this time his choice is to get an alert in case of a goal. When he is alerted it is possible for him to watch a selected fragment of the game, in this case of course the fragment, which shows the goal, when it is convenient for him. Jan can view the fragment as often as he wishes. He knows that he has to pay €ct 0.3 per second for it, but that is not a problem for him, he has enough money in his truck.

5.4.7.3 Choice and Being in Control is Important

When this feature was offered to him, Jan had several choices. To begin with: it is possible to subscribe for € 30 per month. In that case you are free to use NGN and watch as many football games as you like but you will face a lot of advertising as well. For € 60 per month it is possible to watch as many games as you like without the ads. Without subscription it will cost the already mentioned €ct 0.3 per second, no ads of course. The mobile device will show how much money he has spend so far.

Furthermore there is the filter function. For Jan it is possible to let the system know what he likes the best in a specific situation: start showing the game from the first kick-off, get an alert in case there is a goal or other important matters like Ruud van Nistelrooij plays very unfair against Jan Vennegoor of Hesseling during Manchester United against PSV or the referee takes the wrong decision all the time.

For Jan it is very important that he is in control of what he is watching (and paying). Jan did not subscribe. He prefers to stay selective using this feature and he fears that being subscribed will feed his addiction for watching football games too much. Luckily every football game costs the same; an important game pays the same price as a less important game. This is important for Jan as well because, by the way, who is going to decide what is an important game or not?

5.4.7.4 Other Sports

Jan can hardly wait for the time this feature will be available for other sports as well. He is dreaming of the time he will be able to watch the box sport anytime and anyplace he likes it, hidden for his wife, who hates that kind of sport. Or being able to watch Wimbledon, even when the games are at an inconvenient time. And most of all, he adores the idea of being alerted when the pack starts to climb a "col" of the first degree, a spectacular break away from the pack or the finish on the Champs Elysee during the Tour de France. Since the success NGN has with the football games it is to be expected Jan doesn't have to wait for very long.

5.4.8 Football and Other Sports Questionnaire

5.4.8.1 General

See first questionnaire

5.4.8.2 Football and Other Sports Questions

- When it was possible, what location to think appropriate to obtain information on or be informed about your favourite sports on you mobile handset?
  - ❑ At home
  - ❑ At work
  - ❑ In a hotel
  - ❑ During shopping (i.e. in a shop)
  - ❑ In a car while driving it
  - ❑ In a car or other vehicle as a passenger
  - ❑ In an airplane
  - ❑ While waiting (e.g. on the airport)
  - ❑ While walking on the sidewalk, on the beach or in a forest
  - ❑ …
- What time do you think appropriate to obtain information on or be informed about your favourite sports on you mobile handset?
  - ❑ Office hours
  - ❑ In the evening on working days
  - ❑ In the weekend
  - ❑ On a day off
  - ❑ On a holiday
  - ❑ …
- What type of information are you prepared to give away in order to make your preferences clear (for example name, age, gender, hobbies, favourite drink etc) and what type of information certainly not (for example income, marital state)?
- How important is to you to ensure you that the data you provide (or generate!) is kept with the organization you got a subscription from (realizing that they might have contact with other organizations who could provide you with similar services)?
- Would you want to see (subscribe to) the whole game or fragments?

- Do you want to be alerted when a goal is scored?
- Do you want to be alerted for other special situations? What kind of situations?
- Do you want the fragment repeated as many times as you like?
- Would you like to pay for services like mentioned above and what part of it is essential to you to make it worthwhile?
- Is it OK for you if the price is lower at the start and will be raised when the games are more important? For instance: are you willing to pay a higher price for the games played in the quarter finales and a more higher price for the semi-finals?
- Would this be an ad-hoc service for you or would you like to subscribe to the service?

5.4.9 Health Care

5.4.9.1 Context

Suppose you are on a holiday. Enjoying your ice cream, you're crossing the street admiring this wonderful cathedral on the other site of the road. Suddenly a motorbike hits you and you are thrown through the air. The mobile device you carry registers the sudden shock and signals you to confirm everything is ok. As you don't respond within twenty seconds, the device starts looking for help. It discovers a general practitioner (GP) just one block away who turns out to be at home. Alarmed by your device the GP arrives a minute later and is able to stop the most severe internal and external bleedings. After 10 minutes the ambulance, which is also alarmed by your device, arrives. While still in the ambulance, the device connects with the systems of the hospital they are heading and provides them with critical information: your anamnesis, the medicines you use and your allergies. In this way they are able to find out that you are allergic to penicillin and that it is dangerous to give you diluents, which otherwise would have been used during the necessary operations. The (male) nurse can connect directly to your device in order to check your blood type, so he is able to give you a blood transfusion.

Meanwhile your partner, who was spending a day at the pool is informed that an accident has happened and that you can be found in hospital so and so.

5.4.9.2 Issues

Many more services (automatic notification to insurance company for example, who then takes care of prolonged hotel reservations for your partner etc, etc.) can be thought of, but for all of these services it will take a big effort to realize them.

5.4.9.3 Market research

Several target groups can be interviewed: the "man in the street", GP's, hospitals (first aid doctors/surgeons, information officers), device/network vendors and network service providers. Because there are no real technical limitations (mind you, there is a lot to be done in this area), this market research focuses on the user need for such services: "the man in the street", GP's and hospitals.

5.4.10 Health Care Questionnaire

5.4.10.1 General

See first questionnaire

5.4.10.2 Man in the street:

- With increasing intelligence in the systems surrounding us, it could be convenient if some information about you is transmitted automatically upon request. Can you please indicate whether you will use such a facility (e.g. name, location, medical history, gender, age, purchases made)

    a. Is there data that you don't mind to be transmitted to anyone interested (like your email alias, your gender, your age, your first name)

    b. Is there data that you want to control before it is being sent to an external party (back account, medical history, credit card number).

- How important is to you to ensure you are the only person who can authorize anybody to obtain the data you want to be available only some of the time (think for example of medical data when you are unconscious).

- Are you willing to pay for services like mentioned in the case (automated emergency calls, exchange of data, warning of partner etc.) and if yes, in what order of magnitude (Euros per month as part of your medical insurance and once in advance (to obtain device))?

5.4.10.3 GPS:

- What type of information would you need in case of emergencies and that you are often lacking?

- Would you mind to carry a system that is able to track you down in case of nearby emergencies and how important are the privacy aspects of this to you?

- Would you like to pay for services like mentioned above and what part of it is essential to you to make it worthwhile.

- What place do you think appropriate to be reachable:
    - ❑ At home
    - ❑ At work
    - ❑ In a hotel
    - ❑ During shopping (i.e. in a shop)
    - ❑ In a car while driving it
    - ❑ In a car or other vehicle as a passenger
    - ❑ In an airplane
    - ❑ While waiting (e.g. on the airport)
    - ❑ While walking on the sidewalk, on the beach or in a forest
    - ❑ …
- What time do you think appropriate to be reachable:
    - ❑ Office hours
    - ❑ In the evening on working days
    - ❑ In the weekend
    - ❑ On a day off
    - ❑ On a holiday
    - ❑ …

5.4.10.4 First aid doctor/surgeon:

- What type of information would you need in case of emergencies and that you are often lacking?

- What type of information is very time critical in case of accidents like described above?

- Does it happen frequently that patients who die (or sustain permanent physical damage) from their injuries could have been saved if medical aid was provided earlier?

- What kind of problems do you encounter with exchange of computerized patient data nowadays