Rotterdam School of Management
Erasmus Graduate School of Business

UNDERSTANDING THE NEW GLOBAL BUSINESS ENVIRONMENT

Daniel Erasmus

GROUP REPORT - CONFIDENTIAL

THE FUTURE OF BROADBAND IN 2010

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1 EXECUTIVE SUMMARY

There are a lot of people who use broadband but who do not understand what it is and haven't even heard about the term. Broadband is a term used frequently by people in the Telco industry. Hopefully most of them know what broadband means and what it is used for.

It is important for the Telco industry to understand how broadband will develop in the next few years in order to set their strategy. One of these companies is Wanadoo, a subsidiary of France Telecom.

The case of Wanadoo was chosen as being an engaging and challenging subject, given the diversity of people in our study group, who have backgrounds in telecom, banking, insurance and the publishing business. The specific focus was on the future of broadband in 2010. Three possible future scenarios have been developed next to the 'official future'.

This report describes not only the final scenarios, but also the process of how they were arrived at.

This process is described after the acknowledgements and research issue. First the driving forces that influence the development of broadband are presented. With input from the driving forces it was then a difficult journey to come to a system diagram that presents the uncertainties that drive the broadband industry from a business point of view.

The key uncertainties were derived from the learning & discussion process that formed the basis of the framework on which to build the scenarios. In the final step the scenarios are described with respect to broadband: "*Official Future*", "*Digital Fragmentation*", "*Broadband Doom*", And "*Empty Toll Highway*".

Despite the sound approach used to develop the scenarios and the trust placed in them, the group thought the process itself had even higher value. The group setting with different professional backgrounds, the low valleys during the process and the insight gained from all the failed initiatives has provided the group members with an in depth knowledge of broadband and, backward looking, a period of great fun.

2 ACKNOWLEDGEMENTS

The love, support and patience of our families gave us the spirit, inspiration and persistence to pull through, even at the most difficult times and in the last hours. Our partners and children gave us strength and courage to pursue the assignment and learning experience, and by doing so, helped us to really get to understand the ever-changing world and the power of a learning organisation.

Special thanks go out to:

- Daniel Erasmus, our guide to the future. With his fresh and open approach he constantly challenged us and brought the report and us to a higher level.
- Guus and Roos Bijlard, for bringing in youth and hope for a better future. These youngsters of 10 and 12 years really made us aware of the changes in education and attitude.
- Erik Huizer, the oracle from Hilversum. When we thought we were on the right track, this expert showed us new directions every time.
- Dimitri Willems, our trustworthy source within ING Investment Management who provided us with the investment analyst reports of the Telco industry.

And thanks to everyone else who helped us in one way or the other.

3 RESEARCH ISSUE

This report focuses on forward-looking technologies and evolutions around the Internet world and the impact that they will have on broadband uptake. Even though some of these concepts and technologies are very much a longer-term view, concerned businesses (providers, Telco's, broadcasting companies) need to be aware of some of the innovations in IT so they can form part of their longer-term broadband strategies. Although some parties believe that many technologies, such as Wi-Fi, fiber-to-the-home and Peer-to-Peer, will increase demand for broadband access, another view that is enlightened by Scenario Thinking reveals alternatives not so bright for this industry. It is important to examine a broad range of options, in order to prepare for different business options, not necessarily the ones that everybody expects from the current outlook of the market.

As an example of the factors influencing the broadband technology, the following list can be compiled:

- Some governments are considering making it a legal requirement for broadband to be delivered as a utility to homes and businesses. This would very much appeal to smaller companies, SOHOs and consumers who do not require always-on connectivity, but would like to take advantage of the higher capacities and enhanced applications.
- One day every end-user will have their own fiber-optic 'wavelength,' which can be more effectively managed. In fact, it may even help the case for utility-based broadband as each person's 'wavelength' can be monitored on an individual basis.

- Peer to Peer, Online Gaming, Grid computing and Web services will have a major impact on economic growth by stimulating high-performance demand for both computing and broadband networks.

Additionally, some countries will develop faster than others. What will be the implications of key factors such as local culture, physical barriers, Internet penetration, and government and EU regulations and subsidies? How will the public sector, education and healthcare benefit from wideband communication? Will the creation of new means of communication, learning and customer care affect the economy and the society in the same way, and with which impact on current business models?

Last but not least, what will be the effect of broadband expansion on the globalization movement, will it foster further collaboration or will the world evolve towards more local communities, self-sufficient but isolated from each other ?

4 DRIVING FORCES

The driving forces used as input for the scenarios are presented in this chapter. The initial set of 12 driving forces was arrived at by continuous brainstorming sessions within the group and the next 12 after a varied selection of research. The research conducted in compiling the rest of the driving forces included an extensive search of websites, the use of investment analyst reports of Telco industry, interviews with two children aged 10 and 12 years, in order to get a better understanding of what currently interests the youth, and an interview with Erik Huizer who is regarded as a specialist in the field of broadband in the Netherlands.

See appendix 8.3 for the comprehensive tables on the driving forces:

1) *Increase in content supply of broadband channels* - content supply and broadband channels will converge. For example, the recent move of KPN to enter the content business is probably a strategic move. TV on broadband is already a reality.
2) *Online Gaming* - this is a killer application. Other killer applications up until 2008 are: adult contents, personal dating & chat, mms & sms contents exchange.
3) *Increase in transaction platform availability* – the technology will provide more opportunities for servicing transactions (e.g. insurances). In the past a dial-up link was too slow to appeal to people or capture them.
4) *Increase in emphasis of copyright, intellectual ownership of suppliers* – this will have a negative influence on broadband. "Currently copyright is already considered one of the major showstoppers for BB"[1]. Copyright will need a new licensing model, more efficient than the current ones.
5) *Globalization of communication* – if the current pace of globalization continues more parts of the world will require access to sophisticated forms of communication, commonly found in the developed parts of the world like Europe.
6) *Increase of perceived value of privacy* – people want their private lives to be kept exactly that, private. However increased terrorist activity in the world, especially after 9/11 has meant that this has come under threat.

[1] Quote from telephone interview with Erik Huizer

7) *Government regulations* - break down monopolies in order to create a competitive market. It also diminishes the number of rules in order to stimulate a competitive market. Moreover government stimulates new technology by subsidizing broadband access to every home, to be deployed in the next 5 years.
8) *Change in society with increases in individualism and increase in mobility* - people will travel more, but still want to have contact with family, colleagues and friends. Speed and access must be coupled, as one without the other is useless. Individualism leads to a situation in which people sit alone, in their own environment, behind their screen, communicating to the people they choose and from whom they can disconnect whenever they please.
9) *Increase in security threats* – serves as an inhibitor for broadband but also pushes innovation in new industries and business models.
10) *Telco's expansion in new profit areas* – ability increased by access to larger market segments and new services.
11) Technology push by Telco's & others – Technological innovation will drive user acceptance, hopefully providers will try to hit on the killer application.
12) *Convergence in media types* (multimedia = video/audio/text) – Multimedia format will also be used as driver for broadband acceptance.
13) *Divergence within device classes*. BB access will be possible via screen, mobile phones, watches, and screen in your car, etc. Within a device class there will be different models, features ect.
14) *Always on* is perpendicular to BB – Obviously the advantage of being always connected will be a requirements for many new applications.
15) *Peer to Peer* (increase use of BB) – This is definitely one of the biggest drivers for broadband expansion.
16) *Registration of networks both software and hardware* - A new software / hardware licensing model; for example, Sun is now licensing storage, instead of buying lots of disks and managing them, Sun will sell storage for less than 3$ / GB. Palledium is another example of licensing.
17) *WIFI enables access to everything, everywhere* – a strong enabler of broadband growth. The first examples are the wireless Leiden initiative. Wi-fi will evolve to become de-facto, a local loop, it will boost broadband to deliver all applications wirelessly: voice, TV, Internet, all at high speed.

18) *Voice over internet (IP)* – an inhibitor to broadband growth as it is a killer application. It is a huge industry driver, with extended impact on several players.
19) *Cultural blocks (China, India, US, Africa, Europe)* - will act as an inhibitor to BB growth as communication will not be effective and needed with other blocks. This stimulates different standards.
20) *Changing education methods increases use of BB* - students will have faster access to all kinds of information. It will also allow for increased market share in other study offering methods like remote MBA's and study courses taken for leisure.
21) *Increase in mass & light entertainment* - providers of BB networks and devices want to reach as many people as possible. The content and entertainment should be developed in such a way that it appeals to the masses. Moreover, an increase in BB increases the amount of options people have to be entertained. With the diminishing working week and a job becoming more of a hobby, marketers will flood to occupy our free time.
22) *More suppliers of BB networks* - the existing suppliers need to become more open and flexible. More service providers will want to offer BB services and buy access from the BB suppliers.
23) *New business opportunities for new services* – the possibility of new services, allowing for new business models and players.

5 SYSTEM DIAGRAM

The next step made was to build a model of the system that is driving the broadband industry from a business point of view. Obviously the view of the consumer is also important, but it was decided to put the main focus of this study on the supplier side.

In order to come to the ultimate system diagram three steps were taken by the group:

1) Big picture
2) Fishbone
3) Final system diagram

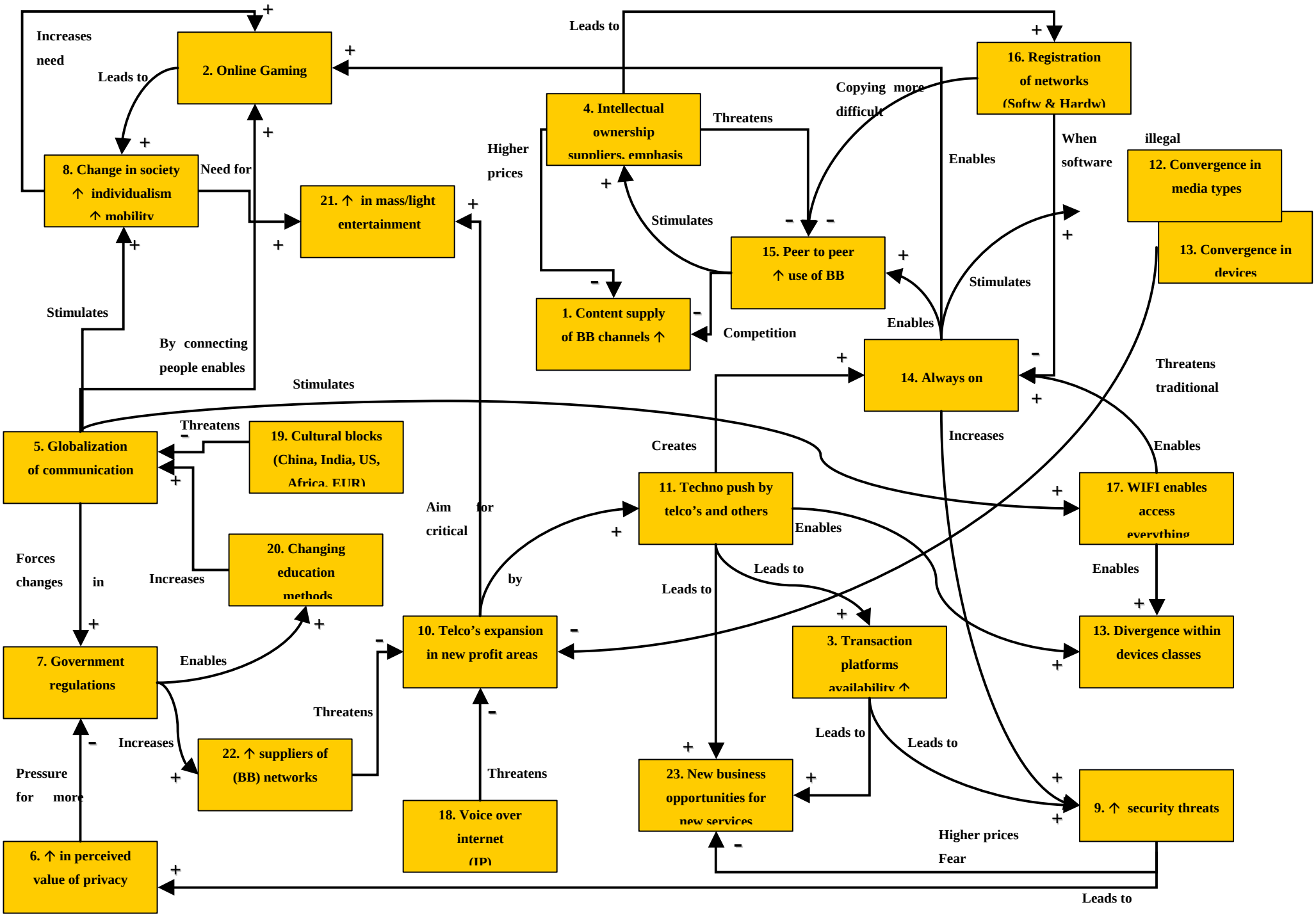
All the driving forces were not listed by the group at the start. In fact, an iterative process between the driving forces and the big picture led to the final list of driving forces.
The first 12 driving forces were derived by a brainstorming session. Then a diagram was developed in an attempt to understand how the different driving forces were linked to each other and in a sense the big picture. In the beginning the group focused mainly on the “official future” of broadband. It was originally hard to think outside the world that has been presented to the group by the various media and companies. The first big struggle was how to deal with, what was originally perceived to be the biggest driver of broadband: the technological development. It was reasoned that broadband was stimulated by the technological development and that the technological development was stimulated by broadband. The group was going round in circles.

Fortunately, after a one-week break, the group presented many different views on relevant issues for broadband. From that moment on, the big picture developed through different

phases. It grew, changed, shrunk, and was turned upside down and inside out. During all these phases the group members introduced new driving forces and new relations between them. The introduction of these new driving forces often led to a new cycle of adjustments to the big picture. It was also recognized that some inhibitors and enablers of driving forces were driving forces in themselves.

It would have been easily possible to have gone on for longer and come up with another or more focused picture. However, no matter the quality of the presented system diagram, the whole process towards the diagram helped to get a deeper insight in the environment of broadband.

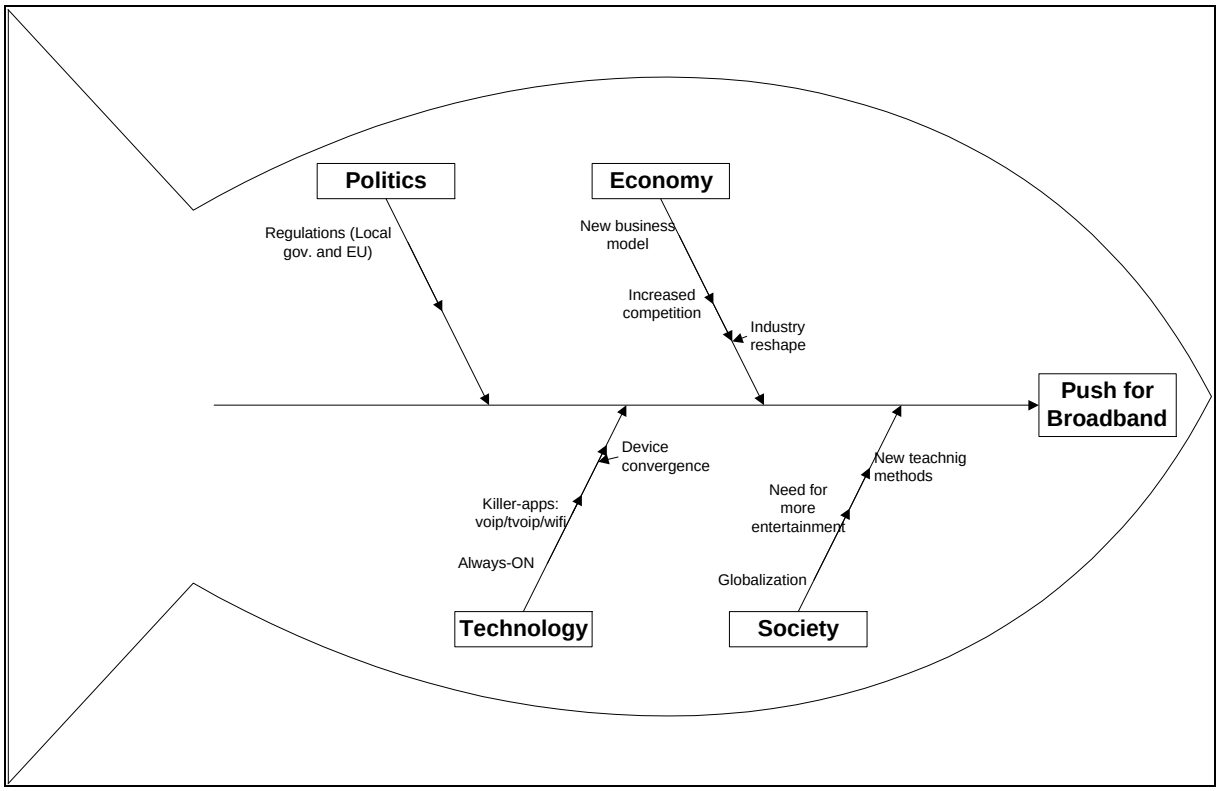
In the next page one of the final system diagrams is presented (refer to Appendix 8.2 for the original working diagram):


Increases need
Leads to
2. Online Gaming
Leads to
16. Registration of networks (Softw & Hardw)
4. Intellectual ownership suppliers, emphasis
Threatens
Copying more difficult
Higher prices
When software
illegal
12. Convergence in media types
8. Change in society ↑ individualism ↑ mobility
Need for
21. ↑ in mass/light entertainment
Enables
Stimulates
15. Peer to peer ↑ use of BB
13. Convergence in devices
Stimulates
1. Content supply of BB channels ↑
Competition
Enables
Stimulates
By connecting people enables
14. Always on
Threatens traditional
Stimulates
Threatens
5. Globalization of communication
19. Cultural blocks (China, India, US, Africa, EUR)
Creates
Increases
Enables
17. WIFI enables access everything
Aim for critical
11. Techno push by telco's and others
Enables
Forces changes in
Increases
20. Changing education methods
Leads to
Leads to
Enables
by
10. Telco's expansion in new profit areas
3. Transaction platforms availability ↑
13. Divergence within devices classes
7. Government regulations
Enables
Threatens
Leads to
Increases
Leads to
Pressure for more
22. ↑ suppliers of (BB) networks
Threatens
23. New business opportunities for new services
9. ↑ security threats
18. Voice over internet (IP)
Higher prices
Fear
6. ↑ in perceived value of privacy
Leads to

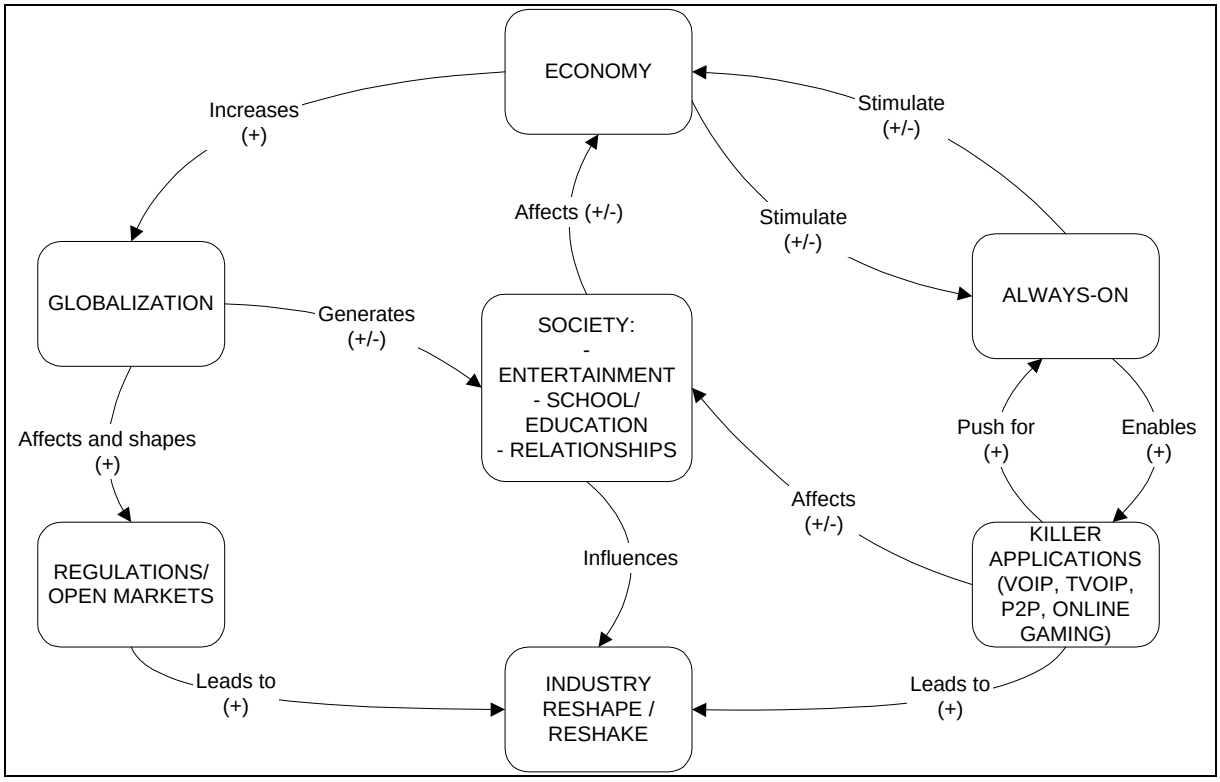
The articles of Toolbox "System Archetypes at a Glance" (*Toolbox reprint series, Vol 3, no 4, may 1992)* were used with the idea to get more structure in the picture. However, this led to confusion as the "success to successful" archetype was recognized too often. Therefore it was decided to base the system thinking on the group's own capacities.

Some initiatives were presented and the different group members threw MBA techniques and diagrams on the table. Ultimately, in order to analyze the situation and come up with a system dynamic, we used a root-cause analysis technique. This analysis looks at the influence of Politics, Economy, Technology and Society (PEST) on the push for broadband.

The picture of the analysis is presented below:



Subsequently, we built a model of the system that is driving the broadband industry was built. The following is the ultimate system diagram that was arrived atwe came up with.

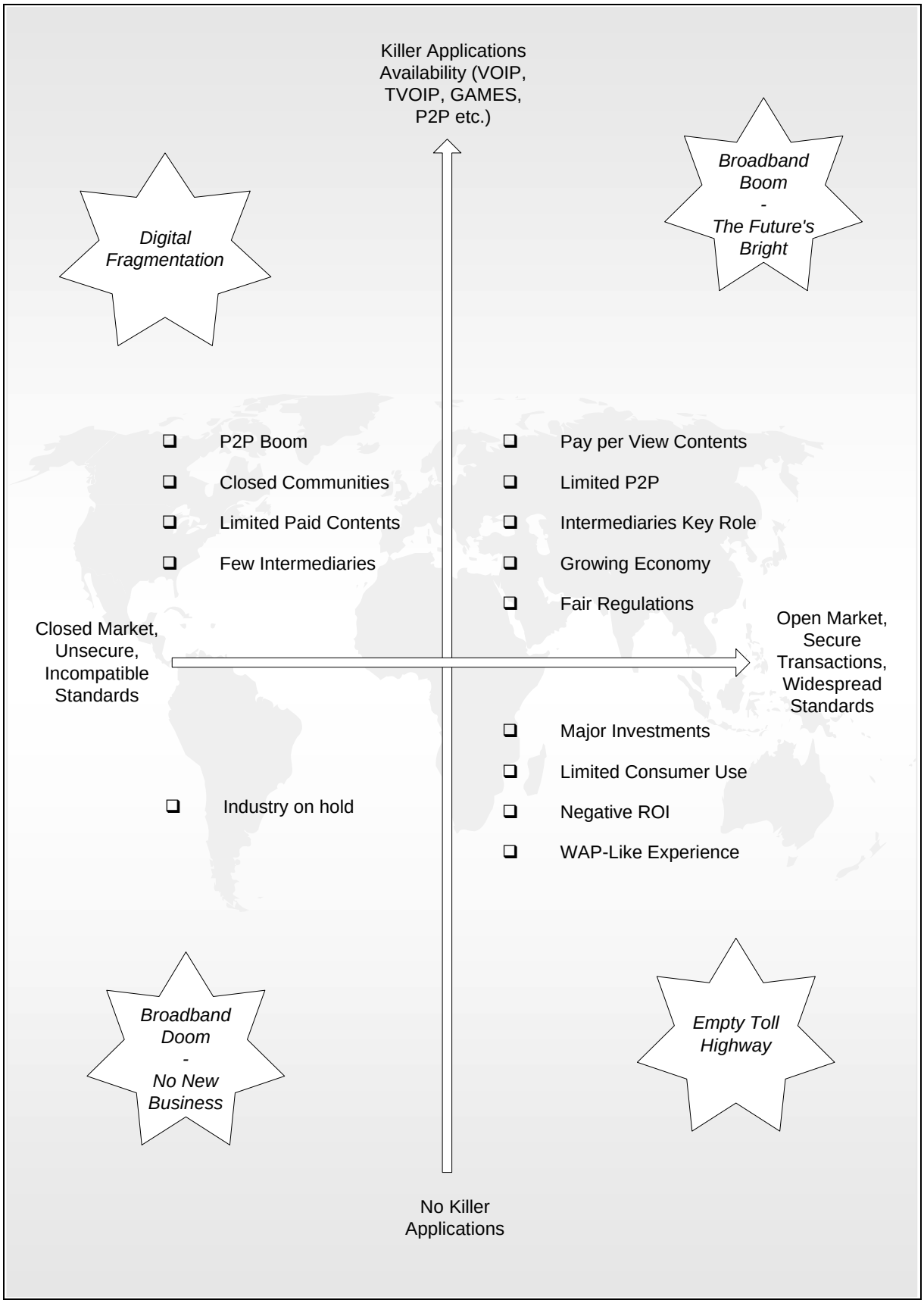

ECONOMY
Increases
(+)
Stimulate
(+/-)
Affects (+/-)
Stimulate
(+/-)
GLOBALIZATION
Generates
(+/-)
SOCIETY:
-
ENTERTAINMENT
- SCHOOL/
EDUCATION
- RELATIONSHIPS
ALWAYS-ON
Affects and shapes
(+)
Push for
(+)
Enables
(+)
Affects
(+/-)
REGULATIONS/
OPEN MARKETS
Influences
KILLER
APPLICATIONS
(VOIP, TVOIP,
P2P, ONLINE
GAMING)
Leads to
(+)
INDUSTRY
RESHAPE /
RESHAKE
Leads to
(+)

6 UNCERTAINTIES

The final uncertainties as shown in our systems diagram from the previous section are:

1) *Economy*: What happens to the economy?. Will it decline, stabilize, or pick up again?. Since the growth of the economy is linked to consumer trust, this is an important factor in the different scenarios.
2) *Globalization*: The development of broadband is interlinked with the way economic and cultural blocks will develop. The trend in globalization can really have a big influence on the usage and growth of broadband.
3) *Regulations / markets*: How will economies and trade blocks act with respect to broadband and intellectual property? And what kind of regulations will set the framework towards information, privacy, security and digital rights management?.
4) *Industry reshape*: What will be the role of the current Telco's and internet providers be, and what new payers will enter the market ? What will be the major investment drivers be and how will money be made?
5) *Killer applications*: Will Pp2p2P, VOIP, TVOIP, online gaming etc, turn out to be the real killer applications? What content will be available and how interesting is this for the consumers?
6) *Society*: What role will broadband play in the way our children are educated and what influence will this window to the world have on our society?. Will our interaction and relationship pattern change and/or will people stick to their old habits and recreational time?
7) *Always on*: How will the consumers perceive the concept of always on and what kind of platform this will this be for all the different kind of applications and contents?

7 SCENARIOS


Killer Applications Availability (VOIP, TVOIP, GAMES, P2P etc.)
Digital Fragmentation
Broadband Boom - The Future's Bright
P2P Boom
Closed Communities
Limited Paid Contents
Few Intermediaries
Pay per View Contents
Limited P2P
Intermediaries Key Role
Growing Economy
Fair Regulations
Closed Market, Unsecure, Incompatible Standards
Open Market, Secure Transactions, Widespread Standards
Major Investments
Limited Consumer Use
Negative ROI
WAP-Like Experience
Industry on hold
Broadband Doom - No New Business
Empty Toll Highway
No Killer Applications

7.1 The Official Future

Although the official future is not the focus of this research, a quick description of it will help to put the other scenarios into perspective. Due to the "rule of seven" (Ged Davis interview hint as reported in "*Scenarios Come to Davos"*, GBN March 2004), we projected the official future into a slightly expanded timeframe: 2004-2009 and 2009-2014:

First of all, the economy picks up again; the growth of the economy goes hand-in-hand with consumer trust, and fixed & wireless broadband are the trendsetter for the other channels and consumers all over the world get used to the "always on" concept.
The way that people from different regions deal with broadband is alike. There is some difference in technology, but the experience and use are of a global kind.
Several applications push the worldwide acceptance of broadband, like VOIP, TVOIP, P2P, and on line gaming.
The use of these applications is aligned with the change in society. They become a substantial part of the way people communicate, work, study, learn, recreate and entertain.
Governments help to boost these developments and regulations are aimed for a mass availability of broadband.
After a major reshape the different industries find their place and prosper along with the growth, enabling them to continuously invest in new developments and applications. Since size matters, partnerships and merger are key to get the needed economy of scale.

Please see Appendix 1 for a further development of this scenario, in a time-oriented fashion.

7.2 Scenario 1 – Digital Fragmentation

This scenario could become a dream for the current content providers and Telecom establishment, provided they adapt to it; furthermore it brings stability

to a very dynamic market and helps to slow down the pressure on the consolidation of contents and distribution players. The negative point, though, is the decrease in revenues due to divergence in standards and the consequent market fragmentation.

Timeframe	***Key Events & Developments***
2005	The technological development with respect to the speed of data transmission will continue for some years to come. Broadband (BB) providers, amongst which many Telco's, continue to offer the best value to their customers (B2B & B2C). No one doubts that the technological improvements will lead to more use of BB. Also the development on devices contributes to the increase in use of BB. The economy is now growing at a reduced rate, which is not helping investments in new technologies and therefore is leaving operators to fully exploit the existing infrastructure. Globalization hampers with respect to disuninformation of regulation amongst the world. Countries are already grouped in economic blocs like the EU, NAFTA, etc. c…..Within these blocks, bringing the regulations of different countries together can be done fast. However, this same step leads to more divergence between regulations of the different blocks. Terrorism continues. Countries start to develop their own strategy how to fight terrorism. Intensified screening of the web. More and more virus attacks will appear.
2006	Within Europe, regulators continue to protect the customer by not allowing monopolies. An open market is created in which providers of BB are free to set up their own network and standards. Because the government does not demand a standard, Telco's will fight each other in order for the market share and profit. They don't agree on standards and safety issues. Telco's see opportunities in the fear of consumers and start to offer special (closed) networks that are secured and safe. Telco's start fierce competition on these networks. As a result more than one standard is developed. Within each network, safe communication is possible. Between networks safety cannot be guaranteed. The technological improvement and fierce competition of Telco's makes

Timeframe	***Key Events & Developments***
	"always on" for everybody available and affordable. Always on is recognized as the only value driver for the adoption of broadband; on the other hand, the threat of security, monitoring and privacy break-in has led people to organize themselves in self-contained communities, which not only do not share any information with each other but started to use incompatible standards as a form of additional protection. By far encryption will be always be a first layer of defense. There is are no real standards, which enable theo roll out of new exploitation of services through broadband channels. The always-on concept is embraced by heavy users who roam the internet for free content and peer to peer services.
2007	Further changes in society stimulates this behavior; the raise of China has now created the first cho-n-ternet (china only) networks; other blocks such as India and Brazil haves started to organize themselves around the idea of self-sufficiency. This decreases the chances for one world standard and agreements on safety issues. There will also be fear between economic or cultural blocks. A more individualistic society, together with increase use of BB, increases the demand for Pp2Pp contents. This fragmentation is increased by the effect that big companies will buy access to the network and offer this to their clients for free if they buy services at this company. At the same time, companies of a particular industry will try to get an exclusiveness contract with the BB provider.
2008	The increase in usage of peer to peer (Pp2Pp) has been finally won over by the legal fights started by main music & video contents corporations; this has relegated Pp2Pp to the world of hackers and piracy, further isolating communities from each other due to the threat of legal actions and police screening. The access to broadband channels is very open and very few intermediaries are able to get a position between the consumers (or between consumers and producers). Self-produced and ripped content is the major driver to access internet and the faster broadband channels.

Timeframe	***Key Events & Developments***
2009	Intermediaries have been affected heavily, with now only a handful of multi-national contents distribution networks now, which function as gateways and contents-converters between nations, languages and communities. Real-time translation is possible and this has started the decline of English as the number one language for business exchanges.
2010	Government regulations are now strong enough to maintain a fragmented market controlled by a few players, and consumer association are not strong enough due to the widespread growth of community oriented organisms, thatorganisms that have no interest in global cooperation or fear that as a threat to their identity, so hardly won.

7.3 Scenario 2 – Broadband Doom

This scenario paints the possibility that the world we know today will evolve in a direction where, amongst other things, there's no development for broadband; this world means limited business for access providers and a significant re-dimensioning of contents providers. The economy doesn't pick up again, and the globalization trend is reversed.

Timeframe	***Key Events & Developments***
2005	Terrorism continues. Countries start to develop their own strategy how to fight terrorism. Intensified screening of the web. More and more virus attacks. Peer to peer almost stops as "Always on" means danger for personal data. The economy starts to suffer.
2006	The situation in the Mmiddle East doesn't find a solution yet, and the inoperability of Iraq as an oil producer has further increased the oil price and

Timeframe	***Key Events & Developments***
	the role of OPEC on the world economy. The Western economy is receding again and the huge investments required for global communication technology, such as BBbroadband and its evolution into wifi/wilan/wimax are now threatened. The lack of market expansion for BB bb and the difficult economic situation has led consumers to withdraw from their fast internet connection and to instead to rely on a cheap and fast evolution of the old dial-up network, where quick and effective work arounds have increased the speed of access and optimized contents for downloads on lines slower than BBbb lines. Telco's see opportunities in the fear of consumers and start to offer special (closed) networks that are secured and safe. Telco's start fierce competition on these networks. As a result more than one standard is developed. Within each network, safe communication is possible. Between networks safety cannot be guaranteed. Globalization hampers as a result of fragmented world.
2007	Market is not recovering yet, indeed a new spread of terrorist attacks siunk the share price of main telecom and internet operators, which did not all consolidate yet. This fragmentation is increased by the effect that companies in a particular industry will try to get an exclusiveness contract with the closed BB provider. As a result, the clients of one company can communicate with each other, but not with customers of other companies who are on the network of another BB provider. Communities of networks are formed.
2008	The Internet has evolved as a main news information channel,channel; however companies have stopped using it as a marketing and selling channel. Content providers are loosing a critical mass to produce their content for. Every community wants his own content. The effort in the content development decreases. As a result, no new killer applications and content are developed.
2009	The economic crisis is the cause that BB is not high on the shopping list of customers anymore. As a result also companies withdraw from it. Governments restrict new technologies and ban different kinds of services, which open new ways of interaction outside the country and/or region.

Timeframe	***Key Events & Developments***
2010	Any new development with some kind of paid content gets hijacked and stripped before take off. Broadband is on hold.

7.4 Scenario 3 – Empty Toll Highway

In this last scenario, the market has taken a sharp detour due to the failure of killer applications to establish themselves and drive revenues from valued added services; history is repeating itself like a few years ago with the WAP technology, and companies will have to react to decreasing return on investments ROIs and limited consumer usage of their services. Companies built expensive infrastructure, but the usage is very limited.

Timeframe	***Key Events & Developments***
2005	The slow economy recovery has diminished interest in new applications from the general public. This has led companies to decrease expanding existing services and creating new ones. Government regulations start to look at the implication of always on and security on citizen's every-day life. Terrorism activity drops, and the globalization trends continue. Although there are no real killer applications, companies heavily invest in mew technologies and businesses. The digital rights management gets widely accepted as a corner stone of further development of broadband and the linked software.
2006	Focussed on the new standards and the belief that the growth of the broadband

Timeframe	***Key Events & Developments***
	BB channels directly leads to paid services, companies heavily invest in the infrastructure. The fast movement in gGlobalization in the past 10 years has made people more aware of their mobility. Holidays and study trips for Europeans do not stop at the border of Europe anymore. Also working abroad in far exotic countries is popular and becomes easier as international agreements and business habits converge. Although people want to explore the world, contact with family, colleagues and friends is still wanted and needed. Moreover, being able to get content and entertainment from their own culture is highly valued.
2007	The technological development with respect to the speed of data transmission will continue for some years to come. Broadband (BB) providers, amongst them which many Telco's, continue to offer the best value to their customers (B2B & B2C). No one doubts that the technological improvements will lead to more use of BB. Also the development on devices contributes to the increase in use of BB. With one flat screen you can handle everything.
2008	A decrease in ARPU[2] and ROI has led to a replication of the WAP model, where companies have gradually stopped development for new software; the lack of services starts to affect customer subscription rate. The main usage of bb BB is now government based and sponsored by the education departments, which uses remote communication as a means to deliver contents and reduce school operating costs. New regulations are coming into place, with a push for market break up that cannot be met due to the lack of confidence from companies about the future of bbBB.
2009	Wireless internet as developed in early 2000 is now an official regulation and will be introduced by governments for all citizens. Overkill of games. Games are out! There is no replacement for games. No other killer applications. What do you use ere to use your BB for?
2010	Peer to peer disappears, only to be replaced by license frameworks that tightly

[2] ARPU: *Average Revenue per User (reference profitability metric for Internet & Telco operators)*

Timeframe	***Key Events & Developments***
	couples contents and users to each other; the Internet has become an electronic invoicing system; given the systemic nature of people's quest for information it is only a matter of time before an aAlternative Internet will come up. High investments and, high debts in the Telco industry. No killer applications available. The interest of the public decreases. Not interesting anymore to try to develop the killer application.

8 APPENDIXES

8.1 APPENDIX 1 – THE OFFICIAL FUTURE, UNBUNDLED

Timeframe	***Key Events & Developments***
2004-2009	Focus on broadband markets, both landline and wireless. All countries will be affected by this evolution, both for the consumer, SOHO and SME segments. This will be strategic, as it will stimulate the ICT contribution to economic growth, social development, welfare and innovation. Efficiency will be dependant on faster, ubiquitous connectivity. Another component will be the reduced costs of connectivity, as well as its commoditization. Broadband networks will surpass the *enabler* phase to reach the *information-sharing* phase. This will require advances in the computing model, further away from the current client-server to a fully distributed peer-to-peer, grid-based model. High-speed affordable backbones will be the key enabler here. Enhanced applications such as VOIP, TVOIP, P2P and unified solutions will both bring benefits to customers, attract new segments and further push fewer companies to dominate the market by a broader, consolidated offers portfolio. Current incumbents will recycle either as service provider or as contents provider, fully leveraging the current dual-play advantage into a triple play position. Another enabler, which will be driven by incumbent and key players, will be the local loop unbundling, allowing increased competition and new products to reach the market. The final step will be the fibre-based access to the last mile. This will bring gigabit connectivity to all markets, which means any contents could be exchanged at low cost (video on demand, movies, 3D video conference, virtual office). An important push will be given by the entertainment industry, especially the

Timeframe	***Key Events & Developments***
	gaming one, where on-line communities and gaming will place a key role in shaping and driving investments in connectivity; this area will be key given the possibilities hidden in combining entertainment with contents distribution, which will indeed achieve a media unification solution. Some countries will develop faster than others. Key factors are local culture, physical barriers, Internet penetration, and government and EU subsidies. Public sector, education and healthcare will also benefit from wideband communication and create new means of communication, learning and customer care.
2009-2014	Governments will regulate the market and create legal requirements in order to deliver connectivity as a utility to home and business users. Standardization will also play a key role; therefore differentiation will only be possible based on channels and contents. Possibly, some media conglomerate will control both of them, unless regulatory limits are imposed. Contents will not be limited to entertainment and personal information but will span all areas of life: social, health, education, work, and business. Broadband access will become a fact of life: standardization and regulations will make it appear in every home, business and local premise as a standard connection plug (wire/wire-less); payment models will change: possibly a pay-per-use, or pay-per-access, metered or flat-fee. This will have to be balanced against ease-of-use, bureaucracy and, security requirements. Tomorrow's water-gas-power companies will replace Internet providers as known today. Computing, as it is known today will leave space to a distributed, grid-based, always-on, all-pervasive model, with wearable components that will keep us always in touch with our relatives and our personal and business communitiesy. Grid-based computing will do to the hardware what web-services are doing to the software model, allowing sharing, collaboration and pervasive communication. Several sectors will be revolutionized as the need for physical assets will be greatly reduced and instead intellectual property will become even more important. New models for information property, sharing and licensing will be needed in order to adapt to this economy. A new economical model will be needed as well (in certain developed countries), with several risks

Timeframe	***Key Events & Developments***
	of going towards an *elite* society. Increased distance between the developed and developing worlds will cause tensions that will need new, longer-term strategies to be developed. The role of a revised, transformed U.N. body will be key for stability. Physical regions will see their border blur and communication will be the enabling driver behind the information sharing amongst countries. Localization will increase, as increased information will not necessarily spur standardization and globalization but actually leverage the new technology to preserve and maintain local contents. Globalization will be replaced by *Communization*, whereby communities will become a format of social life and contact (similar to the *extended family* concept of, for example, in Latin and African countries)

8.2 APPENDIX 2 – SYSTEM DIAGRAM BUILDING PROCESS

Building a system diagram is a creative, iterative process that is best accomplished on a poster size background; the process itself may be haphazard and uneasyuneasy at the beginning, however after connecting a number of elements with different driving forces, some of them positive feedback, others negative feedback, the process speeds up considerably and a warm feeling of accomplishment is achieved. The following picture is this group'se original diagram draft:

8.3 DRIVING FORCES IN DETAIL

Driving force 1	
Name	**Increase in content supply of broadband channels**
What	Increased education level of consumers on broadband use and applications. This leads to more need for content in the form of news, sports events, light entertainment etc. Content should be easy (including speed) and approachable by consumers via devices. Moreover, content should be attractive for the big public.
Enabler	Businesses try to pursue strategy of bringing together content, networks and devices in order to deliver an integrated product to the customer. The success depends on the service provided by the operators.
Inhibitor	Varying content and devices of different standards cause confusion
Paradigms	All information is available at any time at any place and is mainly information that is suitable for the general public. Content more controlled by operator in order to bring it together with, networks and devices to deliver an integrated product to the customer. Consumers still need to be educated.
Experts	
Timing	Currently ongoing
Web resources	

Driving force 2	
Name	**Online gaming**
What	More games are played e.g. global tournaments of world computer football cup Creation of “realistic” cyber world. Preference for full graphics games increases need for broadband
Enabler	Technological development in games industry

Inhibitor	Health issues for children (to may hours behind computer) Lack of interest in educational learning
Paradigms	No distinction between reality and virtual reality
Experts	
Timing	
Web resources	

Driving force 3	
Name	**Increase in transaction platform availability**
What	People want to do transactions as quickly as possible
Enabler	High costs of face to face transactions
Inhibitor	Complex (financial) products
Paradigms	One should be able to control everything form home or workplace. Convenience and speed.
Experts	ING Direct
Timing	Depends on safety issues and convenience of supplier
Web resources	

Driving force 4	
Name	**Increase in emphasis of copyright, intellectual ownership of suppliers**
What	The fact that data transformation becomes easier and faster, increases the need for the right of intellectual ownership and copyright requirements. This negatively influences the content needed for broadband as it becomes more expensive.
Enabler	Legal convergence within EU and in the world
Inhibitor	No legal convergence within EU and in the world, no possibilities to monitor.
Paradigms	We have to pay for everything, nothing is for free anymore.
Experts	Concept guidelines from the EC Headquarters
Timing	
Web resources	

Driving force 5	
Name	**Globalization of communication**
What	The way people want to communicate via electronic media. The preferred level of interaction, visibility, instant access, channel etc.
Enabler	The need of people to use every means possible for optimal and maximal communication. Drive for maximum experience (real time, on line, big screen, multi user, high quality etc).
Inhibitor	The need of people for intimacy, one on one limited communication (example SMS), with smaller and more scattered communities.
Paradigms	The world becomes smaller, everybody can communicate whenever, wherever and however they want.
Experts	Youth of today – 12 to 16 year olds
Timing	Wide spread availability of > 100M bit/s communication
Web resources	www.telecomweb.com

Driving force 6	
Name	**Increase of perceived value of privacy**
What	The way, nature and level of privacy desired and required by the users of the communication methods. What do people want to share and have in the open, and what should not be disclosed?
Enabler	Increasing rights of consumers will enable a global agreement and set of standards on how privacy will be arranged and secured
Inhibitor	The constant technological innovation and the way the global corporate society deal with information, will make privacy a non-issue with regard to publicly available communication
Paradigms	The way people will perceive the down (terrorism) and up (no risk of interference) sides of privacy
Experts	Concept guidelines from the EC Headquarters
Timing	
Web resources	www.echelon.com

Driving force 7	
Name	**Government regulations**
What	The way the governments regulate the means and ways of communication, both cross border and national.
Enabler	International agreement that it is necessary to regulate the modern means and ways of communication, because of the economic and legal aspects of it.
Inhibitor	The public opinion, which does not allow for governments to interfere with communication, in combination with the limitations to regulate very new and innovative communication methods.
Paradigms	Is the government a separate entity or is the government dedicated to the rights and needs of the society and public?
Experts	Concept guidelines from the EC Headquarters
Timing	
Web resources	

Driving force 8	
Name	**Change in society with increases in individualism and increase in mobility**
What	Apart from the technological push and the innovation, the way society develops and how cultures (regional, national, international) form.
Enabler	The need to shape an integrated society and nurture culture is stronger than the newly available mass-media.
Inhibitor	The ageing of the Western world will lead to sub cultures with their own communication patterns, very different from the rest of the society
Paradigms	Does communication sets itself to society, or is it the other way around?
Experts	Religious and community leaders
Timing	An ongoing process
Web resources	

Driving force 9	
Name	**Increase in security threats**
What	People's fear of technology (e.g. afraid of privacy disclosure, on-line transactions, personal data interception etc.) and a common psychologically negative reaction to an all-pervasive technological environment; all information is tracked, therefore there's no hiding, not from the boss, from the family etc.
Enabler	• Government and EU regulations; e.g. digital signature, digital vote, all-digital banking • Disappearance of paper money, replaced by plastic money or digital money, security (authentication + authorization) will be key.
Inhibitor	• Peoples resistance to pervasive and intrusive technology; consumer association and anti-liberal parties fighting government and international bodies sponsoring new technology • Major events (e.g. energy crisis, global war, terror escalation) preventing technology to spreading or evolving
Paradigms	Positive transgression in the world from Morse code to the telephone, conversely this could lead back to a state of chaos
Experts	Hans Appel – visionary officer at Sun Microsystems Marcus Ranum – security expert, implemented the first secure website for the White House
Timing	State regulations: 5 years Cabling standard (end of competition between cable, ADSL, etc.): 5-8 years
Web resources	Too long a list

Driving force 10	
Name	**Telco's expansion in new profit areas**
What	New sources of revenues for broadband companies (access driven) as well as opportunity for new pricing models: metered vs. flat fee vs. time-based fee vs. bundle with other products (e.g. bank account, grocery offer)
Enabler	Society preferences and habits; for example a 2004 poll in the Netherlands showed this order of priority at home: Television, Mobile phone, Internet; Internet is expected to climb to number 1 in a few years; it has the potential of overtaking the other two as it would mean all contents to your home over 1

	fibre, 1 provider (same as Telco / cable providers today)
Inhibitor	Increased competition, reduced industry margins
Paradigms	People will consider the Internet connection (if it'll be known by that name; the broadband name will disappear) the same as an utility, e.g. energy/power link
Experts	Major Telco studies from investment banks
Timing	5-10 years
Web resources	Several

Driving force 11	
Name	**Technology push by Telco's and others**
What	According to Moore's law, technology doubles output speed every 18 months (e.g. new computer processors are 2 times faster every 18 months) additionally advances in unrelated fields that eventually become complementary to Internet/Broadband and create a whole new paradigm (e.g. the web was initially a research program and tool usable only by techies, nowadays every medium and major company must maintain one in order to be in business)
Enabler	R&D spending from different sectors and State funded organization
Inhibitor	Continued recessions in the developed world, reverse of globalization
Paradigms	The concept of 'sky is the limit' as new innovations replace current technology
Experts	
Timing	Ongoing
Web resources	Moore's law:http://www,intel.com/research/silicon/mooreslaw.htm

Driving force 12	
Name	**Convergence in media types**
What	Convergence of contents and channels distribution, current trend is becoming triple-play convergent (TV + phone + internet contents)
Enabler	People's desire for home entertainment and sociological forces bringing masses into the same direction, a factor used by clever companies to achieve

	their targets
Inhibitor	Consumer associations Regulations: local state + government + electors pools
Paradigms	Banks and all-in-one services (account, loan, insurance, internet connection all in 1 package, etc.)
Experts	
Timing	5-8 years
Web resources	

Driving force 13	
Name	**Divergence within device classes**
What	Broadband access will be possible via screen, mobile phones, watches, screen in your car, etc. Within a device class there will be different models, features etc.
Enabler	Innovation by product manufacturers
Inhibitor	Pricing models used to bring the product to market
Paradigms	Access will be possible anywhere, anytime allowing people to be kept informed and entertained
Experts	
Timing	1 to 5 years
Web resources	

Driving force 14	
Name	**Always on**
What	Connected access 24/7
Enabler	Competitive pricing for end consumers
Inhibitor	Government regulation
Paradigms	A world that will always be connected, anytime anywhere
Experts	
Timing	Now to next 5 years
Web resources	

Driving force 15	
Name	**Peer to Peer**
What	Capacity to expand the reach of contents from a personal PC to a network of PCs spanning the entire Internet
Enabler	This is definitely one of the biggest drivers for broadband expansion.
Inhibitor	Regulations, legal protection of contents, limited business models of contents providers
Paradigms	
Experts	KaZaA network
Timing	Now
Web resources	

Driving force 16	
Name	**Registration of networks both software and hardware**
What	A new software and/or hardware licensing model; for example, Sun is now licensing storage, instead of buying lots of disks and managing them, Sun will sell storage for less than $3. Palledium is another example of licensing.
Enabler	
Inhibitor	
Paradigms	
Experts	
Timing	1 to 3 years
Web resources	

Driving force 17	
Name	**WIFI enables access to everything, everywhere**
What	WIFI will evolve to become de-facto, a local loop, it will boost broadband to deliver all applications wirelessly: voice, TV, internet, all at high speed. The first examples are the wireless Leiden initiative
Enabler	

Inhibitor	
Paradigms	Consumers who have access without the hassle of requiring plug in connections to the internet
Experts	
Timing	1 to 5 years
Web resources	

Driving force 18	
Name	**Voice over Internet (IP)**
What	A killer application. It is a huge industry driver, with extended impact on several players
Enabler	Always-on
Inhibitor	Adverse regulations, telecom fighting back
Paradigms	What Email has done to personal/business communication
Experts	
Timing	
Web resources	

Driving force 19	
Name	**Cultural blocks (China, India, US, Africa, Europe)**
What	Communication will not be effective and needed with other blocks as they will all be self-sustainable. This stimulates different standards.
Enabler	Reversal of globalization Increased threat of terrorism
Inhibitor	Globalization
Paradigms	The world become more isolated and will continuously fragment as each block continues to divide and subdivide into smaller communities
Experts	
Timing	10 to 15 years
Web resources	

Driving force 20	
Name	**Changing education methods increases uses of broadband**
What	Students will have faster access to all kinds of information. It will also allow for increased market share in other study offering methods like remote MBA's and study courses taken for leisure.
Enabler	Easy access at low cost to the consumer
Inhibitor	Government policies on education keep them paper and class room based
Paradigms	Adult learning will change tremendously as people will have the ability to study from the privacy of their own homes, to fit with their own schedules
Experts	
Timing	2 to 5 years
Web resources	

Driving force 21	
Name	**Increase in mass and light entertainment**
What	Providers of BB networks and devices want to reach as many people as possible. The contents of entertainment should be developed in such a way that it appeals to the masses.
Enabler	Quality and availability of contents
Inhibitor	Recessions continue
Paradigms	A diminishing working week and people working more to be occupied than out of necessity means the requirement for entertainment will be greater
Experts	
Timing	
Web resources	

Driving force 22	
Name	**More suppliers of broadband networks**
What	The existing suppliers need to become more open and flexible. More service providers will want to offer BB services and buy access from the BB suppliers.
Enabler	Continued success of broadband
Inhibitor	Government regulation
Paradigms	Competitive end price offerings to the consumers as increased number of supplier fight for market share
Experts	
Timing	
Web resources	

Driving force 23	
Name	**New business opportunities for new services**
What	Changes in the industry will allow Telco's to be innovative and come up with new and more creative services to those currently offered, thereby creating new business opportunities
Enabler	Innovations in technology
Inhibitor	Increased security threats keeps consumers away from the Internet
Paradigms	Telco's will be able to sustain their growth for a longer period of time
Experts	Major Telco studies from investment banks
Timing	2 to 5 years
Web resources	www.wanadoo.com