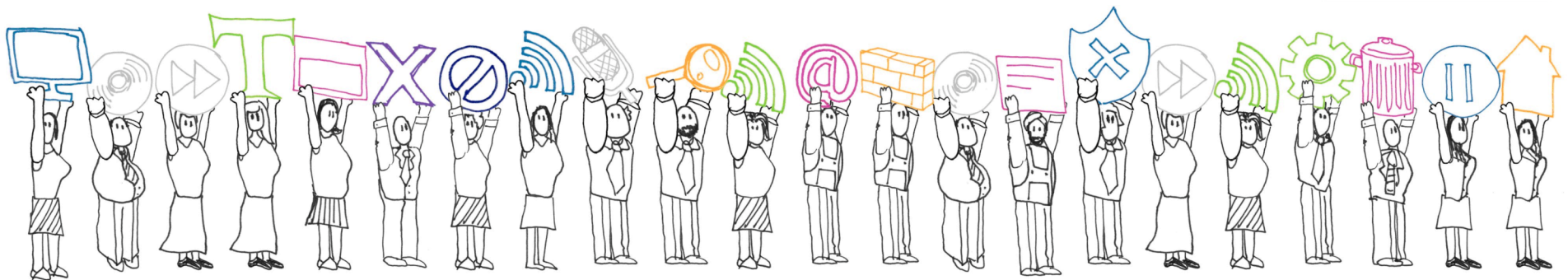
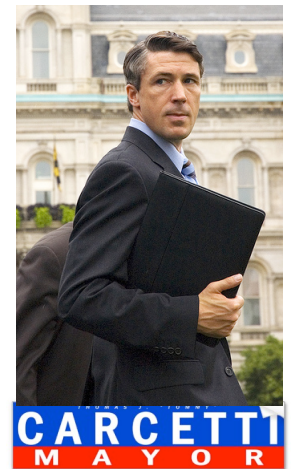


Personal Broadband and the Evolution of Mobile Industry “A Personal Journey”

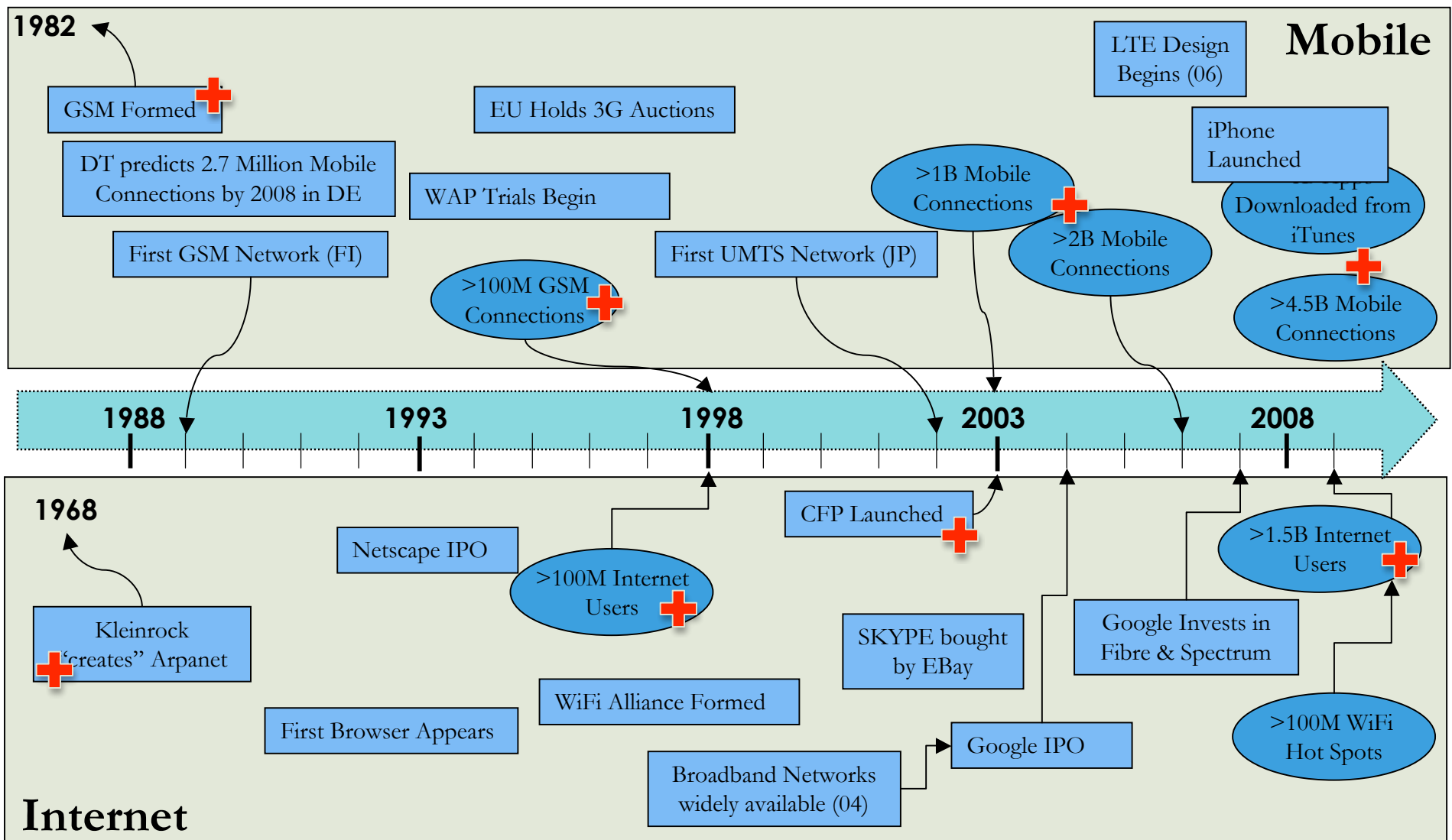
Hossein Moiin

BT



Selective Historical Context

Reach Out & Touch Someone



An Observation & A Key Question



Genesis of Personal Broadband

- Observation: Voice/Messaging moving to mobiles, why?
 - Convenience
 - Personalisation
- Q: What is needed to move broadband connectivity from fixed locations to mobile individuals and thus, mobilise/personalise all other services?

2003






2009

Improve networks	→	LTE/SAE or 4G
Create useful services for the mobile context	→	Mobile payment
Provide the right incentives & business models	→	iTunes
Improve application intelligence and MMI	→	iPhone & Blackberry

Key TMT Trends of the Past Decade



Ecosystem View

- | | | |
|---|--|--|
| 1 Digitisation  | 2 Socially Conscious | 3 Individuality  |
| <i>All Digital / All IP & Much Better: e.g. HDTV, Kodak</i> | <i>Global Communications & Local Actions + Green Policies</i> | <i>"My Tech NOT Hi Tech choice & rise of digital natives"</i> |
| 4 Mobility  | 5 Broadband  | 6 "Liberal" Regulations |
| <i>Any where, Any time, Any Device</i> | <i>Growth of Bandwidth Hungry & (Near) Real-Time Apps + Access as a Right Policies</i> | <i>Spectrum & Competition Technology Neutrality + More Oversight?</i> |
| 7 Competition  | 8 Confluence | 9 Shorter Clock Speeds |
| <i>Inter & Intra Industry Competitors; iPhone, iPod & Kindle</i> | <i>Changes occurring due to multiple effects</i> | <i>Advantages are no longer structural; Ever improving technology: Rapid Change</i> |
| 10 Flexibility | 11 Platforms | 12 Macro Economics |
| <i>The key attribute for success: Liquidity Not Solidity</i> | <i>Applications win battles, Platforms win wars</i> | <i>Dark days ahead or is the worst over?</i> |

Lessons From CFP

Building Blocks of an Intelligent Design (aka Evolution)



1

Product Development

Historical Models & Core Assumptions:

1. Push (Corporate R&D, DRAPA/NSF/EU, Academia, individuals, etc)
2. Pull (Market Research, Customer Feedback, etc)

Plausible New Avenue? → **“Near enough is good enough”**

Collaborative, Incremental & User Led (Web 2.0, “Long Tail”); Semantic & Intelligent (Wolfram & CALO); Permanent Beta & ...

2

Infrastructure

Historical Models & Core Assumptions:

Infrastructure is an expensive entity to be built only once, and requires a “long-time” to recover the initial investment. Often a monopoly & top-down → Industrial Information Production

Plausible New Avenue? → **“Femto Cells & Hubs”**

Easily replaced and upgraded through bottom-up & collaborative ownership: Network Information Production & Community Networks; Spectrum Abundance NOT Scarcity; **“Hong Kong & PCCW; Venice (CA&IT)”**

3

Architecture

Historical Models & Core Assumptions:

Optimised for a specific service (or collection of services) leading to stove-pipes with well defined rigid structures (**solid**)

Plausible New Avenue? → **“Flat, leave it to apps & devices”**

Generic, non-optimised, adaptable to solve various problems (**liquid**)

4

Business Models

Historical Models & Core Assumptions:

Own customers, services or products and match them to one another to maximise some economic measure (profit, revenue, etc)

Plausible New Avenue? → **Partners & Enablers**

Rapid & profound change of industries; Users instead of customers; Services & products user defined; Minimal cost, no ownership (customers/services); **iPhone, Kindle, Nintendo DS, Wii, ...**

Personal Broadband in Action

Commercial Break & A Word From Our Sponsors



The latest street danger? Walking and texting The Guardian, Wednesday March 5 2008



"There are those who believe that the pattern etched by humanity across the great book of world history is one of linear progression. Of improvement. Of advance. Of some nebulous but discernible form of betterment. Those are the people who have not yet heard the news that Brick Lane in east London has started padding its lampposts to prevent those who use its thoroughfare from suffering "walk and text" injuries."

Why the iPhone is giving Apple telephone-number profit

The Observer, Sunday April 26 2009

Nokia has just announced its worst-ever results. The mobile phone business is having to adjust to the idea that perhaps markets don't expand indefinitely. Gloomy forecasts abound. But then Apple unveils second-quarter profits of \$1.21bn (£822m) and \$8.16bn in sales - way ahead of Wall Street expectations. And this despite the fact that sales of the company's desktop (...) Why the rosy numbers? Answer: its new mobile phone business. Sales of the iPhone doubled to 3.79m units from the same quarter last year, (...)

Chicago Police Department Launches its first Google App Chicago Tribune, January 14, 2007

"Earlier in the week, the Chicago Police department launched its ChicagoCrime.org site (a mashup of Google maps and crime statistics) to provide information on the type and location of crimes in the city of Chicago."

Serious Crime Down Chicago Tribune, January 8, 2008

"Yesterday the Chicago Police department released its end of the year statistics for crimes in the city. Overall, the crime is down by 4% in the city with the number of serious crimes (murders, use of deadly weapons, attempted murders) down by 6%. In addition the police department reports that the crime against tourist in the city has dropped sharply (by more than 40%) while the overall number of arrests for prostitution and drug related offences have risen significantly (32%)."

The Future



“Prediction is very hard, especially about the future”

Predicting future evolution of technology is bound to be inaccurate:

- “I believe in the horse, the automobile is just a temporary occurrence.” Kaiser Wilhelm II
- “The computers in the future may weigh only 1.5 tons.” Popular Mechanics March 1949
- “There is no reason anyone would want a computer in their home.” TJ Watson, 1967

However, laws, limits & trends can be used to find the shape of the future

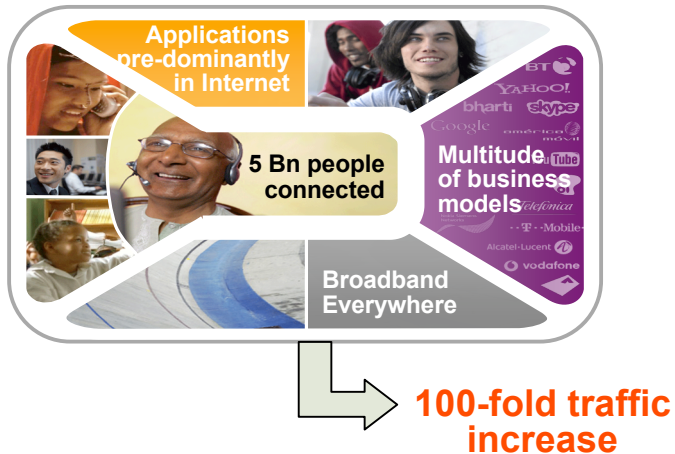
- Technology Evolution: e.g., Moore’s Law
- Worth of Networks: e.g., Metcalf’s Law or Reed’s Law
- Consumption Capacity: e.g., Edholm’s Law

Future of Communications?



Personal Broadband & User/Service Centricity

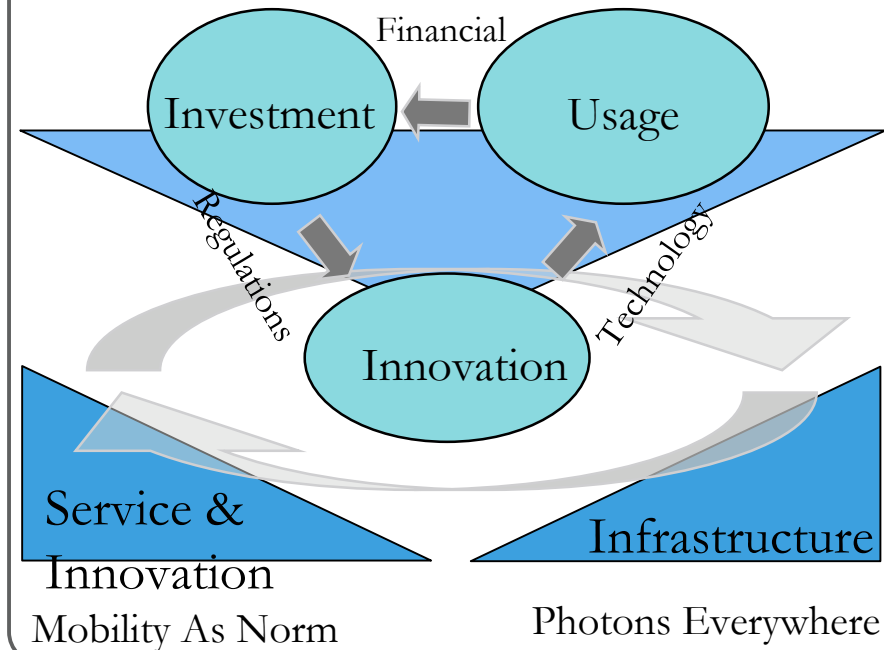
Context: A Plausible Future



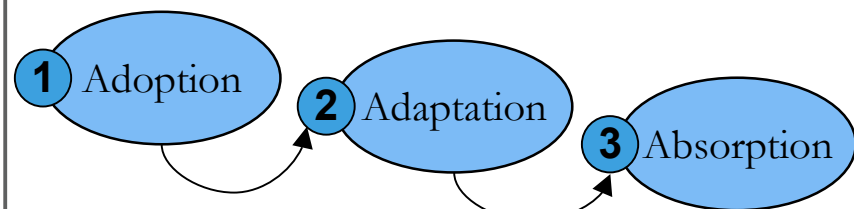
Technology & Service

- A copper-less world: Fiber & RF Radio as core technologies
- Wireless @ the edge: Mobility as the norm
- UI-Centric: No killer applications, but a killer user experience
- Open and standardised
- Internet ++: Semantically Intelligent, Dependable (QoS, Secure) & Mobile

Business



Usage Process of Successful Technologies

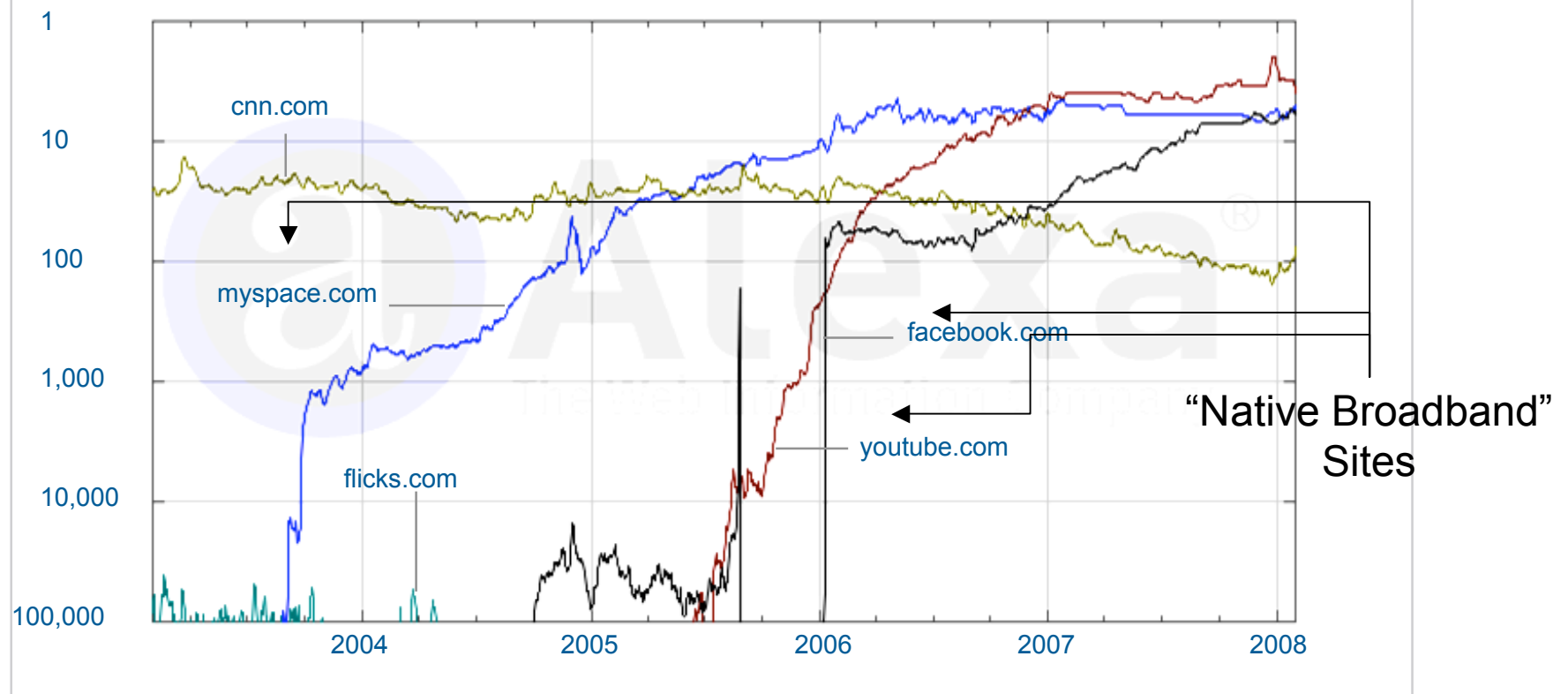


Personal Broadband

Creating new unpredictable opportunities?



Example: Daily traffic rank trends of Internet sites



Mobile Industry Evolution



A Personal View on Realising a Bold Vision: PBB

Phase I - Articulate the vision

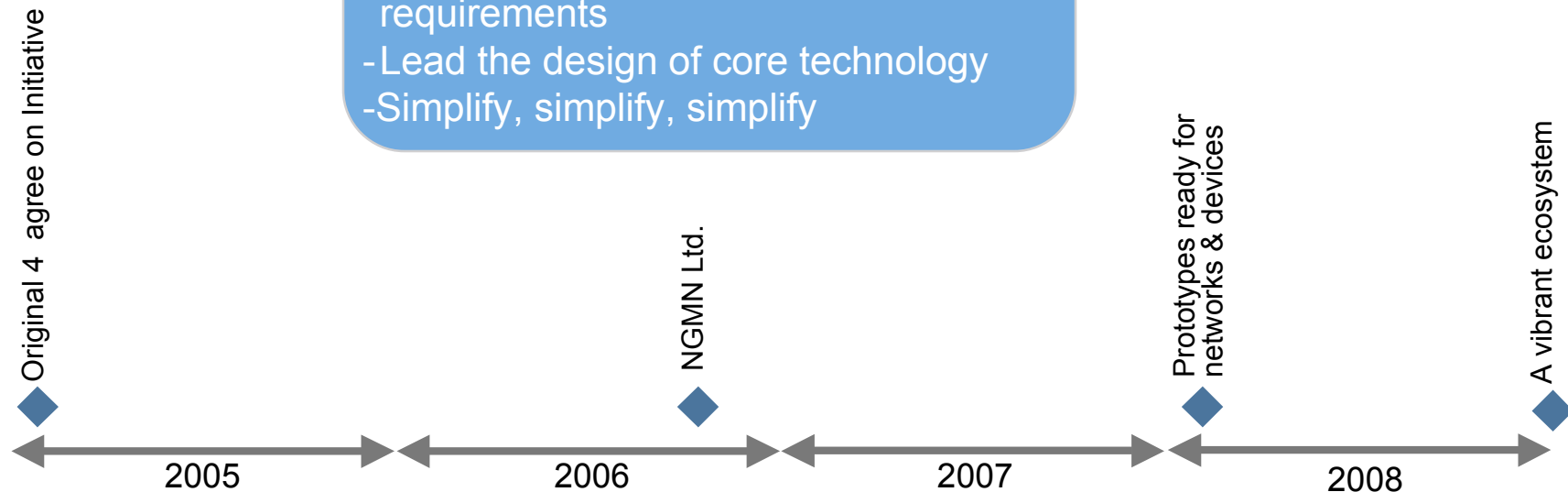
- Set a bold vision and target
- Learn from 2G & 3G experience
- Be customer centric

Phase III – Ensure it all works

- Provide all required enablers
- Keep customer in focus
- Build an end-to-end solution

Phase II – Build the right technology

- Translate customer needs to technical requirements
- Lead the design of core technology
- Simplify, simplify, simplify

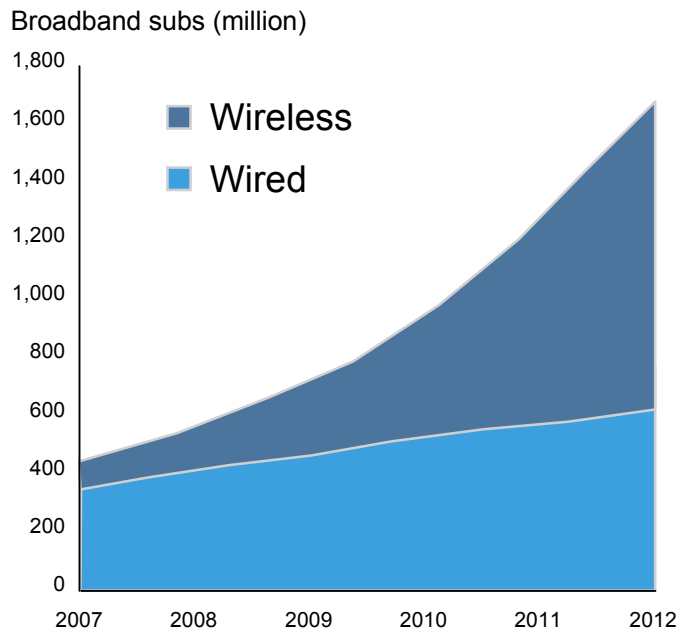


Market Development of Mobile Broadband



Growth - Shape of Things to Come

Global Broadband Subscribers



Source: Informa Telecom & Media 2008

Both supply and demand drive the mass market adoption of mobile broadband:

- Personalised, easy-to-use plug & play devices
- Advanced networks
- Increased competition
- Desirable applications
- Improved coverage
- Worry free pricing
- Example: South Korea & Use of MBB

Future Customers: Example UK

Speed or Mobility?



	Mobile BB data rate
DL	<7.2Mbps Max (~1Mbps realistic)
UL	<5.7Mbps Max (~500kbps realistic)

Mobility Factor

From £10 month
(3GB limit monthly usage)

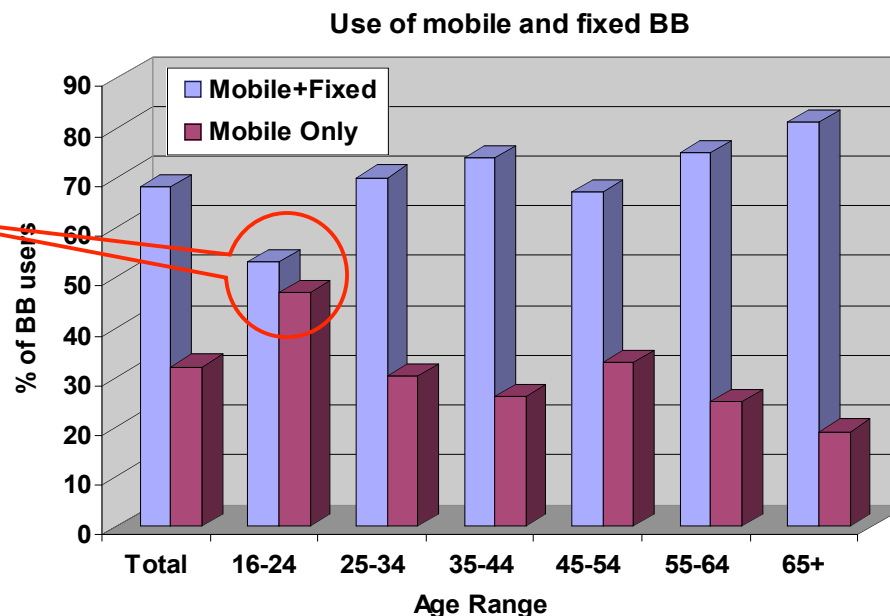
	Fixed BB data rate
DL	<8 Mbps Max
UL	<800 kbps Max

Fixed Factor

BB from £15.65 per month
(10GB max. monthly usage)
+ £10.27 month line rental

This group will
become a greater
proportion of
future customers

Source: The Communications Market 2008, Ofcom

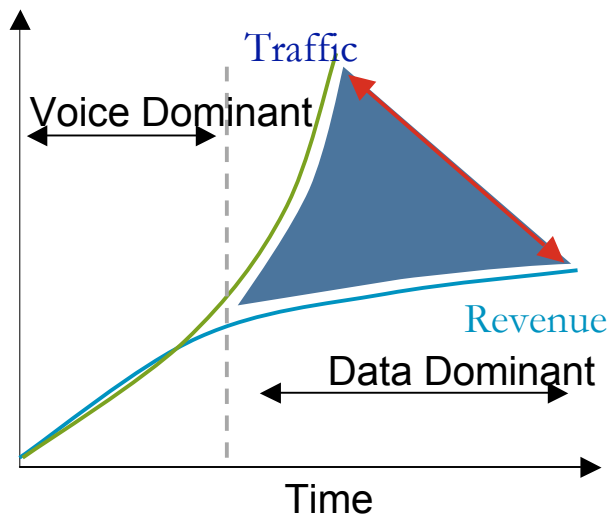


6 Key Challenges To Overcome

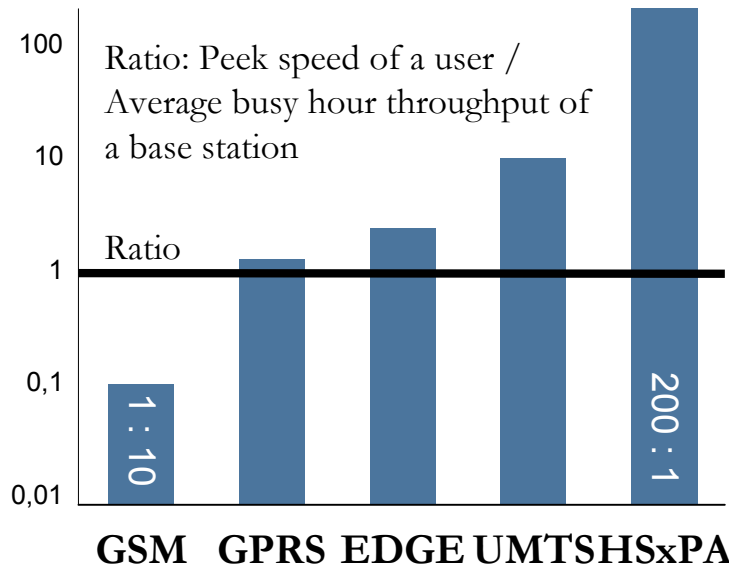
Money, Usage & Innovation



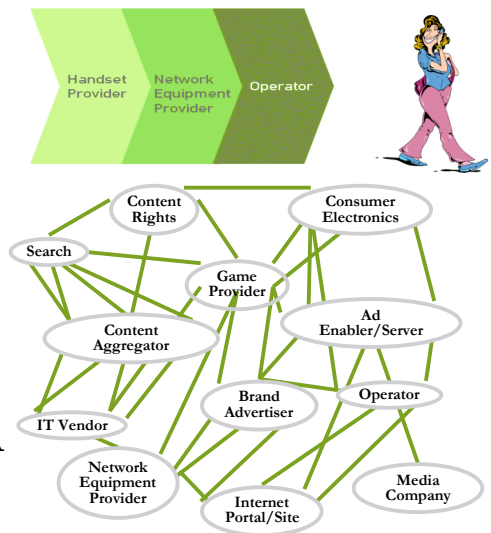
1 Economic Viability



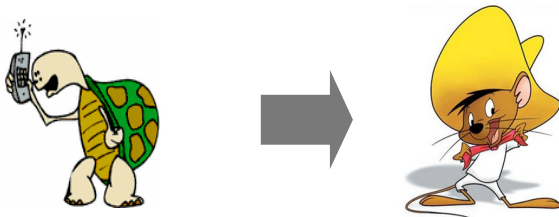
2 Transmission Challenge



3 Value Chain Restructuring Challenge

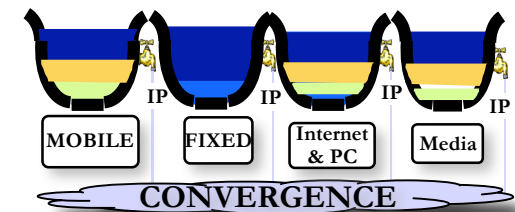


4 Character Challenge



5 Technology Challenge: Lowering of barriers → Moving towards a flat architecture

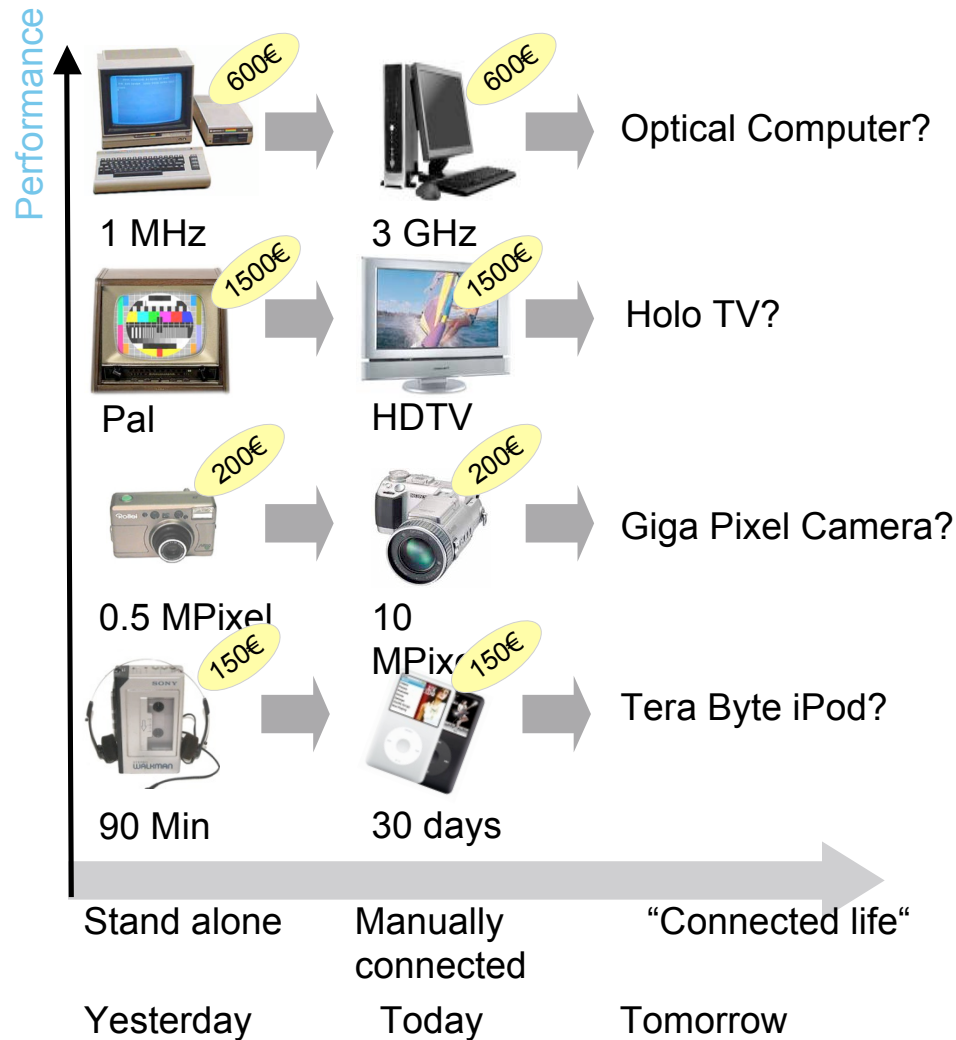
6 Convergence



Service / Device Evolution



Improved devices & applications drive broadband demand
Individuals & society drive connectivity & convenience demands



■ “Digital things get much better with time, but they won’t cost more”*

■ Better in:

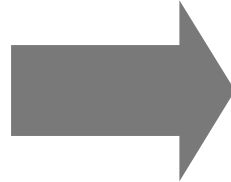
- Processing power
- Storage capacity
- Bandwidth
- Intelligence



Character Transformation Challenge



Can Telecommunication Companies Be Innovative?



Current Characteristics

- Slow Investment cycles & long lead times
- Risk averse due to perception of large investment
- Slow clock speed & cycle times → advantages are long-lived
- Complex infrastructure with little abstraction
- Centralised innovation: innovation @ the core → Few large sources of innovation

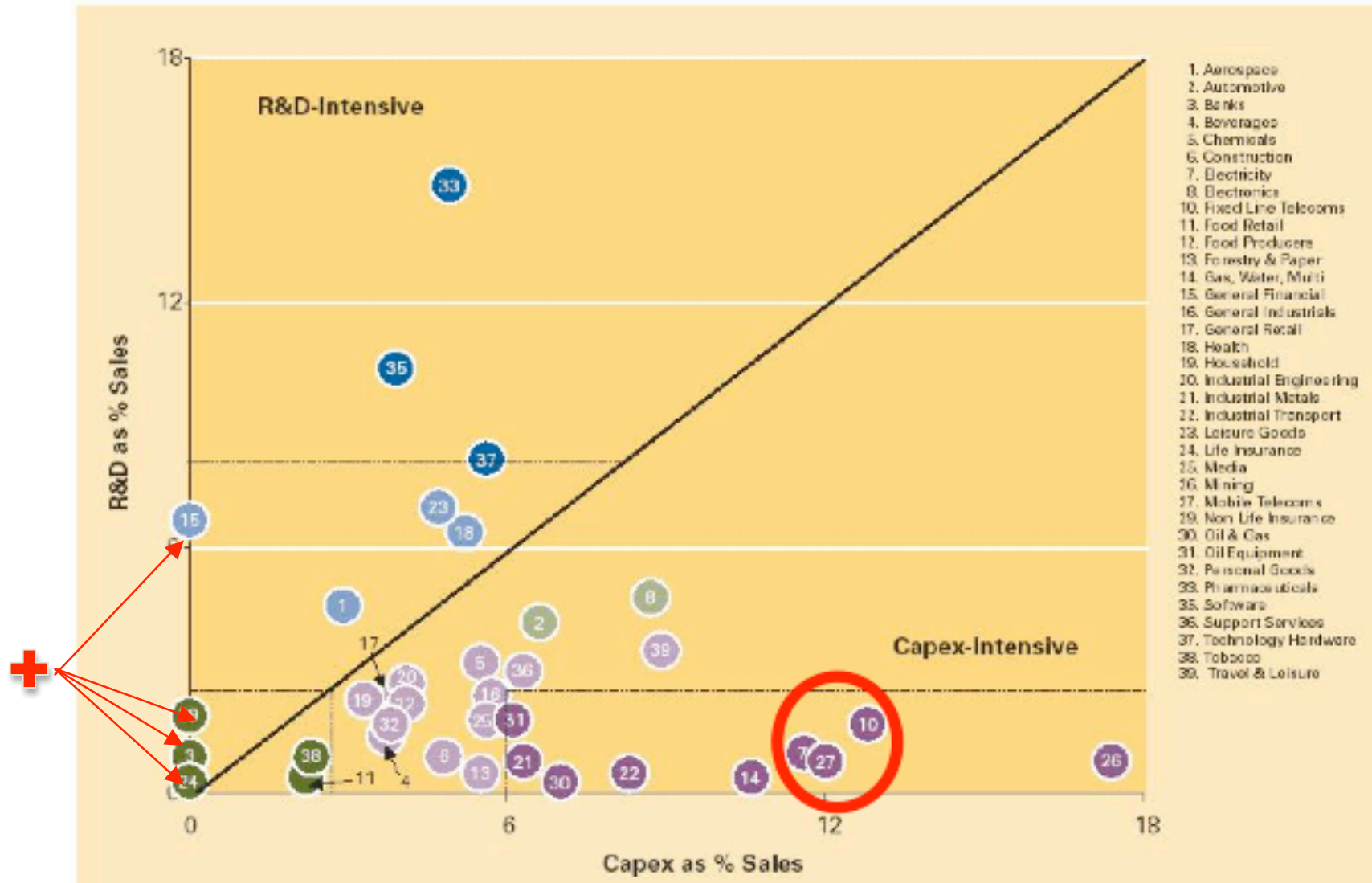
Required Characteristics

- Fast Investment cycles
- Risk encouraged to gain competitive advantage
- Low investment requirements
- Fast clock speed & cycle times
- Well abstracted interfaces
- Democratised innovation : innovation @ the edge → Many sources of innovation (large, medium & small)

Intensity of Investment & Battle of Titans

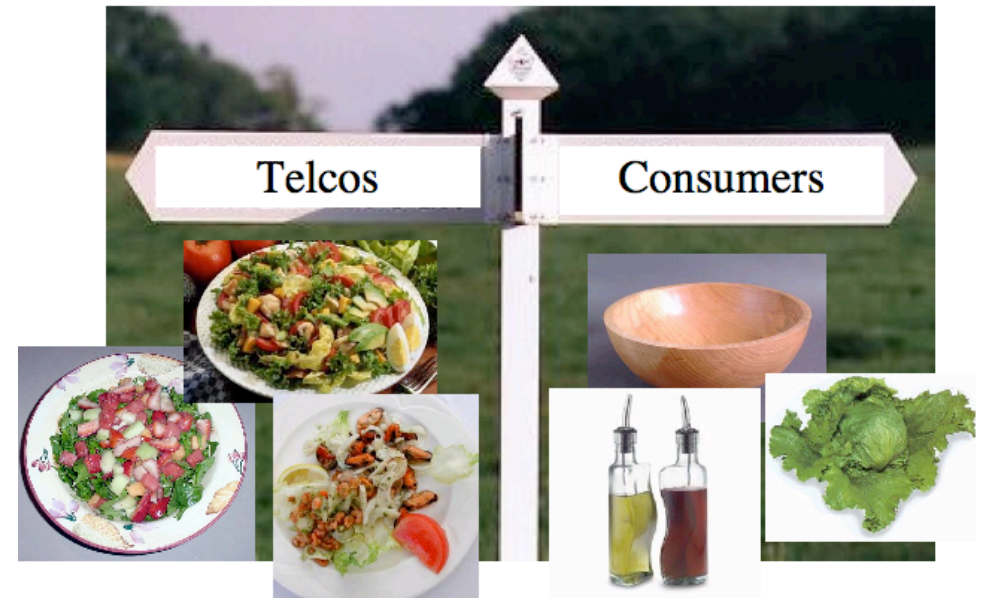
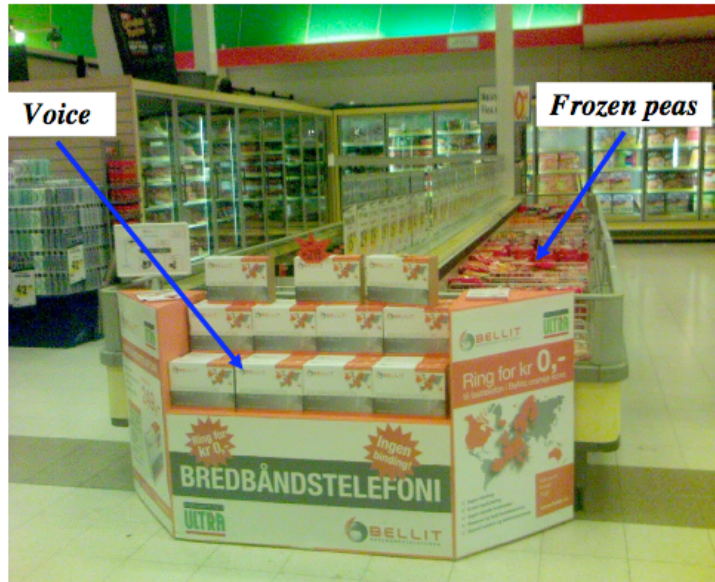


Can Telecommunication Companies Be Competitive?

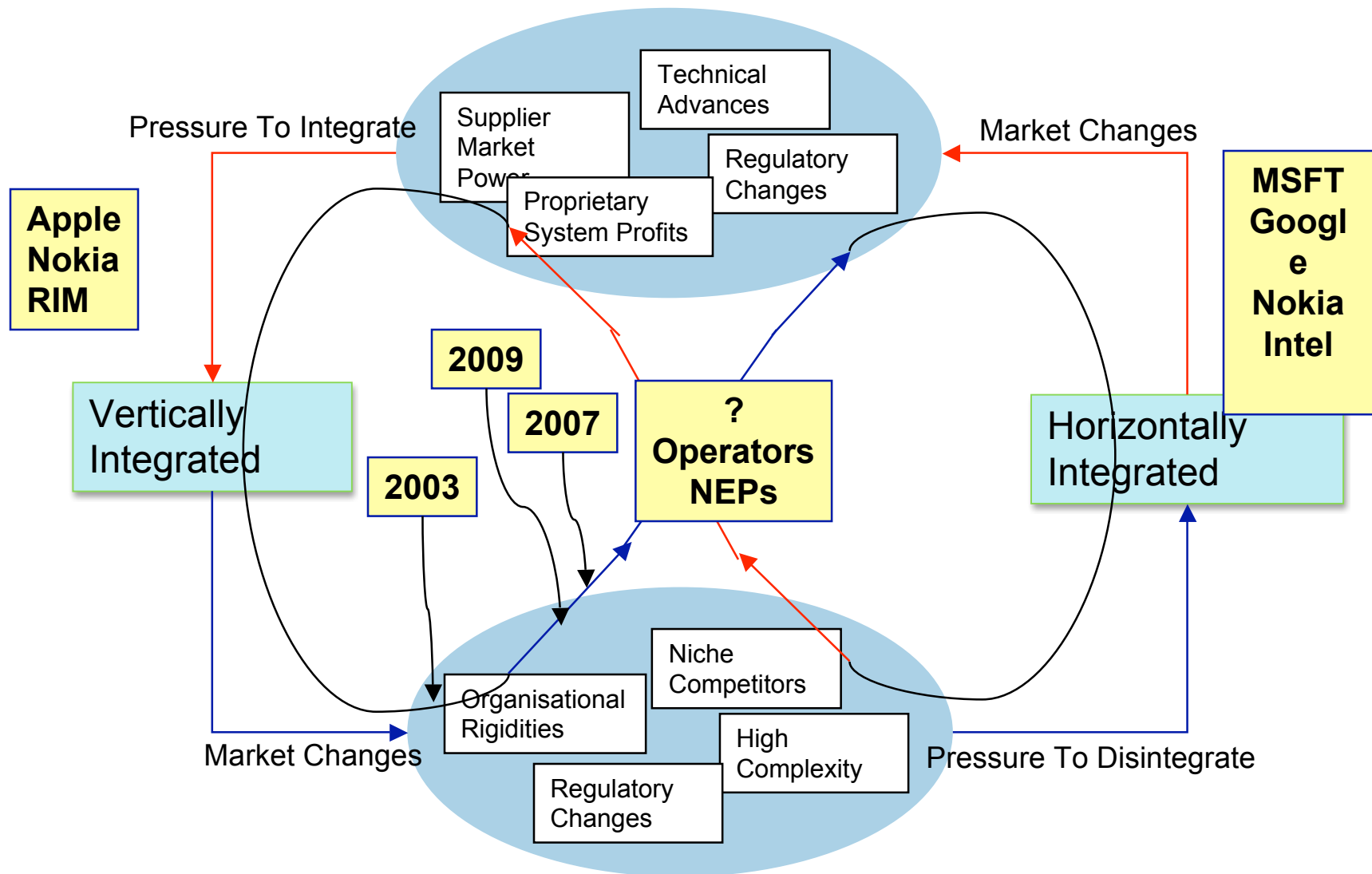


Source: UK Department of Trade and Industry

Where is the Industry?



DNA Evidence

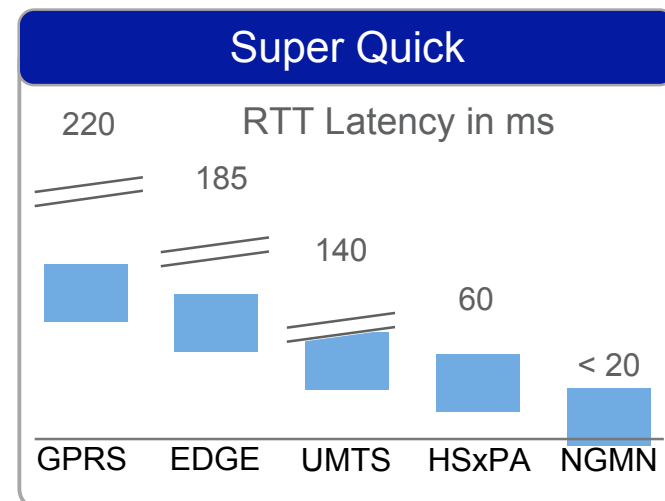
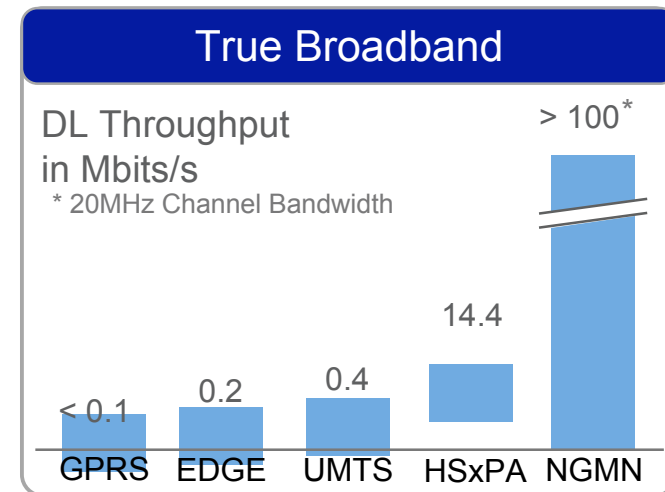


Key Deliverables for Success

Enhanced User Experience



- Improved throughput (DL & UL) with impact on services such as access to email
- Always on
- Improved latency with impact on interactive services such as browsing
- MMI?
- Useful Apps? Value?



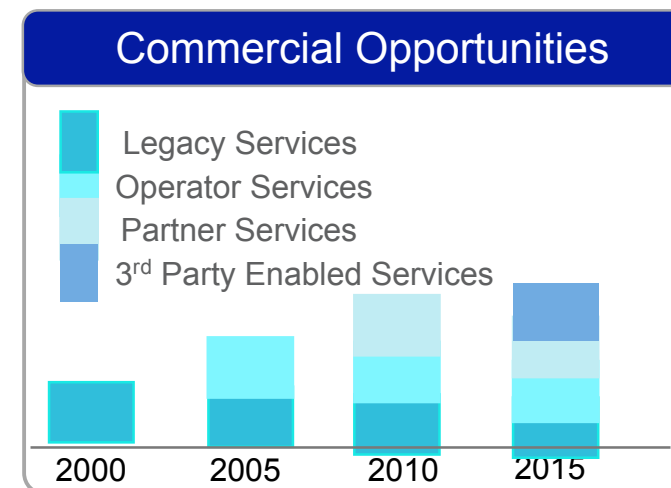
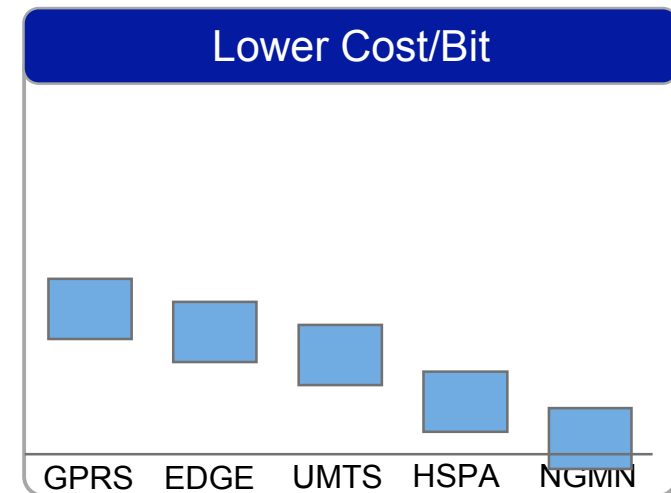
Key Deliverables

Viable Economics



- Lower cost / bit due to:
 - Simplified architecture
 - Improved spectral efficiency
 - Reuse of existing assets

- Expand commercial opportunities:
 - Existing services
 - New services



Conclusions?



The Vision of Personal Broadband has been partially realised by the evolution of mobile and Internet industries & the vision of PBB has impacted those evolutions:

- Capable devices abound; we have a converged device
- Networks have advanced & will advance further; coverage is no longer a differentiator in many markets
- Competition has made PBB affordable in many & worry-free
- New desirable applications appear daily; innovation is gaining momentum
- A vibrant & expanding ecosystem

However much work remains to be done in:

- Access: Inter-networking, inter-operability, inter-...
- Core Network Functionality: Security & Privacy & QoS & ...
- Ecosystem: Rapid innovation & shorter cycle times, ...
- Usefulness: Application, device & infrastructure intelligence, MMI, ...