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

Hossein Moiin
BT
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?

<table>
<thead>
<tr>
<th>2003</th>
<th>2009</th>
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</thead>
<tbody>
<tr>
<td>Improve networks</td>
<td>LTE/SAE or 4G</td>
</tr>
<tr>
<td>Create useful services for the mobile context</td>
<td>Mobile payment</td>
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<tr>
<td>Provide the right incentives &amp; business models</td>
<td>iTunes</td>
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<tr>
<td>Improve application intelligence and MMI</td>
<td>iPhone &amp; Blackberry</td>
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# Key TMT Trends of the Past Decade

## Ecosystem View

<table>
<thead>
<tr>
<th>Trend</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Digitisation</td>
</tr>
<tr>
<td>2</td>
<td>Socially Conscious</td>
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<tr>
<td>3</td>
<td>Individuality</td>
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<tr>
<td>4</td>
<td>Mobility</td>
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<tr>
<td>5</td>
<td>Broadband</td>
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<tr>
<td>6</td>
<td>“Liberal” Regulations</td>
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<tr>
<td>7</td>
<td>Competition</td>
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<tr>
<td>8</td>
<td>Confluence</td>
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<tr>
<td>9</td>
<td>Shorter Clock Speeds</td>
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<tr>
<td>10</td>
<td>Flexibility</td>
</tr>
<tr>
<td>11</td>
<td>Platforms</td>
</tr>
<tr>
<td>12</td>
<td>Macro Economics</td>
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Hossein Moiin – CFP – Venice, Italy – 13th of May, 2009
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, …
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

- 100-fold traffic increase
- 5 Bn people connected
- Broadband Everywhere
- Applications predominantly in Internet

Technology & Service

- A copper-less word: 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

- Financial
- Usage
- Innovation
- Investment
- Regulations

Service & Innovation

- Mobility As Norm
- Photons Everywhere

Infrastructure

Usage Process of Successful Technologies

1. Adoption
2. Adaptation
3. Absorption

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Personal Broadband
Creating new unpredictable opportunities?

Example: Daily traffic rank trends of Internet sites

“Native Broadband” Sites

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

Phase III – Ensure it all works
- Provide all required enablers
- Keep customer in focus
- Build an end-to-end solution

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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

Source: Informa Telecom & Media 2008
Future Customers: Example UK

Speed or Mobility?

<table>
<thead>
<tr>
<th>Mobile BB data rate</th>
<th>Fixed BB data rate</th>
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<tbody>
<tr>
<td>DL &lt;7.2Mbps Max</td>
<td>DL &lt;8 Mbps Max</td>
</tr>
<tr>
<td>(~1Mbps realistic)</td>
<td>(10GB max. monthly usage)</td>
</tr>
<tr>
<td>UL &lt;5.7Mbps Max</td>
<td>UL &lt;800 kbps Max</td>
</tr>
<tr>
<td>(~500kbps realistic)</td>
<td></td>
</tr>
</tbody>
</table>

Mobility Factor
From £10 month
(3GB limit monthly usage)

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

Use of mobile and fixed BB

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
   - Ratio: Peak speed of a user / Average busy hour throughput of a base station
   - GSM : 100
   - GPRS : 1
   - EDGE : 10
   - UMTS : 1
   - HSxPA : 200

3. Value Chain Restructuring Challenge

4. Character Challenge

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

6. Convergence

Hossein Moiin – Internet Reloaded – 2nd of March, 2009
Service / Device Evolution

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

Better in:
- Processing power
- Storage capacity
- Bandwidth
- Intelligence

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

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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)

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Intensity of Investment & Battle of Titans

Can Telecommunication Companies Be Competitive?
Where is the Industry?

We’re not in Kansas anymore...

But where are we, exactly?
DNA Evidence

Vertically Integrated

Pressure To Integrate

Supplier Market Power

Proprietary System Profits

Technical Advances

Regulatory Changes

Market Changes

Operators NEPs

Pressure To Disintegrate

? 2009

2007

2003

Organisational Rigidities

High Complexity

Regulatory Changes

Niche Competitors

Horizontally Integrated

MSFT Googlole Nokia Intel

Pressure To Integrate

Apple Nokia RIM

Market Changes

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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?

![Graph showing DL Throughput and RTT Latency]
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, …