

Mobile Internet or Rich Voice: The Socio-technical Shaping of Convergence

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One of the most powerful visions driving telecommunications innovation is the idea of convergence. Convergence is not just technical, but regulatory, cultural and industrial. There are a range of different interpretations of what convergence means, how it may occur and whom it might benefit. Convergence cannot be planned, and value chains pre-defined. Competition, uncertainty over uses and user, and regulatory change must be accounted for in analysis. Technology vendors, operators, application developers, various users, and regulators all have different agendas - can we understand how these agendas will interact, and how they will shape technology? There are two dominant value propositions : Rich Voice Plus and Mobile Internet. However it is clear that these are not just different services, but represent two contrasting regimes for understanding the market, the role of network operators within it, and the innovation environment for business and technical change. These regimes are those of the Internet and Telecoms world who are circling each other, drawn to the vision of Internet and mobile phone convergence.

Visions of convergence

Convergence is again the prime vision of much innovation in network technology and deployment, the continuation of a vision started in the 1970s. There are a number of different elements in the current visions of convergence that involve the Internet, cellular wireless communications, and broadcasting.

Interoperability: The engineers vision. Total Network Interoperability aims to create a seamless network and interworking through the layer model. It almost an article of faith that all networks and devices should be able to connect together, and operate as one. A device should be able to access content and services whatever access method or terminal they use. Much of this vision is driven by technology vendors with commercial interests in a variety of markets who see profits in synergy. Operators will want it to work in their interest, with a network-centred model, probably first by integrating fixed and mobile voice+messaging services and businesses.

Interconnection: Integral to interoperability, but interconnection is often not a priority for operators of networks, who prefer to own and control as much of the network as possible. Traditionally regulators have played a large part in forcing interconnection, and insisting that networks should be open to others who want to connect their networks, with concepts such as essential facility, common carriage etc., and efforts to reduce termination costs. Interoperability does not always lead to interconnection.

"Interoperability is something the industry will struggle to embrace". Director, European cable broadband provider

Wireless World: Championed by mobile telephony technology companies and operators, this vision is that all devices will communicate wirelessly, all last mile or last metre connections will be by radio and user wires will be eliminated. One version of the wireless world vision suggests a series of connectivity spheres ("Multisphere"), each one using a different set of technologies. This technology-based model ignores the fact that these are not only 'complementary' spheres, but also competing. Different industry players promote services using a range of wireless technologies in competing business models that ignore the multisphere logic. Wires are still a compelling technology too!

Ubiquitous/Ambient Computing: This vision comes heavily from the IT industry, and the consumer electronic industry. It relies heavily on wireless technology. Interoperability is very important in the creation of ad hoc networks between 'smart' devices. IT and computer industry are working hard to promote wireless as something they produce, and promote standards and spectrum licensing that favour their business growth. Machine-to-machine-communication is just as important than person-to-person.

Personal Devices: Personally owned and used devices with multiple functions and connectivity are the focus of strategies of several industries, from consumer electronics, computing and wireless telephony, through to television, finance and security. The point of use is the market key, whether or not convergence occurs in the network, therefore it becomes extremely important to be able to specify, configure and control the devices in the pockets and vehicles of customers. Many would like to loosen the grip of mobile operators. The link between the personal device and the technological environment around - in private and public spaces - is a key challenge.

Critiques of convergence and interoperability

1. Voice and data are very different. Voice still dominates revenues, it does not necessarily make sense to try and use one core network or radio access system to serve both markets (Morganti 2001). Convergence terminals actually allow multiple core networks to be linked together, rather than insisting on a single core.
2. The price that bandwidth is sold at for various applications varies by up to 5 orders of magnitude at least (Morganti 2001) (Noam 2001). Convergence systems cannot sustain this level of difference, even accounting for various quality of service enhancement. Unless the entire system is tightly controlled then solutions will be found to undermine price differences, as we are seeing in constant attempts to run voice calling over the Internet.
3. An engineering focus on interoperability may be a considerable distraction from other development trajectories for wireless terminals, which firms focused on end users or specific applications may be able to exploit to the exclusion of interoperability focused firms.
4. Control over the terminal is crucial based on this argument. When the end user can buy or configure the terminal to take advantage of multiple standards and protocols this undermines the control of the network owners to offer separately priced services and to access controlled applications and content.
5. Interoperability at network levels may make economic sense in terms of deploying common standards and mass-produced equipment, but interconnection and interoperability at application and service levels inevitably means competition for the same customers and services. This will certainly constrain convergence at a commercial level.
6. The mobile telephone, used primarily for voice, with some messaging and data services, has been one of the most successful mass market electronic products for a variety of reasons, despite very poor interconnectivity, even with other mobile network operators. Firms that

- focus on improving the mobile telephone, may best be able to sustain their market position by reducing end-user costs, increasing battery life, reliability, coverage etc.
7. Complex applications need vertical integrated networks - not disintegration on the layer model. This is especially true at early stages of innovation when close coordination between content, application, service and network operators and equipment vendors is needed, generally with the network operator taking the lead as they have the largest investment.
 8. Interoperability allows content and service companies to deal with end users while the network operators apparently disappear. This is a highly undesirable position for mobile operators, who learned from the internet that the layer model can mean that much innovative service and profitable business can flow over their networks and which they do not benefit from, while they are squeezed in a highly competitive commodity carrier business.
 9. Single Standards Solutions. One family of standards can be used to provide all types of network access. This has the advantage of keeping standards development within one established forum, with the same industry actors.
 10. Another benefit of single standard solution, rather than radio convergence is that single standard solutions are simpler to manage, and may be just as cost effective in the long run.
- (Morganti 2001) points out that most attempts at convergence have failed to produce returns. Engineers long ago decided not to try and integrate rail and road transport! Convergence is likely to be a messy business, and although multi-standard terminals will be in demand whatever scenario eventually develops, we need to use other perspectives to throw more light on likely outcomes.

Mobile Internet

Destroying value, stimulating innovation

The Mobile Internet concept envisages wireless technologies as providing a tail to the Internet, the most flexible, dynamic platform for convergence. One telco manager described the Mobile Internet concept as 'destroying value' - many of the valuable parts of a ubiquitous radio access network are undervalued - individual network services cannot be marketed and charged for separately by the operator. However, to deny the promise of the mobile Internet would be folly. The Internet model suggests that most potential customers understand very well on-line information and advanced communications. They want it easily, but are coming to expect ubiquitous access to content and unified messaging systems.

"We believe that people want access to the Internet, that the Internet has all the applications and services that people require and they want to access those applications and services from a laptop or a PDA using an interface, a user interface that they're comfortable and familiar with, and they want to access that in multiple locations" TDD technology firm executive

The all IP model that sees voice as just another form of data is central to the Mobile Internet vision, the radio access system is whichever one provides the best connection for the job, and the end user - be they a firm or individual - should be free to choose. Convergence management can be done by third party brokers - MVNOs are central to this model of convergence. Radio network operators still hold key place in value chain, but need to diversify technologies primarily to two way broadband.

Rich Voice Plus

Operator profits in a simple package

The Rich Voice Plus model views convergence as incrementally adding valuable services to current voice offerings based around the personal mobile handset. The mobile operators have a clear business - providing ubiquitous person-to-person mobile voice and messaging services to the mass market, in a simple, managed package. Their key business asset is the *billing system*. They are able to charge in many different ways, and use this to extract the maximum payment they can from users, for themselves or content providers. Mobile operators want to make money using their billing system and keep control over the terminal in their customer's pocket, and will do everything they can to make sure they are allowed to continue operate this way. What they fear is the Internet model:

"[There are] two worlds, the free world of the Internet and the business of the mobility. They are different models and in the Internet, no one has a SIM card that can prepay already able to be invoiced by an operation and this is why Internet has value because nobody can pay. In mobility everyone, operator, has ability to extract from your pockets some cents or pennies, ... So this billing enabler makes the business to happen. Then, behind us there is a whole industry of contents that have to use this billing machine to make the business. So there are two approaches to this. The Internet world normally and ... all the stuff is just a battle for free, free, free. And freeness costs reduction, competition on bandwidth, flat rate, free access within the weekend, free access..." Telco senior manager

Many would argue that they are right: Mobile Internet business is relatively small, and confined to the peripetetic business market- people carrying laptops and wanting Intranet connections - simple interoperability is all that is needed. The key value to most people is connectivity to link them to their social networks. Most useful services need always-on connection, not broadband. People are willing to buy some extra services, but none of these come close to the core value the phone provides. Mass market content-based services are best developed in a broadcasting mode, through convergence with broadcast technologies.

Convergence of Innovation Cultures?

Rich Voice and Mobile Internet are not just different products. They represent to a large degree perspectives of different industries. There are clear differences in the way innovation is done, standards are made, and the market is conceived from firms coming from computing and internet world, and those based in telecommunications technology and provision. Culture can be the hardest barrier to convergence. International difference may be very important. Here are a few of the differences.

From the INTERNET world	From the TELECOMS world
Bottom up development	Top down
Internet style business model (I.e. many, none convincing yet)	Tendency to vertical integrated
Heterogeneous supply	Centralised
Decentralised network control	End-to-end control
Open innovation	Closed innovation
Network-Edge model	Highly regulated
Starts from Unlicensed spectrum	Starts From Licenced Spectrum
AAA still weak - post hoc development	AAA strong, but developed before rollout
Best effort and extensibility key concepts	Quality of Service key consideration
Computer industry able to enter wireless world	
Suits US mentality	Suits European model
Contrasting innovation and operating environments for Internet and Telco world e.g. (Lehr and McKnight 2002)	

Where next?

All the we see scenarios produced to predict the future of communications offer alternatives where different industries get the 'upper hand'. How will operators maintain their position - by consolidation or interconnection agreements? Can IT industry and the mobile internet model attract enough investment to bring a new diversity of wireless infrastructures, built on demand, and operated competitively? Is this the right question? There will co-exist a range of markets, and accommodation will be arrived at, firms must see past defending existing core business to build new ones.

Two key issues emerge are 1)the control of the end terminal, and through it the access to the network and the customer, and 2) the changing regulation and access to spectrum that is occurring around licence free and new spectrum releases. We suggest that the innovation space must be opened up, the terminal must be let loose, and be primarily linked to applications, not to network services. Operators should concentrate on providing ubiquity and redundancy. A big question is how content firms and IT systems operators will deal with operators - will they be happy with a rich voice system and access to billing, or can the best connection to the customer be found through the Mobile Internet model.