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VoIP: A DISRUPTIVE INNOVATION
IN THE TELECOM INDUSTRY

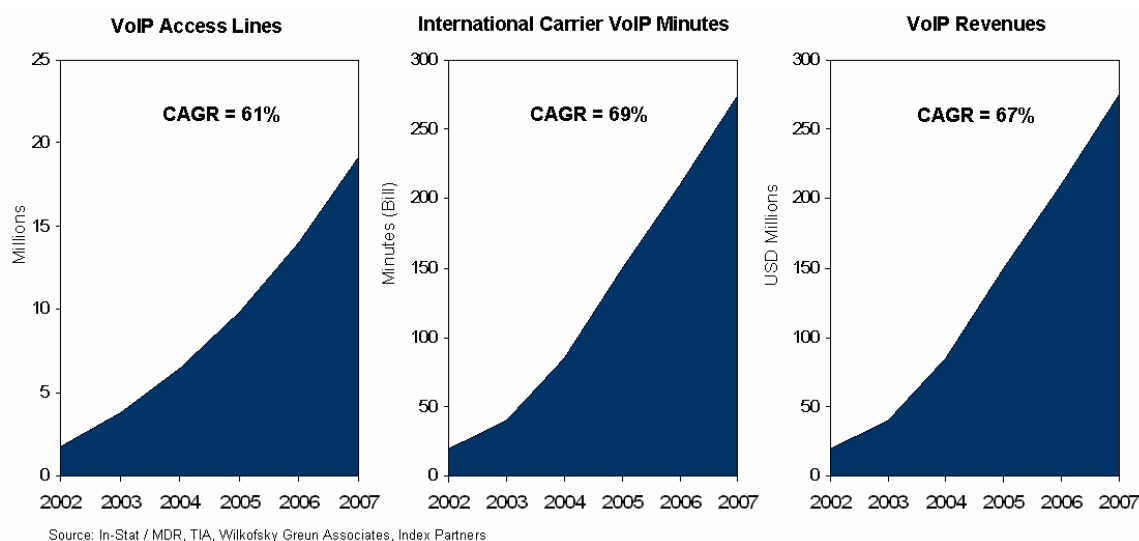


VoIP: A DISRUPTIVE INNOVATION IN THE TELECOM INDUSTRY

"It's probably the most significant paradigm shift in the entire history of modern communications, since the invention of the telephone"

FCC Chairman Michael Powell at the World Economic Forum in Davos, Switzerland 2004

The rapid growth of Voice over Internet Protocol (VoIP) is poised to redefine the telecom industry structure – the size and market share of its key players, their business models, their financial strength and the value of their legacy assets.



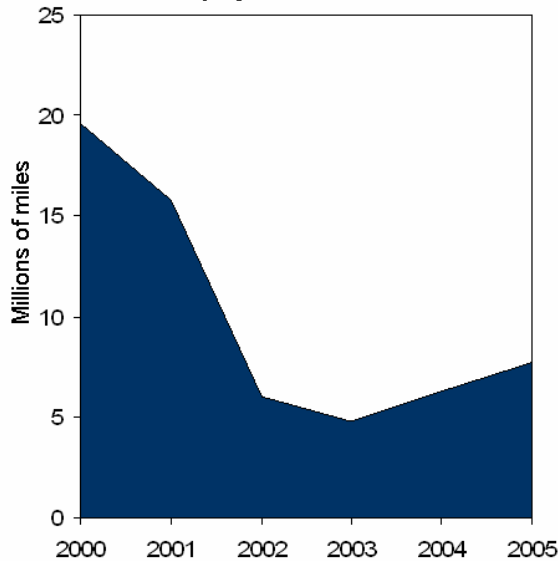
1. VoIP Growth Drivers

VoIP emerged in mid-1990s but failed to take-off due to quality (QoS) and bandwidth problems. However the recent phase of growth is driven by a confluence of relatively sustainable industry trends, namely:

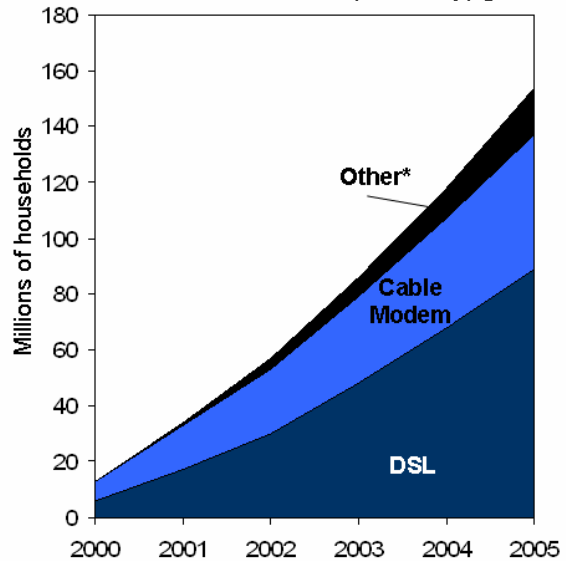
- **Technology enhancements**, including improvements in packet architecture (implying all packets reach the destination node in time) as well as end-user interfaces
- **Bandwidth growth** including the rapid increase in backbone fibre capacity and more notably the uptake of local-loop broadband access in key markets
- **Improved marketing strategies** including price packages, distribution and service design (e.g. VoIP's positioning as a service rather than a technology¹).
- **Falling costs** of bandwidth and related hardware such as IADs.

¹ Several incumbents in Europe are offering VoIP services to clients without necessarily publicising the fact.

Fibre deployment in the US market



Global broadband access (local-loop) growth



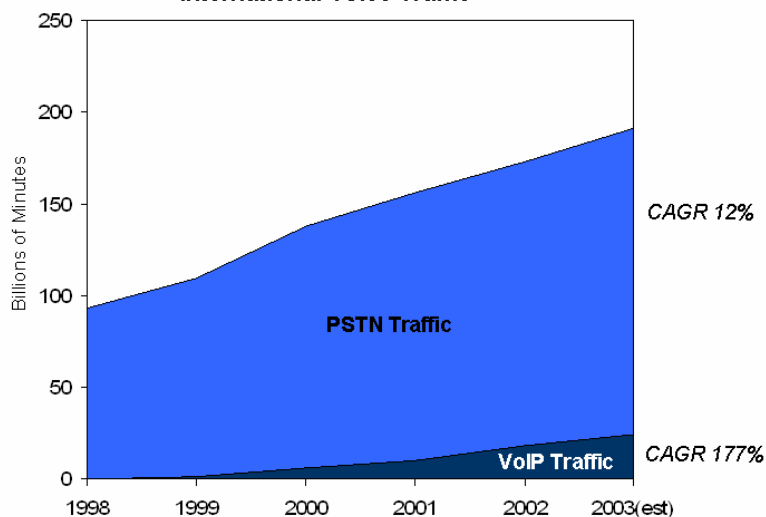
Note: * Other includes fixed wireless, satellite, fiber, Ethernet, LAN and powerline technology
Source: eMarketeer, KMI Research, Index Partners

The long-term growth of VoIP is likely to be driven by introduction of innovative services that seamlessly integrate voice and data over single communication networks.

2. VoIP Growth Segments

VoIP services are currently positioned as “low-cost” alternative to incumbent’s *voice* call services. In particular, VoIP exploited the “price arbitrage” opportunity in domestic and international long-distance call services as incumbents’ legacy business models (irrationally high tariffs and interconnection/ termination charges) were exposed to competition by liberalisation of telecom markets. International VoIP traffic accounted for 18.7 billion minutes or 11% of total international voice traffic in 2002, as summarised in the diagram below.

International Voice Traffic

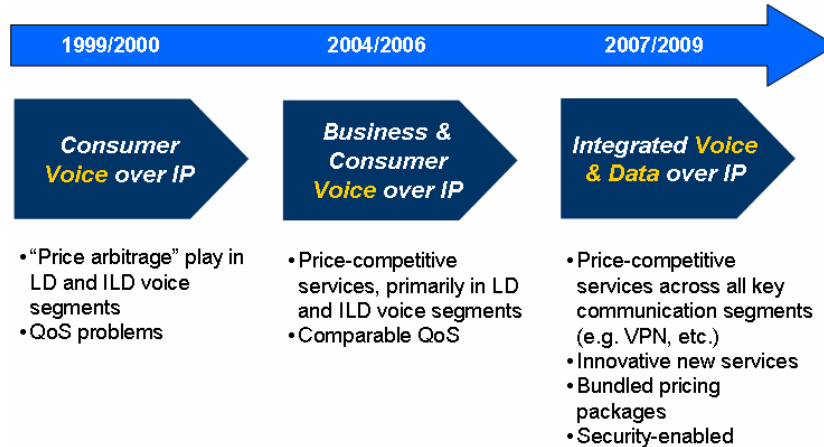


Year	1998	1999	2000	2001	2002	2003(est)
VoIP as % of total voice traffic	0.2%	1.5%	4.3%	6.5%	10.4%	12.8%

Notes: VoIP traffic includes all cross-border voice calls carried on IP networks but terminated on PSTN; PC-to-PC communications and private network traffic are excluded. PSTN traffic includes circuit-switched voice and fax traffic carried on traditional international facilities as well as international simple resale (ISR) facilities.
Source: Infonetics Research, Analysys, TeleGeography, Index Partners

However, several challenges remain to be overcome before VoIP established itself as a mainstream business. These include low consumer awareness, interoperability issues and, in particular, regulatory uncertainties. VoIP derive its price advantage from its ability to bypass high settlement rates given its classification as "information" rather than as a "telecommunications" service. This essentially constitutes a "regulatory arbitrage" and remains vulnerable to adverse changes given existing lobby pressures that advocate a more "harmonised" policy.

In the medium-long term, the regulatory risk exposure is likely to reduce as VoIP evolves from being a voice-centric service to an integrated voice-and-data service over a single network (hence, making the term "IP Telephony" more appropriate). This is summarised below.



Source: Index Partners

3. VoIP Service Providers

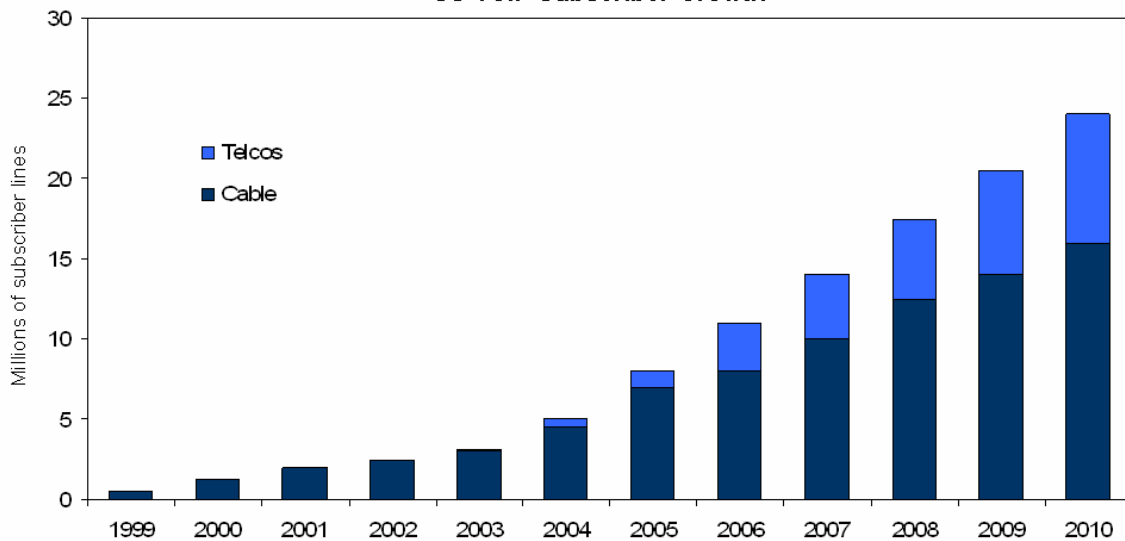
The VoIP business is in its early stage of evolution and consequently lacks established business models or industry structure. Existing participants in the sector include traditional telecommunication service providers (incumbents), network operators in "adjacent" communication services (e.g. Cable) as well as "independents" without any legacy business and exclusively focused on VoIP provision. These players have very different competencies and assets and offer distinct value propositions. The following table summarises the relative position of the different types of participants.

	Fixed-line Incumbents	Other communication network operators	Independent service providers
Strengths	<ul style="list-style-type: none"> • QoS & network reliability • Existing customer franchise • Existing billing & customer support infrastructure 	<ul style="list-style-type: none"> • No legacy problem • Bundle pricing opportunities • Existing billing & customer support infrastructure 	<ul style="list-style-type: none"> • Low infrastructure cost • No legacy problem
Weaknesses	<ul style="list-style-type: none"> • Late starters • Legacy problems ("cannibalisation") • High infrastructure cost 	<ul style="list-style-type: none"> • Lack of brand equity as a voice service provider • Network quality not yet proven • High infrastructure cost 	<ul style="list-style-type: none"> • Lack of control on network assets and thereby on QoS • Lack of brand equity • Required investment in billing & customer support infrastructure
Examples	BT, SBC	Comcast, Cox, NTL	Skype

Source: Index Partners

No specific segment has yet emerged as a clear winner and their relative positions vary across markets. For example, broadband access firms lead the sector in Japan while alternative carriers (and select incumbents) lead the market in Europe. In the US, Cable operators have captured a significant share of the VoIP market by aggressively rolling out bundled service packages over upgraded networks, as indicated in the diagram below.

US VoIP Subscriber Growth



Source: Morgan Keegan & Co., Index Partners

In the medium term, the business models of the different participants are likely to diverge with incumbents and other network operators bundling access & services while independents continue to offer network-independent services (or self-service products).

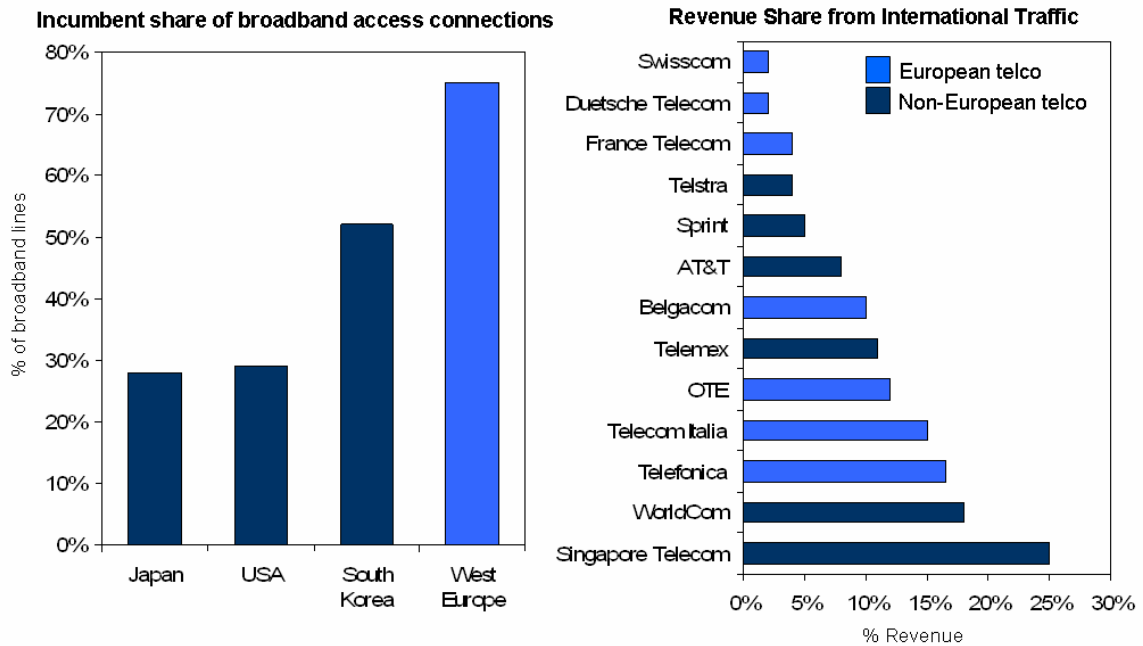
4. VoIP Impact on Incumbents' Business

Incumbents across markets remain exposed to cannibalisation of legacy revenues by VoIP, primarily due to:

- Loss in access lines and revenues
- Loss in voice call traffic and revenues
- Loss in termination / interconnect charges
- Potential price competition as VoIP competitors drive down call tariffs. However, this risk is minimal in developed markets given historical tariff erosion to the point where incremental decay is insignificant, positive price elasticity effects as well as “rebalancing” of price structures whereby revenues are less sensitive to changes in traffic and call tariffs
- Loss of wholesale / CPS revenues as resellers migrate to IP platform and capture the entire revenue from value added features such as call waiting, caller ID, v-mail, etc.

Furthermore, VoIP growth also strengthens the overall strategic and competitive position of cable operators vis-à-vis the incumbents.

However, the “risk-exposure” of incumbents to VoIP growth varies across markets. For example, European incumbents are relatively well insulated from such threats given their lower exposure to voice traffic (12-15% of group revenues) and international traffic (1-3% of group revenues), relatively higher share of broadband access lines (~70% average) as well as relatively weaker competing cable networks (poor broadband/ IP infrastructure). This is summarised below.



Source: Analysys, Index Partners

A recent research study by Analysys estimated a 3-3.5% loss in fixed line revenues for European incumbents to VoIP services.

5. Conclusions

VoIP is more of an opportunity than a threat for telecom sector incumbents, notably in Europe. While it cannibalises a small share of incumbents' existing revenue streams and expands the competitive landscape, IP-based communication services offer significant opportunities for price rationalisation (and consequent stimulation of incremental traffic) as well as introduction of innovative new services that increase ARPU and reduce churn. In the medium-long term, incumbents' proprietary networks will prove to be their most valuable asset for offering competitive QoS and reliability levels in IP based communication services.

Assessing the impact of VoIP growth on different communication businesses require rigorous, independent, timely and insightful analyses of relevant issues within the telecom and technology industries. Index Partners leverages its knowledge and experience across these converging sectors to help investors and companies assess specific business / investment opportunities.

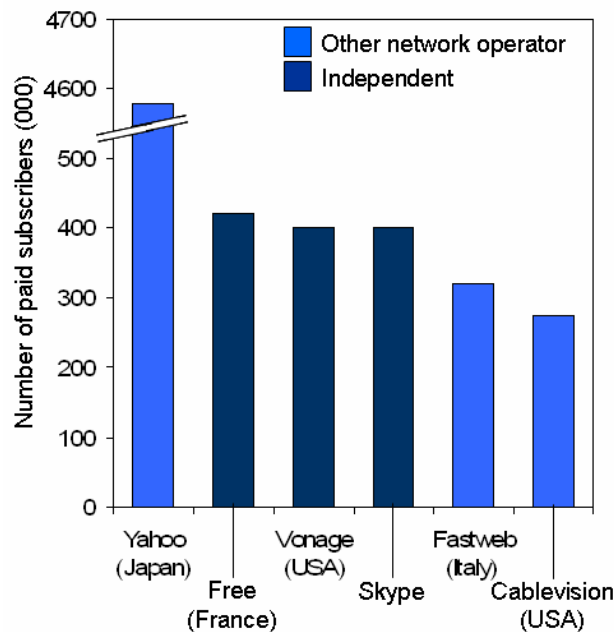
Annexure-1: Sources of VoIP Price Advantage

VoIP has three key sources of price advantage. These are:

- **Efficient network operations**, whereby voice calls disintegrate into small identifiable "packets" of data that travel through a common or "open" network and are reassembled at the destination node point. This allows the same network to be *simultaneously* used by traffic from *multiple* calls. In contrast, traditional "circuit switched" telephony requires a dedicated circuit to be set up between the caller and recipient for each voice call implying a "one-call-at-a-time" routing structure. Consequently, VoIP allows networks to be more efficient, better utilised.
- **Low-cost infrastructure** whereby IP networks are built around software "switches" that are significantly cheaper than the big and expensive physical switches installed in traditional telephone exchanges.
- **Regulatory cost advantage**, whereby VoIP bypasses high settlement rates given its classification as "information" rather than as a "telecommunications" service.

However, it may be noted that VoIP is different from other voice over packet technologies such as VoATM and VoFR that have different cost structures.

Annexure-2: World's Largest VoIP Service Providers (end-2004)



Source: Ditberner, Index Partners

Notes:

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