Title: A Review of Internet Telephony and Its Strategic Impact On Telecommunications Industry

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Author(s):   S. Ji and H. Najera

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Abstract: A nascent technology and nascent industry-Internet Telephony is reported and discussed in this research. A broad definition of Internet Telephony is adopted and its basic products and services are introduced first in this paper. Also this research reports the most recent technology progresses in the area. The Internet Telephony market has been defined and analyzed from different perspectives. Moreover, this paper conducts a research about the representative players' strategies and the telecom giants' countermeasures, as well as this technology's strategic impact on traditional telecommunications industry. Finally, this paper has taken an overview about the future of this fledgling industry.

A Review of Internet Telephony and Its Strategic Impact on Telecommunications Industry

S Ji   H Najera

EMP-P9745

Executive Summary

A nascent technology and a nascent industry—Internet telephony is reported and discussed in this research. A broad definition of Internet telephony is adopted and its basic products and services are introduced first in this paper. Also this research reports the most recent technology progresses in the area.

Generally, this research addresses two questions:
1. What has been happening in the convergence area of Internet and telecommunications—Internet telephony?
2. What is its strategic impact on traditional, circuit switch-based telecommunication industry?

Some leading players, including VocalTec, Net2Phone and Microsoft, and their technology as well as major products are introduced and discussed. The Internet telephony market has been defined and analyzed from different perspectives.

Moreover, this paper conducts a research about the representative players' strategies and the telecom giants' countermeasures, as well as this new technology's strategic impact on traditional telecommunications industry.

Finally, this paper has taken an overview about the future of this fledgling industry.

The literature search covers technology journals, magazines, newspapers, industry publications, and government documents and this research is based on reports, analyses, discussion, syntheses and predictions. While there are important progresses occurring every month in the concerned area and related areas, we realize that a persistent attention should be kept on the topic for proving, correcting, reevaluating and updating the concepts, results as well as conclusions.

EMGT 520
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TEAM PROJECT

A REVIEW OF INTERNET TELEPHONY AND ITS STRATEGIC
IMPACT ON TELECOMMUNICATIONS INDUSTRY

Song Ji
Homero Najera
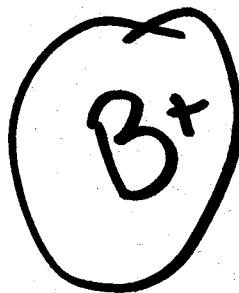
DECEMBER 8, 1997

comparable to cellular phone systems or good speaker phones. However, according to Philips Tarifica, a London-based telecom consultant, the quality of Internet-based voice calls will have improved radically by the turn of the century. [8]

Internet telephony is a nascent but fast growing market. It is going mainline especially for international service. A handful of start-ups are offering dramatically lower rates for international calls. For example, a 10-minute call from Chicago to Tokyo at Sprint's highest rate would be nearly $20, vs. $2.90 via Net2phone service. [2] Internet phone service is expected to grow from the current tens of millions of dollars to about $2 billion in 2000, according to Forrester Research, a high-tech/telecom market research firm based in Cambridge, Mass. [3]

AT&T, MCI and Sprint are taking it seriously as an alternative to their systems that use land lines, microwaves and satellites to carry long-distance traffic.

Players, Products and Services Outline

So far, there have been three generations of Internet telephony. The first generation products require both parties to the call to be online at the time of the call — either by coincidence or pre-arrangement. The second generation, pioneered by companies such as IDT's Net2phone and the Israel-based VocalTec, allow PC users with Internet connections to call traditional phones located anywhere in the world. The third generation in the evolution of Internet telephony allows the consumers to make calls with a regular telephone. [4]

The pioneers in this area are VocalTec, IDT's Net2phone, Vienna, Delta Tree etc. All of them have their proprietary technology on Internet telephony. The giants like Microsoft, Intel, Netscape and Motorola are strong imitators.

The representative products and services of Internet telephony are shown in Table 1. [5] There are still some companies providing Internet-based faxing and call centers services.

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Business vs. Consumer Markets

To date, Internet telephony has achieved fabulous growth in consumer market. It's hard to figure out how many people now over the world are making calls through the web. But taking Net2phone as example, it has already over 290,000 subscribers just one and half a year after its release, with its fiscal year 1997 (July 96 ~ July97)'s total revenues of $2.4 million and 1st Quarter FY98's total revenues of $2.1 million. [6] [7] Figure 1 shows Net2phone's growth within recent 5 fiscal quarters (Net2Phone commercial version is just released in summer, 96).

The people who made Internet calls earliest were those hobbyists just for fun. They enjoyed the crackling, halting conversations with each other over the Net. No doubt, this population would not be the main component of today's Internet phone consumer market.

Figure 1. Net2Phone's Growth
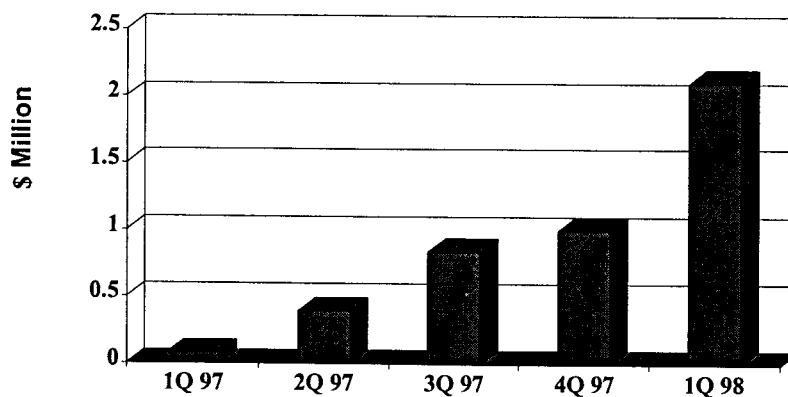
Source: IDT

What is Internet Telephony?

Internet telephony is a nascent technology and a nascent market. This technology harnesses the global power of Internet to place telephone calls. Recently, a wider definition of Internet Telephony, embedded with voice calls, faxing, voice mail, conferencing and multimedia interactivity over the web is increasingly accepted by the people in this area.

Let's go back to its basic idea.

With just a computer, an Internet connection, and some software, the long-distance telephone world can be your oyster—free. What Internet telephony promises is to pay for a local call to hook up to the Net, then chat with your partners in far-flung locales.

A typical one-way process can be technically described as the following. A call starts from a PC that has special software to convert the sounds into digital codes, which are then passed on to the ISP (Internet Service Provider). ISP in turn breaks the digital messages up into packets encoded with a destination address each. Then the packets go though the Internet and are passed on to the ITSP (Internet Telephone Service Provider), which reassembles the packets as they arrive and recovers them to speech. At last, it goes to the traditional public telephone network, which directs the call to the right phone number. The ITSP charges for the local call (maybe a cheap long-distance call) and a handling fee. [1]

The principle of Internet telephony is distinguished from the regular voice telephone networks. While the latter is "circuit switched" (networks assuring a dedicated link for each call), the Internet, which was primarily designed for carrying data, is "packet switched". That is, all Internet signals are split into small "packets" and sent by different routes to their final destination. While the arrival of packets at different times does not affect data traffic (like email), it leads to some quality problems in the case of "real time" applications like voice and video. Today's Internet long-distance quality is

Domestic vs. International

Because long-distance rates are already quite low in the United States, it is doubtful that Internet telephony will have much impact in the domestic market. Now that one can already get flat rate of dime a minute from major carriers, it is doubtful that he will go for dialing extra numbers and suffering some degradation of quality to save one or two pennies. The domestic market seems not be a mass market. [10]

Conversely, Internet telephony does have a bright future for international calling. As long as information is traveling over the Internet, it's traveling for free, or at least without any long-distance company having to be paid. Only when it hitches a ride on the telephone network are charges incurred. What that means is that long-distance costs for a Net-to-phone call end up being destination-based vs. a traditional long-distance call being route-based. For Net2phone, that is 15 cents a minute 7 a.m.-7 p.m., 10 cents 7 p.m.-7 a.m. and weekends to the United States, regardless of where the call comes from, as long as it's coming over the Internet to IDT's U.S. based phone switches.

Table 2 gives the sample international rates from Net2Phone, Delta Three (a member of VocalTec's worldwide ITSP network), [11] [12] as well as AT&T [14].

Table 2. Sample International Long-distance Rates ($ / min)

	Net2Phone	Delta Three	AT&T Standard	AT&T Economy
United Kingdom	0.18	0.16	1.24	0.83
Germany	0.26	0.23	1.39	0.87
Japan	0.29	0.28	1.86	1.10
Philippines	0.75	0.67	2.30	1.34
Colombia	0.71	0.64	2.02	1.24
Israel	0.69	0.27	2.15	1.21

[Handwritten annotation: ? → 0.35, 0.15 econ]

Table 1. Products and Services in Internet Telephony

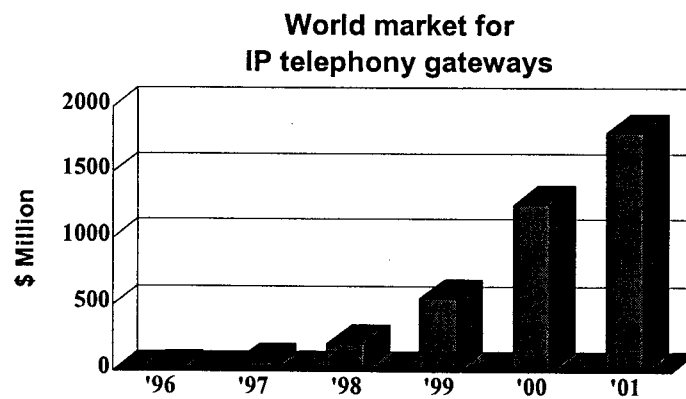| Pioneering Internet Telephony		
COMPANY	*THEIR PRODUCTS*	*THEIR SERVICES*
VOCALTEC	Internet Phone, Net telephony soft - ware, gateways	ITSP Network PC-To-Phone Services
NET2PHONE	Net2phone	Net2phone and Net2phone Direct Services
VIENNA	Vienna.way: Net telephony software, gateways	Rimnet's Vienna. Network Service
MICROSOFT	NetMeeting	NA

Figure 3. Revenues by Segment

**World market for
IP telephony products**

Legend: Gateways, Client Software
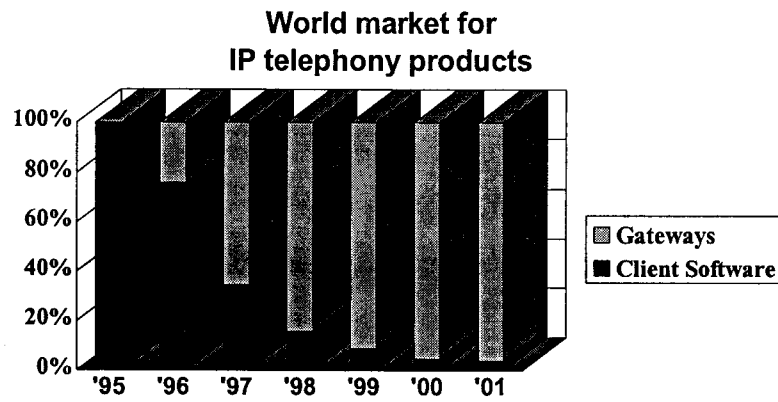
Source: Frost & Sullivan

Figure 4. Revenue Forecast

**World market for
IP telephony gateways**

Source: Frost & Sullivan

The customers value drivers in Internet phone are firstly its economic value, then some satisfaction of their desire to be seen as an astute deal maker and a modern citizen. With today's satisfactory or acceptable quality of Internet calling, its dramatically lower price is an irresistible attraction to the consumers. Many of Net2phone's subscribers who are in the overseas military line up before and place calls from laptops.

The quality issue has prevented the majority of business users from taking to Internet telephony. However, some vendors claim that users in this important segment have begun to use their products for less important calls. [4] Moreover, VocalTec and other vendors have progressed radically on providing solutions for corporate Intranet telecommunications. Seeing itself as a provider of products to telecommunications carriers and problem solver of corporate intranet communication, VocalTec has identified two dominant markets for VoIP gateways: the corporate VoIP customer, and carriers/service providers. Figure 2. shows VocalTec's revenue growth (its fiscal year starts from Jan. 1, and ends on Dec. 31).

Forrester Research reported that almost half of 52 Fortune 1,000 companies surveyed were looking at connecting their digital PBX (Private Branch Exchange) phone systems to Internet servers within two years. [9]

Figure 2. VocalTec's Growth
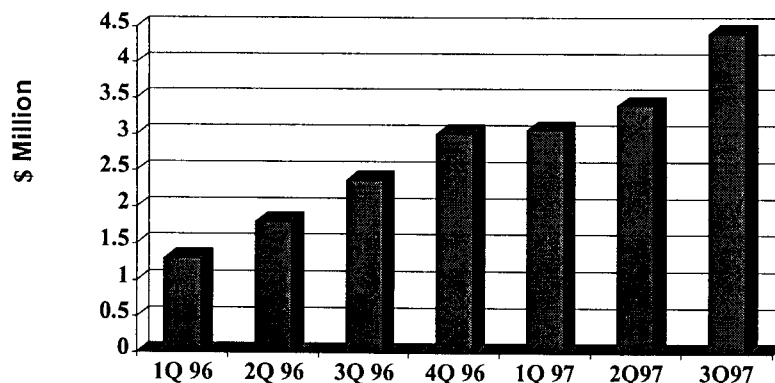
Source: VocalTec

IDT Corp. and Net2Phone Technology

IDT Corp. is a diversified telecommunications company with seven years' history. Now it's still a mid-small company with annual revenues of $135 million (FY97) but has been showing a momentum of growth. IDT currently has over 400,000 retail customers using its services including international long distance, Internet, and Internet telephony services. IDT is one of the leaders in Internet Telephony, with its Net2phone product— the first commercial telephone service to bridge live calls between the Internet and telephones. [15]

Net2Phone is the name of IDT's core product, a client-software of Internet telephony. Also it is the name of IDT's Internet telephony division.

The Net2Phone service system is different from other companies, like Delta Three's systems. The companies such as Delta Three and G-Cubed etc., offer phone-to-phone Internet service via toll free access numbers. With their services, callers dial into the company's network using toll-free numbers and then enter passwords and the long-distance number. The approach is identical to that often used with calling cards. Then, the phone call is digitized, sent over the Net and ultimately connected to the local phone service as close as possible to the destination. In some cases, if the Net phone company doesn't have a local computer connection in the destination country, calls must be transferred from other countries. [2]

IDT's Net2Phone system is a hybrid because calls are routed to a computer "server" in Hackensack, where IDT's headquarter is, and then over conventional phone lines. Sarah Hofstetter, IDT spokeswoman, contended that her company's approach of sending the call from the United States preserves its sound quality. Sound quality generally is good, though sometimes not as good as with conventional calls.

Net2Phone Direct, released in September 97, allows phone-to-phone communication. It works like a long-distance, dial –around service. A user dials an 800 number or a local access number, punches in an account number, then dials the number to

Ten cents a minute on an international call is a tremendous deal, no matter what country the caller is, but in countries where monopoly public phone companies have artificially elevated prices, a 10-cent-a-minute call is absolutely revolutionary. For that reason, about 80 percent of Net2Phone" clientele are based outside the United States.

Presently conventional international long-distance business adds up to $76 billion. No one, however, expects Internet telephony to topple the telephone giants. Forrester Research of Cambridge, predicts the Internet will take away less than 5 percent of total long-distance revenue by 2004. [13]

So far, Internet telephony's low-cost competitive advantage has been based on a simple fact: Internet is near free. Therefore, this advantage depends in large part on government policy that excludes Internet connections from various access fees assessed on regular phone connections. Some countries, like China, do impose onto Internet connection such access fees assessed on regular phone connections, even very low. The regulatory issues will be discussed in more detail in later chapter of this report.

General Analysis

In Internet telephony market, the market drivers are identified as the following:
- Toll bypass or toll reduction
- Rapid product quality improvement
- Spreading interoperability
- Growth of the Internet and intranets
- Carriers' need to offer value-added services
- Desire to integrate voice and data into a single communication network

While there are some market restraints:
- Lower quality than the PSTN
- Lagging infrastructure upgrade by corporations
- Increasing Internet access charges
- Decreasing prices for PSTN calls
- Lack of global structures for ITSPs

The Atrium Conferencing Suite is designed for the corporate market. It enables multiparty voice and data conferencing to significantly reduce the cost of communication and increase the quality and frequency of remote interaction. In many installations the cost per user of Atrium amounts to less than an half hour international conference call.

Internet Phone with Video is another VocalTec client software that enables users to simultaneously talk and see each other in real time for the cost of an Internet connection. Internet Phone with Video also includes numerous audio, data, text and collaborative computing features important for SOHO communications including firewall support, whiteboarding, document conferencing, file transfer, and voice mail. [18]

Microsoft NetMeeting

Microsoft NetMeeting is an award-winning product that provides a conferencing solution for the Internet and corporate intranet. Its features let one communicate with both audio and video, collaborate on virtually any Windows-based application, exchange graphics on an electronic whiteboard, transfer files, use the text-based chat program etc.

Using a PC and the Internet, one can now hold face-to-face conversations with friends and family around the world, and it won't cost a fortune to do so! NetMeeting is designed to work with any video capture card or camera that supports Video for Windows, one can choose from a wide range of video equipment. [19]

Summary

Internet telephony technology has achieved radical progress since its birth before two years. From the first generation PC-to-PC Internet telephony, to Net2Phone, then to Net2Phone Direct, it can be concluded that this technology has successfully provided people with satisfactory client solutions. Audio quality and connection quality has been rapidly accepted in consumer market.

Pioneered by technology and market leader such as VocalTec, Internet telephony has provided complete client/server solutions for corporate intranet and carriers and services providers.

Figure 5. Revenue Forecast

**World market for
IP telephony client software**
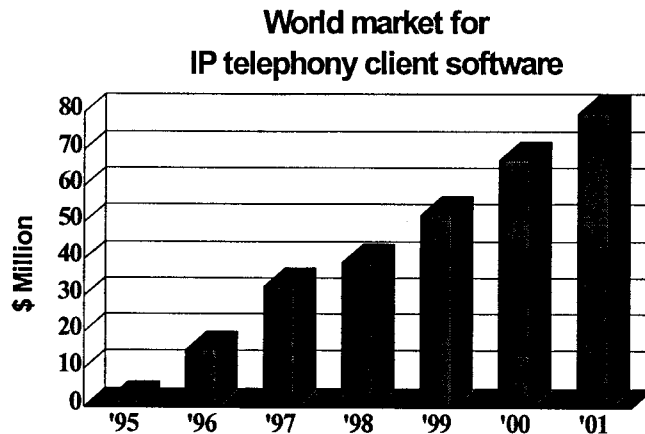
Source: Frost & Sullivan

Figure 3 shows the change of percentage revenue by two market segments. An important implication is that the sales of gateway servers will contribute much more in the total Internet telephony market than the sales in consumer segment. And Figure 4, 5 give the growth of each market segment.

Your graphs are all from other resources. You could have tried to forecast (using these sources) what the markets will look like yourself!

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Marketing Strategies

- **Net2Phone(IDT)'s Strategies**

IDT's key product of Internet telephony is a free downloaded software—Net2Phone, the first commercial client software allowing PC-to-Phone calls. What it sells is its Internet long-distance telephone service and the working principal is as using a pre-paid phone card. The consumers buy the minutes defined by the value of its virtual pre-paid phone card — "Debit Card"(the minutes defined by the "denominations" are different between different destination countries) to make calls. The people who do not buy Debit Card still can use the free Net2Phone software to call 1-800 toll free numbers. Net2Phone's PC-to-Phone feature differentiates itself from the other Internet phone client software and thus make it possible for Net2Phone to be the first mover and achieve outstanding success in a broader consumer market than just fooling among the computer hobbyists.

IDT had a good record of releasing their newest products (early Net2Phone Commercial and recently Net2Phone Direct) ahead of their competitors even their own schedule. By doing that they established a "ahead-of-time" strategy and that is why they can create " first mover advantages" or namely preemptive move effects.

And Net2Phone benefits from IDT's own diversified businesses: a variety of Long-distance telephone services, Internet access services, and Internet telephony. From years of international long-distance services has IDT gained plentiful management experience in international long-distance telephone system. Its own Internet access services provide the backbone for Internet telephony. So a synergy exists among IDT's three basic services: Long distance telephone service, Internet access service, as well as Internet Telephony.

- **VocalTec — Comprehensive Product Positioning**

be called. For anyone within a local call of a Net2Phone Direct gateway, a call anywhere in the United States costs only 8 cents a minute. As of now, according to news report, that local service is available in Chicago, Cleveland, Dallas, Portland, and San Francisco. IDT plans to have outbound servers in 30 U.S. cities. [16] [17] [13] [9] This "localizing tactics" is different from the above other companies approach of providing 800 access, in terms of technology and marketing strategy.

VocalTec

VocalTec Communications Ltd. is an Israel-based, Internet telephony company. Unlike IDT which has diversified background in telecommunications and Internet area, VocalTec was started from Internet telephony technology just two years ago. It is a "pure" Internet telephony company and also so far the biggest winner in this arena. VocalTec develops and markets software that enables voice and multimedia communications over packetized networks, the Internet and intranets. The company also develops open systems to bridge the Internet to the public switched telephone network. VocalTec's core products include Internet Phone software introduced in February 1995, the VocalTec Telephony Gateway Server and the Atrium Conferencing Suite. [18]

The VocalTec Telephony Gateway Server bridges the gap between the traditional telephone network and the Internet/intranets to enable unlimited long-distance calling and faxing. It allows users to connect over the Internet or intranet from telephone-to-telephone, PC-to-telephone, telephone-to-PC, fax-to-fax, and Web browser-to-telephone. The Telephony Gateway Server uses the power of the Internet protocol to improve the flexibility and performance of business communications systems while reducing long-distance phone charges.

This scaleable, open platform enables the integration of PBXs and the Internet or intranets in order to create a global virtual PBX network, substantially reducing long-distance charges on "interoffice" calls by using a company's intranet to carry voice as well as data. Service providers can deploy Telephony Gateways in order to offer PC-to-phone service.

Tech. Net2Phone expect to provide a corporate solution to Internet telephony through joining with Quicknet Tech, a hardware(Internet PhoneJack) supplier. [30] As mentioned before, even though Net2Phone has achieved a rapid success in consumer market, still it is far behind VocalTec in carriers and especially corporate market.

The Big Boys' Internet Telephony Strategies

The biggest threat to the phone companies seems to be the Internet. The Net started as a handful of computers that routed packets of data over telephone circuits. The phone companies thought of the Internet as harmless and a nice piece of business. But now that Internet is being refitted to carry faxes, phone calls, line radio programs, and even video teleconference, they are alarmed. Suddenly, the Net is becoming the kind of multimedia Information Superhighway that phone companies like AT&T had expected to offer. True, the Internet runs over circuits leased from phone companies. But that is the low cost, commodity part of the business.

The Internet telephone service providers (ISTPs) that buy this capacity at wholesale prices use their own equipment, known as routers, to direct calls. They never pay to go through the phone-company switches where toll calls pass and where a carrier such AT&T or MCI charges by the minute and by the mile. Today, Internet calling is still mainly a novelty. And part of its cost advantage — an exemption form paying access charges to local phone companies — may be swept away in the next few years due to possible regulation. [31]

The telephone companies like AT&T or MCI know that there is a huge interest in Internet. So, they have incorporated the Internet as part of their services. This telecommunication tool allows companies to develop abundant applications.

AT&T has launched its own Internet access service -AT&T WorldNet Services. Its strategy is to make the Internet as easy to use as the telephone. To help the converging Internet/Online Services industry, AT&T is focused in three areas:

- Access Services, to make the Internet easily accessible to users whether they are at home, at work or on the road.
- Hosting and Transaction Services, to provide business customers with end-to-end

Technology progress has given birth to broad applications in this area. Internet faxing, Web call center, Interactive Voice Response (IVR) etc. are potentially to get momentum from the market needs. Especially, Faxes are a natural for the Internet because the problems that affect voice conversations in Internet calls do not affect the quality of a faxed document. [21]

As to videoconferencing, according to specialist's technical review and analysis, while Internet videoconferencing does occasionally provide a semblance of motion video, it remains completely unreliable. And even as solutions to some of the most pressing bandwidth problems are on the horizon, it looks as if fundamental changes to the Internet's payment model may reduce Net videoconferencing's appeal as a money-saver. [20]

However, multiparty and multimedia Internet telecommunications are still the directions. Microsoft and Intel are working on setting and updating Internet-videophone standards.

tuning up their technology to respond to the Internet telephony. [21]

   For instance, AT&T Corp. is forming a new venture with Vocaltec Communications Ltd. to provide interexchange services to Internet telephony companies. The new venture, called ITXC, will provide routing and settlement services based on Internet protocols to ISPs that want to provide telephony services. AT&T expects 16% of its long-distance business to move to the Internet by 2000. That is why AT&T is keeping close tabs on ITXC. It will hold a seat on the young company's board and has the option of making an equity investment if the business starts to fly. Also AT&T's Japanese business is testing Internet calls from Osaka and Tokyo to 36 countries around the world, as well as developing technology at its AT&T Labs division. MCI, is testing Internet phone products, too. It won't start selling any services until the quality is closer to regular phone service, according to its spokeswoman Caroline Rice. WorldCom, the fourth-largest long-distance carrier, will use the Internet for fax traffic. The incumbent telephone companies are not moving very aggressively in Internet telephony yet, because they don't want to underprice themselves. But as quality improves, companies are expected to attach Internet gateways to their corporate phone systems. For the most part, the telephone industry is approaching the market cautiously, concerned in part that the new technology could eat into its revenues. [3]

It is not accidental that VocalTec became the biggest winner in Internet telephony. The company introduced probably the first commercial Internet telephone software: Internet Phone— yet it is not enough to interpret its success. An innovator might not be the winner.

So what substantially makes it succeed and seem to have brilliant prospects?

VocalTec started from selling Internet Phone through the web two years ago, worthy of $49, and thus it earned its life and grew. Nevertheless is its scope confined within providing client software to the consumers. Besides this segment, the company, seeing itself as a hardware(Internet telephony gateway servers) supplier for the Internet phone carriers and corporate customers, has targeted the other two segments: carriers/service providers, and corporate customers. Therefore, it has provided complete client/server solutions for Internet telephony service system and corporate Intranet.

Product position is sometimes so critical that it becomes much more than a tactical market effort— it represents the essence of a business. [29] VocalTec's product positioning positions itself as a comprehensive supplier and outstanding problem solver.

Global Strategies and Strategic Alliances

In its nature, Internet telephony is first an international business. No wonder, the successful companies in this industry have developed their own global strategies.

VocalTec just launched its Virtual Worldwide PC-To-Phone Calling Network in August, '97. The companies like Delta Three join this network to provide worldwide Internet telephone service. Also, nearly at the same time, Net2Phone announced its Global Partnership Network, which has received 15 countries reseller-partnership already and is negotiating with the representatives from additional 30 countries.

VocalTec's important strategic alliances include ITXC, a new company invested by AT&T and aiming at developing Internet telephony technology, Motorola, DEC, Compaq, and Dialogic. And it has a big investor, Deutsche Telecom, a Germany telecom giant.

Net2Phone's important strategic alliances include Marubeni, a Japan-based the world's 7th largest Corp, and Daewoo, the leading Korean Conglomerate, and Quicknet

services and users will benefit by receiving the services they want as well as paying the lowest possible price for services. [23]

Regulatory Issues

The opposition to Internet telephony from established telecom companies is growing as fast as the nascent industry grows. Fearing a threat to their long- distance revenues, government-run monopoly telecom operators in countries such as Portugal and the Czech Republic, have reportedly attempted to ban Internet telephony.

In the US, the country with the maximum Internet users, an association of small and medium-sized long-distance carriers recently complained to the country's telecom regulator, the Federal Communications Commission(FCC), about Net telephony services. This event is named as ACTA (America's carriers, telecommunication association) petition.

The FCC has not yet made any rulings against Internet telephony. Conversely, it has indicated it will support this new technology. Given that the FCC's goal as competition, opening up the marketplace, new service and innovation for consumers, Internet telephony drives this goal by helping to bring new kinds of competition, new kinds of innovation into the telecommunications industry, which potentially could go a long way.

A related issue is the question, which has gained attention nationally, about whether Internet service provider (ISP) should pay access charges. The FCC decided no. The commission decided to keep the existing system in place under which ISPs paid business line rates like other businesses that don't pay permanent access charges. The FCC rejected the request under a lot of pressure from the telephone industry, from members of Congress to get rid of what people argued to be a competitive imbalance.

The FCC's view on regulating Internet is that: if they (FCC) had done so 15 years ago, the Internet might not have grown to the extent that it has. And the growth of the Internet is not just a threat, but a driver that generated tremendous new sources of revenue and opportunities for the incumbent telephone industry as well as for new service providers. [24]

applications in a transaction environment that ensures safe e-commerce.

- Content Services, to offer tailored information services for specific segments of the consumer and business market through alliances with content owners and providers.

MCI is the leading U.S. carrier of commercial international Internet access service, providing 450 connections in nearly 60 countries. Concert InternetPlus, a joint effort by MCI and British Telecom, combines the existing Internet networks of the two companies into regional "superhubs" around the world. The company offers through MCI Internet: [32]

- Local dial-up Internet access
- Dedicated Internet access via Direct Connect Access
- Intranets

Sprint is one of the world's true Internet pioneers. More Internet traffic flows over its all-fiber network than over any other global telecommunications network in the world. Sprint Internet products include: [33]

- Sprint Internet Passport provides the home user with simple, direct access to the Internet and the World Wide Web.
- Sprint Internet Dedicated delivers the power and versatility of IP networking solutions to businesses.
- Sprint Intranet Dedicated provide the businesses intranet solutions.

Summarily, each of the incumbent telephone companies has integrated "Internet Strategy" as apart of their whole business strategies. Therefore it is not hard to understand why they treat Internet telephony seriously even though it is still a new-borne.

While the market for Internet telephony is minuscule today, amounting to only about $10 million in revenues last year, spending on Internet telephony is expected to reach $2 billion by 2004, according to Forrester Research as mentioned before. Forrester Research estimates that in that year, consumers will save about $1 billion by not having used the traditional phone network; with the $2 billion in Internet revenues, that translate to a loss of roughly $3 billion to the conventional telephone companies, or 4 percent of their projected annual revenues. But telephone companies are also forming alliances and

of enormous savings in sending international faxes, which this year will cost them
upward of $7 billion. [21]

Figure 6. Revenue Loss for AT&T in Business Customers Market (International)
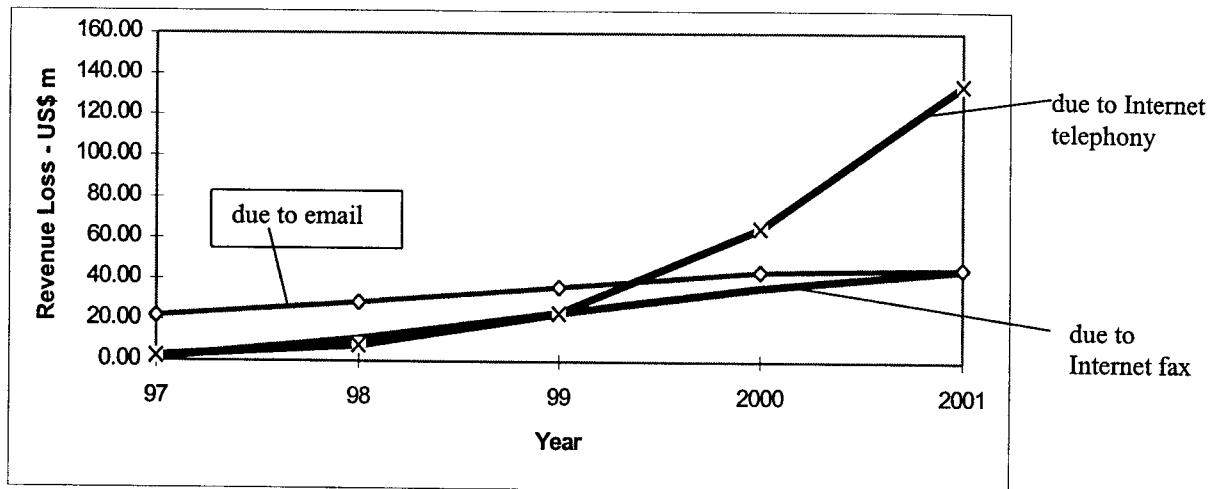
However, AT&T is not a loser alone by Internet telephony. Figure 7 gives the
revenue loss in international long-distance market for the world telecommunications
giants. Figure 8 gives the percentage loss.

Figure 7. Comparative Analysis of Forecasts
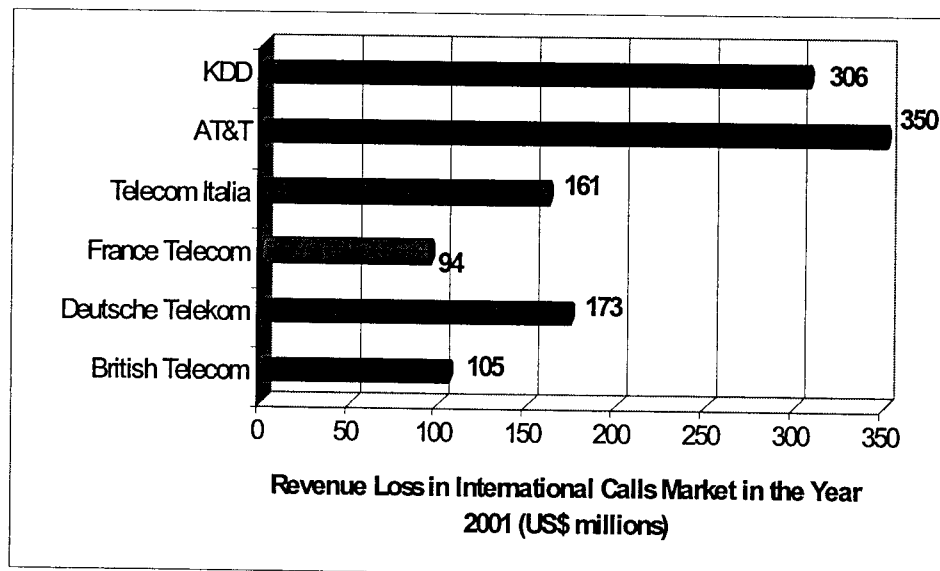
(source: Phillips Tarifica Ltd)

Technology Implications

To date, the technology achievements which is gained in Internet telephony represent a significant step in the way leading to tomorrow's telecommunication: real time, multimedia interactive, multiparty, account-portable, and—low cost! What it will bring to us is seldom only talking through the Web. Let's take a look at what today's Internet telephony promises to us: [22]

> "While voice is the first and best-known example, VocalTec Communications products and technologies turn the desktop PC into a full-featured communications and collaboration device for business and personal applications. From their personal computers, users can call other Internet Phone users at random or in private company or in personal chat rooms, share and edit a document while discussing the revisions, conduct a private text chat, exchange files, or send a voice mail to colleagues away from their desks."

In the future, two-way videoconferences, sending and receiving faxes from a fax machine, exchanging messages with two-way wireless pagers, and placing calls to or receiving calls from standard cellular telephone sets anywhere in the world — all will be possible through Internet telephony technology with reliable quality and more affordable price.

It can be predicted that the telecommunications industry is experiencing a new evolution. The outcome of this evolution is a new global telecommunication infrastructure—building a new Internet-based telephone network onto today's PSTN (Public switched telephone network). Both of the two network structures will survive, and converges with each other.

The future of "voice over Internet" is not in cheaper voice, but a new way to communicate, a way to communicate as different from telephone as telephone from telegraph. The nature of Internet communication is packet switching while that of traditional PSTN is circuit switching. Both of them will be used to deliver integrated

The telcos will benefit by the proposed two-tier pricing system in the following aspects:

- Maintain price-sensitive customers
- Lower network cost
- Bypass accounting rate system

And the customers will benefit in the following aspects:

- Choice
- Services from the same provider
- Further strengthening competition

The most important reason that Internet telephony companies are succeeding is because they're able to get around regulation primarily in the international context. The existing international accounting rate system is increasingly seen as flawed. The FCC values Internet telephony as that it is able to undermine the flawed accounting rate system around the world.

Reed hunt, the FCC's chairman, has said: "What we should do in looking at the future is, study very carefully all of the existing rules in the telecommunications industry, all of the existing rules we've built up and other countries have built up and do exactly the opposite." [24]

However, the FCC need to deal with existing regulatory structure and make, maybe, imperfect but not-wrong decisions.

Now in lot of countries in Europe before they liberalize on January 1 '98, voice service by a other than the incumbent carrier in many cases is illegal.

Economic Analysis

What is the Internet impact on traditional telephony industry? Reasonably, the traditional telephony carriers will achieve revenue gain in the local calls market while suffer revenue loss in the international long-distance market. Then what is the overall effect? The following factors determine the overall impact of the Internet on telephony market:

- Proportion of serious Internet phone users (non-hobbyist)
- Number of calls substituted
- Call duration
- Pricing structure of the telco
- Regulation and competition
- Internet penetration
- Proportion of dial-up users

Figure 6 estimates the revenue loss due to Internet telephony in business customers market for AT&T. [25] Initially, corporations are intrigued with the possibility

- The size of the circuit-switched network is shrinking
- Almost one quarter of the residences in the US have a packet last mile(representing 50% of the traffic)
- International settlement is cost based and applies to all traffic
- Ditto for access charges and funding for universal service

Then looking forward to ten years out, the industry has such view: [27]

- There is a single, converged communication industry
- Circuit switching has gone the way of vinyl records
- IP-V19 is the level of the protocol stack right above the wire
- ...But there isn't much wire anymore either

Even though the progress in regulation aspect is not as certain as technology, one thing is certain: we will have tomorrow's telecommunications— a new way to communicate as different from telephone as telephone from telegraph!

To AT&T, there is a big reason for its presence in local calls market. Otherwise the overall Internet effect for it will be considerably negative. In other words, if the

Figure 8. Comparative Analysis of Forecasts

Japan:
a highly regulated market

USA:
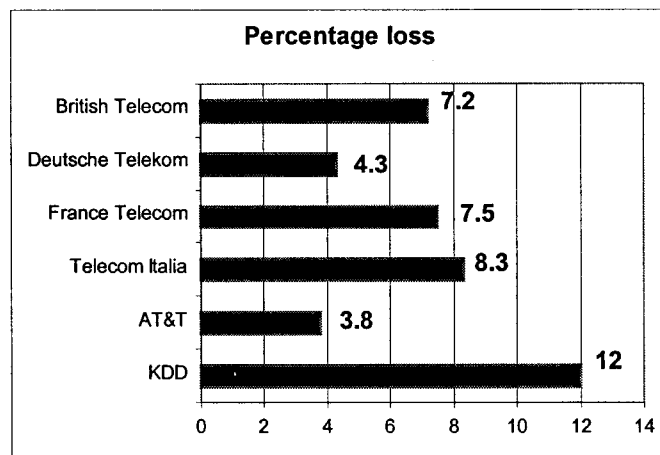competition / choice for customers

Italy:
higher international tariffs

France:
Lower Internet penetration

Germany:
less substitution,
shorter call durations,
bigger market

UK:
competition, so others
face the loss as well

~ 7% - 8% international voice traffic
routed over the Internet in 2001

Percentage loss

Carrier	Value
British Telecom	7.2
Deutsche Telekom	4.3
France Telecom	7.5
Telecom Italia	8.3
AT&T	3.8
KDD	12

(source: Phillips Tarifica Ltd)

Internet opportunities are not explored, the overall Internet effect will be negative. Internally, AT&T management does consider its presence in local calls market as of strategic importance. [26]

Now the question is: in the immediate future, where are the opportunities for traditional telephony carriers with respect to Internet telephony? The answers lie in four:

- Backbone provider
- Revenue from leased lines
- Revenue from local calls
- Other value added services

There are so-called two tier services integrated with tier pricing system to be proposed: one tier is for traditional, circuit switched service while another is for packet switched service, namely Internet telephony service.

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Where is Internet Telephony Headed?

What's about today's Internet telephony?

- Computer-to-computer only significant volume of IP telephony
  - New form of communication
  - Limited market
  - Doesn't directly challenge PSTN
- Computer-to-phone becoming available
- Phone-to-phone on the near horizon

And what can a user expect in five years or out?

- TVs and computers and other devices are persistently connected to the Net
- It's hard to decide whether to get packet phones or a home gateway
- Calls are made to people, not devices
- Multimedia, multiparty calls are common
- Some new application uniting cheap voice and data has surpassed the growth rate of the Web

To get from today to tomorrow, Internet telephony industry need to solve the following problems:

- Interoperability

  Clients and gateways from different vendors don't communicate
- Quality of service

  There is no option of high quality
- Persistent connections

  Computers don't "ring"
- Universal connectivity

  Users need different accounts where ever they may call

Looking forward to five years out, the industry has such view: