

**When Innovators and Not Implementers:
The Political Economies of VoIP in Japan and the United States**

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Introduction:

The spread of Two puzzles immediately present themselves when one examines the spread of “Voice over IP” (VoIP, or IP telephony), a technology that sends voice signals as data, which can travel across the Internet.

The first is that, despite the technology’s widely hailed potential to undermine the core businesses of incumbent telephone operators by circumventing their traditional telephone networks, incumbent operators do not seem to be in imminent danger. When VoIP made headlines in the late 1990s and early 2000s as a dramatically cheaper alternative to conventional telephones, many predicted that new VoIP service providers would seriously threaten, if not cause the sudden demise of, incumbents. Yet, instead of telephone-replacement VoIP services, it was Skype, the online-based service more reliant on one party calling from a computer, which grew rapidly to take center stage. Why did VoIP as a substitute for conventional telephony, despite being hailed as a potentially “disruptive” technology, not have a catastrophic and relatively immediate disruptive effect on incumbent carriers’ business models?

The second puzzle is that the US, where the technology was innovated, was not the country in which telephone replacement VoIP services spread most rapidly. Instead, the technology spread much more rapidly in Japan. In March 2004, North America had roughly 330 thousand subscribers to VoIP services as replacements to conventional telephones. Rapid growth in the subsequent two years led to the US having 6.8 million subscribers by the end of 2006, but this is still a small number given the population of approximately 300 million, with approximately 50% of households connected to the Internet.¹ In March 2004, Japan had approximately 5.2 million VoIP subscribers to services that replaced telephones, which grew

¹ Half of Households in the United States Now with Broadband Internet. *Internet World Stats*. <http://www.internetworldstats.com/usage/use011.htm> [Last accessed Sept 14, 2007.]

to 11.5 million by 2006 – almost double the number in the US, despite having less than half the population and half the number of broadband subscribers.²

To understand why the fast spread of VoIP in Japan rather than in the US is a puzzle, we must first recognize that the world's two largest economies are remarkably different in their relative technological strengths and weaknesses.³ The US dominates in basic science, software design, IT applications, biotech, financial services and the like, while Japan excels in manufacturing processes, mechanical design-heavy areas such as robotics, and its domestic wireless services. The underlying reasons for these differences in technological strengths is essentially a political economy issue, stemming from differences in national institutions and markets, which allow each country to excel in a particular pattern of economic activity.⁴ Thus, while the US is better at fostering start-up firms, labor mobility, competition, and breakthrough technology, Japan excels at providing stable capital, labor-management cooperation, managing competition, and incremental production improvements.⁵

At first glance, VoIP seems to be a perfect match for activities in which the US excels: the first innovations were from start-up firms; it is based on software and is not capital intensive; it offers strong competition against local telephony carriers who faced relatively

² Japan had 16.5 million broadband subscribers in June 2004, and 24.2 million in June 2006, while the US had 30 million in June 2004 and 50 million in June 2006. Ministry of Internal Affairs and Communications data http://www.soumu.go.jp/s-news/2006/060412_1.html#bs; <http://www.johotsusintokei.soumu.go.jp/field/data/gt010103.xls>, [last accessed June 1, 2007.]; Federal Communications Commission data http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.pdf [last accessed June 1, 2007.]

³ As measured by GDP according to official exchange rates (not purchasing power parity), as of 2006 Japan's was approximately double that of the third largest, Germany. CIA World Factbook <https://www.cia.gov/library/publications/the-world-factbook/> [last accessed Sept 14, 2007.]

⁴ Herbert Kitschelt argues that Japan excels at incremental production improvements with medium to long term production runs. Kozo Yamamura argues that market-based capitalist countries such as the US excel when "technology is changing fundamentally and rapidly," while the advantages of Japan and Germany lie in implementing those innovations, when "technological change is adaptive and gradual." Kitschelt, Herbert. 1991. Industrial Governance Structures, Innovation Strategies, and the Case of Japan: Sectoral or Cross-National Comparative Analysis? *International Organization* Vol 45 (4):453-493. Yamamura, Kozo. 2003. Germany and Japan in a New Phase of Capitalism: Confronting the Past and the Future. In *The End of Diversity? Prospects for German and Japanese Capitalism*, edited by K. Yamamura, and Wolfgang Streeck. Ithaca, NY: Cornell University Press. p. 115

⁵ Vogel, Steven, and John Zysman. 2002. Technology. In *U.S.-Japan Relations in a Changing World*, edited by S. K. Vogel. Washington DC: Brookings Institution Press. p. 242.

little competition, while enjoying the “network effects” of conventional telephony if VoIP subscribers are assigned conventional telephone numbers.

However, it was in Japan where a startup firm offered VoIP services that became extremely popular, challenging incumbent carriers to the point of forcing them to offer their own VoIP services. In the US, startup firms offering VoIP did not enjoy the same type of success, and incumbent telecom firms were slow to adopt the technology. Instead, US incumbents waged numerous, but ultimately unsuccessful regulatory battles to hinder the growth of VoIP service providers. How do we explain this seemingly reversed pattern of technology diffusion?

As a research design, taking this common technology, VoIP, and examining how it interacted with national institutions and existing market structures of each country, provides us with something akin to a natural experiment. In both countries, the core technologies and business models of incumbent telecommunications carriers were similar, and VoIP, widely regarded as a “disruptive” technology, was an exogenous shock.⁶ Tracing how the new technology “hit” the two countries reveals the exact mechanisms by which differences in regulatory and institutional contexts and market structures affected how market players interacted with policy processes.

Our findings are as follows. In the US, incumbent telecom carriers had relatively more power to alter their policy environment, blocking the potentially disruptive VoIP service providers. US VoIP service providers did not offer their own broadband services, having to rely on leasing incumbents’ networks. This placed them at the mercy of regulations governing incumbent network access. When VoIP service providers began offering services

⁶ There have been many conceptions of discontinuous, or disruptive technology, but let it suffice here to refer to Clayton Christensen’s conception, in which technology can be sustaining or disruptive. If it is disruptive, the “value propositions,” essential the mix of suppliers, consumers, and the company’s business model, do not conform to previous generations of technology. Firms with disruptive technology take advantage of new “value propositions” to benefit from new market segments, while incumbent firms that cannot adjust find themselves rendered obsolete. Christensen, Clayton. 2000. *The Innovator's Dilemma*: Harper Business.

that bypassed incumbent carriers' telephone networks entirely, incumbents used the multiple regulatory arenas available to them to influence the terms of competition. Their efforts were aided by the lack of decisive federal government policy regulating VoIP. Only when faced with increased competitive pressures from cable companies, possessing their own infrastructure and therefore immune to the same regulatory challenges, did the incumbents shift towards more market-based competition by offering their own VoIP services.

In Japan, the incumbent's strategy was limited to market responses because the Japanese regulator, relatively more autonomous and strategic (in the sense of being willing to promote particular technologies) than the US regulators, quickly established a regulatory framework governing VoIP. Major Japanese VoIP providers also offered broadband services, often possessing their own network infrastructure, and the Japanese regulator was active in expanding regulatory advantages enjoyed by broadband challengers to the incumbent. Japan's incumbents were therefore deprived of the type of policy levers available to US incumbents. As a result, Japan's incumbents had little choice but to engage in market-based competition by offering their own VoIP services to maximize market share.

As an implication of this study, we contend that notion of "disruptive technology" depends not only on the nature of the technology, but largely on whether the *business models* based on the new technology undermines prevailing business models – whether the *potentially disruptive technology* is embedded in a *disruptive business model*. Furthermore, we propose that in telecommunications, the relative dependence of a new, promising technology on particular infrastructure – infrastructure being usually heavily regulated – can affect the range service business model options. Thus, countries with different regulatory regimes offer a different range possible business models, and the less the technology is dependent on particular infrastructure, the more easily a potentially disruptive technology can be incorporated into a disruptive business model.

This paper first differentiates between several types of VoIP. It then traces the development of VoIP markets in each country. For each country, we first survey the market developments, dividing them into distinct phases. Then we trace regulatory developments, followed by a close examination of how VoIP challenged incumbent business models.

What is VoIP, and why is it potentially “disruptive”?

Voice over IP, in its simplest form, refers to voice signals sent as data, on top of Internet protocols. This data usually travels through the public Internet or dedicated IP networks rather than conventional circuit-switched telephony lines.

It is generally cheaper for all parties involved to send voice signals over data networks than over conventional telephone lines. This is partly because conventional “circuit switched” telephony equipment requires much more “intelligence,” in the network, since switches must directly connect two telephones or devices from any origin to any destination in an instant. Circuit-switched network equipment is therefore quite costly. In contrast, Internet data traffic does not require as much “intelligence” in the networks, since data is broken up at the sending end and reassembled at the receiving end. Rather than “direct” connections, different packets of data can take different routes to arrive at their destinations. Equipment handling data using Internet Protocols, such as routers, is therefore much cheaper.

Packet-switched data networks also require less overall capacity. Circuit-switched conventional networks, by creating dedicated connections for the duration of each connection, tie up the line even if no voice or data is being sent. By contrast, packet-switched networks send data packets through the most efficient route as soon as they are generated and do not tie up lines when data is not being sent; they therefore utilize capacity much more efficiently.

VoIP of an acceptable quality to most household users requires data transmission speeds provided by broadband.⁷ There are many physical infrastructures capable of carrying data at broadband speeds, including DSL (which uses existing copper wires), cable, 3rd generation wireless, satellite, FTTH (Fiber-to-the-Home) and next generations of WiFi (The wireless internet technology currently used by most laptops). In other words, VoIP *decouples* voice-based communications from conventional telephony (and cellular) networks. This is the main reason that VoIP is usually considered a disruptive technology – it is disruptive to incumbent telephone carriers relying on circuit-switch telephone networks because it does not rely on them.

There are several types of VoIP that require an analytical separation, since different types are incorporated into different business models, posing different types of challenges for incumbents.

IP-to-IP

In the first form of VoIP, which we label IP-to-IP, both ends of the transmission are connected via the Internet, and at no point does the transmission enter conventional circuit-switched telephony networks. Consumers experience two main forms of IP-to-IP telephony.

The most popular is when both ends of the transmission are PC-based, with software such as Skype, Microsoft's MSN (now Windows Live) enabling voice/video chats.⁸ In the second form, users on both ends use conventional telephones, which connect to broadband modem adapters, calling each other via the Internet rather than conventional telephony lines. These are mostly subscription-based services, such as Vonage (US) and Softbank (Japan), offering callers functional substitutes to their existing telephones.

⁷ Following the OECD, we refer to "broadband" as services offering more than 256Kbps downstream. OECD, *The Development of Broadband Access in OECD Countries* (Organization for Economic Co-operation and Development, 2002), p.6.

⁸ In strictly technical terms, there are several variations within this type of VoIP. For example, Skype uses a "peer-to-peer" architecture, in which computers connect to each other to alert each other when "contacts" are online, while MSN used its own servers to send and receive this data, thereby limiting the number of contacts a user can store.

IP-to-IP services threaten conventional telephone carriers by bypassing their conventional telephony network, completely cutting them out of carrying voice traffic over their telephone networks.

IP-to-PSTN

In the second form of VoIP, IP-to-PSTN, one end originates or terminates with an IP connection, and the other end connects to a circuit switched conventional telephone (Public Switched Telephone Network – PSTN). The Skype’s Skype-Out service, allowing people using a computer call an ordinary telephone, is an example. Another example is a Vonage (US) or YahooBB! (Japan) subscriber with a conventional telephone plugged into a broadband modem dialing a conventional telephone number to reach a regular telephone.

The other direction, PSTN-to-IP, involves a call from ordinary telephone connecting to an IP telephone. A example is when somebody dials a phone number for a subscriber of Skype’s Skype-In service, or of Vonage (US) or YahooBB! Phone (Japan).

IP-to-PSTN services do threaten incumbent carriers, but do not cut them out entirely. Since the call is handed off to PSTN circuits at some point, local carriers can charge access to VoIP providers. This is why most VoIP services require subscribers to pay for calls to PSTN numbers – they must offset the costs incurred by connecting to local carriers’ networks. However, by connecting to PSTN networks at hand-off points as close as possible to the destination, VoIP services can cut out long distance carriers.

On the other hand, although IP-to-PSTN services do not cut out local carriers entirely, they have a potentially much broader consumer appeal than IP-to-IP if they offer significantly cheaper prices. Since they can tap into the installed base of telephone users by being capable of calling and receiving calls from anybody, they are functional substitutes to conventional phones.

PSTN-IP-PSTN

The third form of IP telephony, which this paper does not examine in depth, involves both ends being PSTN, with only the intermediate section traveling over IP networks. With this arrangement, the end user can be unaware that their phone call is converted into data, then back to conventional telephony again. People who are knowledgeable about VoIP often do not consider this form of VoIP to be VoIP per se. Confusion over these various types of VoIP is prevalent, and sometimes even encouraged by companies. When AT&T offered such a service around 2000, labeling it VoIP and asking for regulatory relief, it was playing on this confusion – it simply reduced costs in long distance transmission by adopting VoIP in only a portion of its networks, but still attempted to win favorable regulatory treatment.⁹

Table 1: Varieties of VoIP

Type of VoIP	Origin	Transit	Destination	Example
IP-to-IP	IP	Internet*	IP	Skype
IP-PSTN	IP	Internet → PSTN	PSTN	Skype-Out, Vonage to regular phone
PSTN-IP	PSTN	PSTN → Internet	IP	Skype-In, regular phone to Vonage
PSTN-IP-PSTN	PSTN	PSTN + Internet	PSTN	AT&T's VoIP service around 2000

* depending on the service, "Internet" can also be a carrier's private IP network

VoIP in Corporate Networks

VoIP adoption has been much more extensive in corporate networks than residential units.¹⁰ However, since the effects of government policies are much weaker in shaping the markets for corporate communications, and since it is the collapse of incumbents' business

⁹ Nuechterlein, Jonathan, and Philip Weiser. 2005. *Digital Crossroads: American Telecommunications Policy in the Internet Age*. Cambridge, MA: MIT Press.

¹⁰ Services allowing greater flexibility, such as consolidated voicemail boxes, location-free numbers, the ability for one person to leave the same voicemail to multiple people, and reducing overall telecommunications costs by consolidating telephone and data networks, are among the merits of VoIP to corporations. In one estimate cited by *The Economist*, 63% of North American companies had adopted VoIP to some degree by late 2004. (See Survey: Hearing voices. 2004. *The Economist*, Oct 30, 23.) In a poll of over 1000 large Japanese firms, Japan's Ministry of Internal Affairs and Communications (MIC) reports that in 2005, 33% of firms had already implemented VoIP services, with an additional 28% planning to or considering. Two years earlier, a survey of approximately 800 firms revealed that only 17% had adopted VoIP.

models for residential telephony that has been predicted for over a decade, this paper focuses on residential, telephone-replacement VoIP.

The Development of VoIP Market in the US: Challenging Incumbents

First, we provide a historical overview of VoIP market in the US, beginning with an overview of incumbents' traditional business models, and tracing four phases of VoIP development. In each phase, VoIP provides a new challenge to incumbents, which, as we will see in the subsequent section, elicited a different response.

The Original Incumbent Carrier Business Models

The business model of AT&T, which owned approximately 75 percent of all local lines and dominated long distance services until its breakup in 1984, was fairly simple. It charged relatively high prices for long distance services, which were relatively inexpensive to operate, using the proceedings to subsidize local services, which were much more costly to build and operate. Large corporations that relied heavily on long distance communications therefore often leased private lines to minimize their use of AT&T's long distance network.

After the breakup of AT&T into one long distance and several local carriers, their business models were strongly shaped by the FCC, which coordinated with federal and state regulators to implement pricing policies to restrict subsidization between long distance and local services.¹¹

The resultant typical business models until the early 2000s were as follows. Local carriers, who owned the physical infrastructure to households, charged monthly subscription fees for unlimited local calls. Long distance and international carriers charged consumers by the minute, paying local carriers at both the origin and destination locations to connect to

¹¹ These pricing policies revolved around access charges that each "Baby Bell" charged to one another. The FCC continued to reform access charges in the 1996 Telecommunications Act, and again in 2000.

their local networks. Local carriers incurred “universal service” obligations, mandating that they charge similar prices to all customers in their geographic region regardless of the actual cost incurred by carrier to provide that service.¹²

Let us now examine the development of VoIP services, most clearly understood if divided into four phases according to their business models.

Phase 1 (mid-1990s): Early VoIP Services a Threat to Nobody

Early VoIP services developed in the US in the mid-1990s. They were designed as PC-to-PC and PC-to-PSTN applications, running on slow, dial-up Internet connections (around 28.8kbp/s, versus at least 1 to 3 mbp/s with the advent of broadband and higher speed corporate private lines).

The early business models, typified by Net2Phone, which commenced services in 1996, consisted of offering PC-to-PC communications for free and charging low per-minute fees for PC-to-PSTN calls. These early VoIP services did not threaten local or long distance/international carriers, since they could not receive calls, preventing them from tapping into the network effects of connecting to the conventional telephone network,¹³ and because the sound quality was poor, with long lag times, making them far from functional substitutes to conventional telephones.¹⁴

Phase 2 (late 1990s): Competitors in Long Distance/International

In the second phase of development, VoIP services joined the rapidly increasing ranks of low cost competitors in the long distance and international calling card markets, as VoIP

¹² The precise language in the statute reads: “quality service should be available at just, reasonable, and affordable rates” not necessarily the “same price”. Communications Act Section 254 (b) (1)

¹³ By network effects, we refer to the phenomenon whereby the value of a particular network for an individual increases when more people join the network, which in turn increases the value of the entire network for everybody.

¹⁴ Briere, Daniel, Christine Heckart. 1996. Internet/PSTN: The shape of things to come. Network World, August 12, 22.

offerings independent of PCs appeared. At the height of the late 1990s tech bubble, large technology firms also became interested in VoIP service providers.

In the late 1990s, companies such as IDT (Net2Phone) began offering VoIP calling card services, using VoIP as the long distance and international link. Consumers dialed a toll free number, which connected to a VoIP server, which then called the number entered by the user.¹⁵ Since VoIP providers did not have to build their own networks, they could offer lower prices than most existing long distance and international calling card providers, whose business models entailed reselling wholesale capacity. For example, upon its introduction in 1997, Net2Phone offered long distance domestic rates of 8 cents per minute and 18 cents per minute to London and 29 to Japan.¹⁶

Unlike their predecessor PC-PSTN services, VoIP calling card services could tap into the network effects of PSTN telephony, since they could be used from any telephone to call any telephone. Although the quality of calls was usually lower than those of traditional long distance carriers, VoIP calling cards were close substitutes of other calling cards, adding to the competitive pressures in that market segment (later further intensified by the entry of cellular services offering flat-rate long distance). Existing long distance carriers were already finding their business models unsustainable in the face of downward pressure on prices. (See table 3).

Table 3: Average Revenue per Minute for Interstate Toll (Long Distance) Service Calls

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
Revenue per Minute (USD)	0.12	0.11	0.11	0.11	0.09	0.08	0.07	0.07	0.06

Source: FCC Telecommunications Industry Revenues (March 31, 2006)

At this stage, local carriers were only partly bypassed, since the VoIP services needed to connect to local telephone networks at the destination, paying interconnection fees.

¹⁵ Niccolai, James. 1996. IDT to offer phone-to-phone service via the Internet. *Computerworld*, Oct 21, 82.

¹⁶ For example, upon its introduction in 1997, Net2Phone offered long distance domestic rates of 8 cents per minute and 18 cents per minute to London and 29 to Japan. Maney, Kevin. 1997. Internet Long-distance no longer needs a PC. *USA Today*, September 8, 1.B.

At the height of the tech boom in the late 1990s and very early 2000s, major technology companies became interested in VoIP service providers such as Dialpad, iccoecthere, PhoneFree.com, and Net2Phone. In 1999, in the midst of the browser wars between Netscape and Microsoft, Netscape picked Net2Phone, with a reported 250,000 regular users at the time, to include in its Communicator browser.¹⁷ Microsoft followed in mid-2000 by incorporating Net2Phone in its MSN Instant Messenger services, allowing members to call each other, and to place domestic IP-to-PSTN calls for approximately 1 cent per minute.¹⁸

A battle over control and ownership of Net2Phone broke out in mid-2000, with America Online and Yahoo! announcing \$150 million investments in the company. AT&T, which had also been courting Net2Phone, then estimated to carry approximately 40% of calls routed over the Internet (according to the New York Times) stepped in with a \$1.4 billion cash offer, leading a consortium of investors including Liberty Media Group to hold approximately 40 percent of its voting stock.¹⁹ While AT&T contended that it would use Net2Phone's technology for its own services, many analysts understood AT&T's actions as a move to prevent AOL, one of its biggest perceived threats at the time, from obtaining the company and its technology.²⁰ In sum, VoIP entered existing telephony markets as a viable substitute, and its perceived potential attracted the interest of existing technology companies.

Phase 3 (early 2000s): Rise in Popularity, Emergence of Vonage and Assigned Numbers

In the third phase of VoIP development, new VoIP services shifted from becoming long distance/international competitors in already competitive markets, to posing a threat to

¹⁷ Mehta, Stephanie N. 1999. Netscape to Include IDT Phone Icon on Web Browser. *The Wall Street Journal*, March 10, 1.

¹⁸ Buckman, Rebecca. 2000. Microsoft to Offer Free Calls Through Net2Phone. *The Wall Street Journal*, July 20, B.14.

¹⁹ AT&T and Allies Invest in Net Concern. 2000. *The New York Times*, April 1, C.2.

²⁰ Quinton, Brian. 2000. AT&T finds its IP voice. *Telephony*, April 10, 12.

local incumbents who had enjoyed near monopolies in regional markets. The new VoIP services undermined the business models of incumbent local carriers by essentially offering full telephony services, including a unique telephone number, while entirely bypassing incumbents' PSTN infrastructure.

Vonage, incorporated in 2001 and commencing service around late 2002, was the most notable telephone-replacement VoIP service provider. It was able to take advantage of the rapidly growing US broadband subscriber base (faster Internet connections led to higher voice quality), as well as new technologies (the nascent Session Initiation Protocol (SIP)) which enabled VoIP to closely mimic traits of conventional telephony, such as dial tones and ringing, to offer VoIP performance quality almost on par with conventional PSTN services.²¹ Vonage subscribers could also use their existing telephones, bypassing the use of PCs, by attaching a Vonage-provided box to their broadband modem, into which the telephone was plugged.

Subscribers paid a flat monthly subscription fee to Vonage which allowed them a certain number of domestic call minutes regardless of distance, or for a slightly higher price, unlimited domestic calls. Significantly, Vonage succeeded in getting conventional telephone numbers allocated to its subscribers. This allowed Vonage to take advantage of the full network effects of conventional telephony, enabling any telephone user to dial Vonage VoIP subscribers as if they were dialing other telephone users.

Arguably the most significant business model innovation was that Vonage could allocate not only one, but multiple telephone numbers, and from different area codes, to one VoIP account.²² Therefore, if a subscriber expected frequent calls from Maine and Hawaii,

²¹ Functions simulated included dial tones, ring tones, etc, and it also went beyond simulating PSTN, enabling many of the additional features as well.

²² This was possible in the US because of the technical setup of the network equipment. US local carriers charged interconnection fees on the basis of the number from which the call originated. Therefore, no matter where the call came from on the network, if the number of original was local, it was recognized and charged as a local call.

they obtain one number of each locality, allowing each of the callers to be charged only for a local call. If the Vonage user decided to use a PC on her end, she could be anywhere in the world with an Internet connection – Abu Dhabi, Amsterdam, or Annapolis – and receive “local” calls to the Hawaii or Maine numbers. Conversely, the Vonage subscriber’s calls from anywhere in the world to Hawaii or Maine would be considered “local calls.” As an example of how this was used, the *Economist* noted that many Indian mothers in India whose children worked in Silicon Valley had Vonage accounts with a 650 area code, enabling them to make “local” calls to the Bay Area.²³ This ultimately lowered the interconnection costs of Vonage, who only needed to pay local rather than international rates to the incumbent carriers for connecting to their local networks.

With this type of VoIP service, which bypassed local telephone carriers’ PSTN networks entirely, and even arguably unfairly stripped them of long distance and international interconnection revenues, local carriers’ only potential revenue source was from providing the broadband which carried the VoIP service. Thus, they had every incentive to “bundle” their broadband with conventional telephony service, offering standalone DSL at almost the same price as the bundle of DSL combined with telephony. For example, only in 2006 did AT&T (formerly SBC) quietly allow subscribers to enroll in standalone DSL, but it set the price at \$44.99 per month, compared to a bundle of local telephone and DSL at around \$46, but with the breakdown of that bundle amounting to \$16 for local telephony and \$29.99 for DSL. Thus, it was in this third phase that VoIP services posed a serious threat to the core revenue sources of local carriers, which, unlike long distance and international carriers, had avoided price wars due to their local monopoly status (see Table 4).

²³ Business: The phone call is dead; long live the phone call: telephony. 2004. *The Economist*, December 4, 69.

Table 4: Average Residential Rates for Local Service in Urban Areas (1996-2005)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Representative Monthly Charge	13.71	13.67	13.75	13.77	13.64	14.49	14.38	14.54	14.57	14.75
Subscriber Line Charge	3.54	3.53	3.52	3.58	4.5	5.05	5.74	5.86	5.81	5.81
Additional Monthly Charge (touch tone)	0.3	0.25	0.1	0.09	0.06	0.04	*	*	*	*
Taxes, 911, and other Charges	2.4	2.42	2.39	2.48	2.57	3.03	3.94	4.12	4.14	4.19
Total Monthly Charge	19.95	19.88	19.76	19.93	20.78	22.62	24.07	24.52	24.52	24.74

Note: Rates are based on flat rate service where available and measured/message service with 100 five-minute, same-zone, business-day calls elsewhere. Beginning in 2001, all rates reflect flat-rate service.

Source: FCC Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service

Phase 4 (2004 -): VoIP in the Cable vs Telecos Battle

In the latest phase of VoIP market development, major cable companies began offering VoIP over their cable infrastructure as they strategized to replace incumbent local companies altogether by offering cable television, broadband, and telephone service.²⁴

Vonage had been offering VoIP services to second-tier cable companies since early in its inception, but from around 2004, the major cable companies began their own services.²⁵ In 2004, Comcast, the largest cable operator, began testing VoIP in limited markets, beginning to expand nationwide in early 2005.²⁶ Cablevision, a smaller company, was one of the first to offer IP telephony. Time Warner also began offering VoIP in all its markets by the end of 2004.²⁷ These cable VoIP services did not aggressively market themselves to be as flexible as Vonage, instead aiming squarely to replace existing local carriers' telephone subscriptions.

Decisive figures for VoIP subscribers in the US are difficult to find. We provide a composite picture by including two sets of data: the market shares of the top ten VoIP service

²⁴ They aimed for a "triple play" in which they could provide cable TV, broadband, and telephony over the same cable.

²⁵ Charney, 2007.

²⁶ Grant, Peter. 2004. Comcast Pushes into Phone Service; Rollout of a VOIP Product Heats Up Cable's Turf War with Telephone Companies. *The Wall Street Journal*, May 26, A.3.; Wilson, Carol, and Vince Vittore. 2005. SBC, Comcase Enliven Convergence. *Telephony*, Jan 17, 8-10.

²⁷ Cablevision press release http://www.cablevision.com/index.jhtml?id=2003_11_11a [last accessed May 20, 2007], Times Warner press release

<http://www.timewarnercable.com/Investorrelations/pressreleases/TWCPressReleaseDivDetail.ashx?PRID=881&MarketID=52> [last accessed May 20, 2007]

Grant, Peter. 2004. Comcast Pushes into Phone Service; Rollout of a VOIP Product Heats Up Cable's Turf War with Telephone Companies. *The Wall Street Journal*, May 26, A.3.

providers in the US, excluding cable companies, and the number of subscribers for major North American companies.

Table 1: Market Shares of Top 10 US VoIP Service Providers (excluding cable)

Name	market share (%)
1. Vonage	53.9
2. Verizon Voice Wing	5.5
2. AT&T CallVantage(SBC)	5.5
3. SunRocket	4.0
4. Lingo	2.6
5. NetZero Voice	2.5
6. Broadvoice	2.2
7. America Online (AOL)	1.6
8. 8x8 (Packet8)	1.1
9. Earthlink	0.9
Other	20.5

Source: Telephia Total Communications Survey, Q2 06

*Note: Data in table includes subscription VoIP providers who actively promote their service as Internet Telephony. It excludes cable companies

**Note: Data in the table measures pure-play subscription VoIP services and excludes providers offering free or pay-per-call VoIP services (e.g. Skype)

Table 2: VoIP Subscribers in North America (thousands)

	Q1 04	Q2 04	Q3 04	Q4 04	Q1 05	Q2 05	Q3 05	Q4 05	Q1 06	Q2 06	Q3 06
Vonage	131	194	276	391	640	848	1,062	1,269	1,597	1,853	2,058
Time Warner	-	-	104	220	372	614	854	1,079	1,370	1,604	1,649
Comcast	-	-	-	-	72	87	159	328	539	865	1,384
Cablevision	60	125	189	273	364	478	601	731	865	988	1,101
Videotron	-	-	6	10	15	42	75	163	227	283	344
Charter	-	-	6	45	55	68	90	122	191	258	340
Cox	-	-	-	-	60	90	140	170	200	220	245
Rogers	-	-	-	-	-	-	18	48	97	165	271
Shaw	-	-	-	-	-	22	57	91	119	169	210
SunRocket	-	-	-	-	4	-	-	-	-	130	170
8x8	11	17	26	40	57	73	93	113	133	151	165
Mediacom	-	-	-	-	-	-	2	22	46	66	83
Total Subs	202	336	601	978	1,639	2,322	3,151	4,135	5,384	6,751	7,983

Source: PiperJaffray

US Debates over Regulatory Framework for IP Telephony

Two main drivers shaped the trajectory of the US regulatory framework over VoIP.

First, VoIP as a technology, and the evolving business models espoused by VoIP service providers, did not conform cleanly to the existing regulatory framework for telephony. Rather than quickly defining the parameters of VoIP services to place it within existing regulations,

the government opted for flexibility and potential innovation, consciously delaying key decisions. Second, incumbent telephony carriers drove the evolution of VoIP regulation by trying to use VoIP technology to get easier regulatory treatment, and challenging VoIP service providers. The barrage of challenges by incumbents occurred in the historical phase described above – when the core business model of local carriers were threatened.

Contention over US regulations over VoIP occurred in multiple regulatory arenas, including the federal government, the judicial system, and state governments.

The US Regulatory Issue: VoIP as “Telecommunications” or “Information” Services

The existing US regulatory framework, broadly, distinguished between “telecommunications services,” which were subject to a host of regulations, such as universal service obligations, emergency communications, and minimum quality requirements, and “enhanced,” or later, “information services” which did not incur these obligations.²⁸ Extending the regulatory framework over VoIP entailed deciding into which category VoIP service providers fit. It was this decision in which the FCC had to weigh potential for experimentation and innovation against possible rapid diffusion, since ruling it to be a “telecommunications” service would force massive obligations upon VoIP providers. It chose to move slowly, and in a piecemeal fashion, opening the door to challenges by incumbent telecom firms against VoIP providers in a variety of regulatory arenas.

Before the Threat: AT&T’s Ploy to Skirt “Telecommunication Services” Regulations

Before the challenge to local incumbents ignited a complex regulatory battle, in a somewhat bizarre regulatory experiment, AT&T (then a long distance company), attempted to exploit the regulatory uncertainty over VoIP. AT&T attempted to skirt some of its legal

²⁸ For an excellent overview, see Niechterlein and Weiser 2005.

obligations in providing “telecommunications services” by lobbying to get its IP-VoIP-IP long distance designated as an “information service.”

From around mid-2002, AT&T had refused to pay local carriers such as SBC, Verizon, Qwest, and BellSouth the access charges AT&T incurred for connecting calls from its long distance VoIP network to their local PSTN networks. In October 2002, AT&T petitioned FCC to declare that its service to be an “information service,” therefore exempt from paying local telephony companies. AT&T contended that since its traffic came from the Internet, it should only have to pay local telephony charges rather than the higher long distance interconnection rates.²⁹

However, since AT&T’s service was a PSTN-IP-PSTN service, only employing VoIP for the long distance portion of a call, users were unaware that their voices were transferred to the Internet along the way – for them, it was indistinguishable from conventional long distance services. AT&T’s business model was simply to substitute IP networks for conventional lines to carrying long distance traffic. In April 2004, the FCC rejected AT&T’s claim.³⁰

This episode illustrates the regulatory experimentation that US market players could engage in, given the lack of a tightly formulated regulatory structure over different types of VoIP services. As we will see, this type of experimentation is in stark contrast with the behavior of Japanese firms, which had little avenue for such experimentation because the government stepped in early to comprehensively regulate VoIP services.

²⁹ Squeo, Anne Marie. 2004. FCC Is Poised to Clarify Future of Internet Phone Calls. *The Wall Street Journal*, Jan 22, B.1.

³⁰ Nuechterlein and Weiser pp. 200-201

The Regulatory Battle: Local Incumbents using States, Courts, and Feds

At the point that VoIP services such as Vonage threatened the business models of local incumbent carriers, a regulatory battle erupted, pitting states against the FCC, and involved the judicial system.

In October 2003, the Minnesota Public Utilities Commission responded to a complaint filed by the Minnesota Department of Commerce, most likely under pressure from the local incumbent, by ordering Vonage to cease its DigitalVoice services within the state until it obtained state certification. Similar moves were undertaken by state-level organizations in California and Wisconsin, intending to subject VoIP providers to universal service and emergency dial obligations.³¹

Vonage responded by filing a petition with the FCC, as well as a suit in the federal district court in Minnesota. Vonage argued that it provided an “information service,” that it was not a “telecommunications carrier,” and that it should be exempt from state regulations. The district court of Minnesota responded in late October 2003 by agreeing with Vonage – that Vonage did indeed provide an “information service,” ordering an injunction to bar Minnesota’s Public Utilities Commission from forcing Vonage to get a state license. Receiving this, the Minnesota Public Utilities Commission appealed to the next higher level of court, the Eighth Circuit court.³²

In March 2004, the FCC invited industry input in order to create a comprehensive set of regulations for VoIP.³³ In November 2004, before it completed such regulations, and before the Eighth Circuit reached a decision, the FCC issued an order contending that states

³¹ Charny, Ben, and Evan Hansen. 2003. Court's call: Hands off VoIP. *CJNet News*, October 8. <http://news.com.com/2100-7352_3-5088158.html> [Last accessed June 1, 2007.] ; Charny, Ben. 2003. Minnesota: Phone rules apply to VoIP. *CJNet News*, August 21. <http://news.com.com/2100-1037_3-5066652.html> [Last accessed June 1, 2007.]

³² Vonage v. Minnesota Public Utilities Commission. 2003. United States Court of Appeals for the Eighth Circuit. <<http://www.nysd.uscourts.gov/courtweb/pdf/D08MNXC/03-08475.PDF>> [Last accessed June 1, 2007.]

³³ FCC. 2004. Notice of Proposed Rulemaking: In the Matter of IP-Enabled Services, Federal Communications Commission.

had no authority to regulate VoIP services, since it is impossible to separate “interstate” from “intrastate” portions of the service. However, the FCC did not rule whether or not Vonage’s service was indeed an “information service,” preferring a slower and more careful deliberation of the issue.³⁴

In the meantime, several petitions were filed by various states in several Circuits, which were consolidated to the Eighth Circuit.³⁵ In March 2007, it affirmed the FCC’s order, and denied the petitions.³⁶ Thus, the state-initiated battle over regulatory jurisdiction over Vonage-style VoIP was decided by the judicial system to be in the hands of the FCC, though the FCC had yet to formulate a clear regulatory structure to govern them.

PC-to-PC VoIP as “Information Service”

As a first step in extending its regulatory framework over VoIP services, the FCC ruled PC-to-PC VoIP to be an “unregulated information service” in early 2004. This was in response to a petition by Pulver.com for its service, Free World Dialup, which became exempt from universal service obligations for this service.³⁷ In this ruling, in the context of the state-versus federal government jurisdiction battle above, the FCC went on to assert sole jurisdiction over pulver.com’s service, excluding it from state-level regulation on the grounds that VoIP did not differentiate between “interstate” and “intrastate” services.³⁸ This settled the regulatory structure for PC-to-PC style IP telephony, which was, however, was least significant in potentially disrupting existing markets.

³⁴ Nuechterlein and Weiser. pp. 204-205

³⁵ Vonage v. Minnesota

³⁶ *ibid.*

³⁷ F.C.C. 2004. In the Matter of Petition for Declaratory Ruling that pulver.com's Free World Dialup is Neither Telecommunications Nor a Telecommunications Service.

³⁸ Nuechterlein and Weiser p. 198-199

Emergency and Universal Service Obligations – Towards Becoming a Substitute

In May 2005, the FCC took a further step in extending the regulatory structure over VoIP with a ruling over IP-to-PSTN services. It ruled that IP-to-PSTN VoIP providers, excluding PC-based services, such as Skype, were obligated to offer emergency 911 services. The intent was to bring services by those such as Vonage as closer substitutes for conventional telephony.³⁹

In June 2006, the FCC went further by announcing that VoIP service providers such as Vonage were required to contribute to universal service funds.⁴⁰ The FCC calculated rates as “interstate telecommunications services,” amounting to approximately \$2 per service subscription – actually higher than conventional local telephones and cellular services, but though FCC members considered it an “interim” solution.⁴¹

Thus, in the US, VoIP did not automatically fall into a particular category of existing regulation. Mostly in response to petitions by service providers, the FCC extended regulations over VoIP in a piecemeal and incremental fashion. This opened up possibilities for political strategies by incumbents which took advantage of state governments and the judicial system.

Number Allocations to VoIP providers

³⁹ FCC. 2005. In the Matters of IP-Enabled Services, E911 Requirements for IP-Enabled Service Providers, edited by F. C. Commission: Federal Communications Commission.

⁴⁰ FCC. 2006. Fcc updates approach for assessing contributions to the federal universal service fund, edited by F. C. Commission.

⁴¹ Broache, Anne. 2006. FCC approves new Internet phone taxes. *CNET News.com*, May 28, 2007. In press releases, FCC members stated that this was an interim solution, in place until they created a fundamental regulatory framework for IP telephony. This price was determined partly due to the fact that DSL was classified as an “information service” and did not have to contribute to the universal service fund, and because the fund’s expenditures were rising, and needed to be covered. Assorted FCC member press releases.

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A2.pdf (Martin)

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A4.pdf (Adelstein)

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A5.pdf (Tate)

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A6.pdf (McDowell)

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-94A3.pdf [last accessed June 1, 2007.]

Local telephone companies were understandably concerned about the number allocations to VoIP providers, the cornerstone of the VoIP providers' threat to their business models. However, the FCC did not make an issue of the number allocations, and incumbent began getting numbers allocated to VoIP services themselves.

Vonage was probably not the first firm to receive number allocations, since Net2phone and other companies also received number allocations, but it became by far the largest. The North American Numbering Council (NANC), an industry group chartered by the FCC, and the North America Numbering Plan Administrator (NANPA) are responsible for distributing phone numbers in the US. They allocate blocks of numbers to “incumbent local exchange carriers,” (ILECs – infrastructure owning local telephone carriers such as SBC and Quest), which transfer some to “competitive local exchange carriers” (CLECs) – carriers using their infrastructure to provide service. Vonage receives its telephone numbers from CLECs, though it is not keen to reveal which CLECs, or the contractual terms.⁴² Vonage then maps the telephone numbers to IP addresses allocated to its subscribers.⁴³ Local telephone companies, such as Verizon and Qwest expressed their concern about this number allocation in a presentation to NANC, but the FCC did not make it an immediate issue.⁴⁴

Little Legal Recourse for Challenge by Cable Carriers by Phase 4

However, in the fourth phase, after cable companies began offering VoIP in earnest, there was little that local telecom carriers could do in the way of erecting legal hurdles to block their service. With a large proportion of the public subscribed to cable television, cable

⁴² Charny, Ben. 2007. *Net phone hang-ups looming?* January 27 2003 [last accessed May 15 2007]. <http://news.com.com/2100-1033-982130.html>.

⁴³ [Cite Vonage presentation](#)

⁴⁴ Charny, 2007. Later, in late 2004, A subsidiary of SBC petitioned the FCC to receive number allocations directly from NANC, to which FCC granted permission. (cite FCC statement). In February, 2005, the FCC ruled on a request from a subsidiary of SBC that it could obtain numbers for its VoIP services directly from NANC. FCC. 2005. In the Matter of Administration of the North American Numbering Plan: Federal Communications Commission.

companies offering bundles that included broadband and telephone service (via VoIP) could offer their own network effects.

To sum up the regulatory developments of VoIP in the US, the nature of US policymaking, in which actors can engage in “regulatory arbitrage,” or shop for different policymaking arenas that may give them the most advantage, allowed local carriers to use state regulatory authorities and the judicial system to mount challenges to VoIP. Despite VoIP posing a threat to both long distance and local carriers’ business model by bypassing their PSTN networks, it was local carriers that had more regulatory mechanisms available to challenge VoIP services and service providers.

Table 5: VoIP Incumbent Market Challenges and Regulatory Developments – US

Phase	Challenge to Incumbent Carriers’ Business Model	Incumbents’ Responses	Regulatory Developments
1 - Early PC-to-PC (mid-1990s)	Little challenge	-	-
2 - IP-to-PSTN (late 1990s)	Price pressure on Long Distance/International	Buy startups, look for regulatory loopholes (AT&T)	
3 - IP-to-IP with PSTN numbers (Early 2000s)	Functional substitutes bypassing Local, Long Distance/International networks entirely	Regulatory challenges to VoIP providers	State challenges to VoIP
4 - IP-to-IP with Cable (2004 –)	Bypass Local, Long Distance/International, and Broadband	Offer own services	Incremental steps to clarify regulatory structure

Overview of Japan's VoIP Market

Let us now turn to Japan's VoIP market, most notable for the price shocks delivered by the new entrant Softbank, and quick regulatory support by the government which created a comprehensive regulatory structure for IP telephony. We begin by examining the incumbent business models.

Local and Long Distance Markets Dominated by NTT

In Japan, Nippon Telegraph and Telephone (NTT) and KDD (Kokusai Denshin Denwa) were the state-owned monopolies providing all domestic services until they were partially privatized in the mid-1980s. From then until the late 1990s, the government carefully orchestrated the introduction of competitors into compartmentalized market segments.⁴⁵ NTT owned the physical last-one-mile of infrastructure, and most competitors entered by offering long distance or international services. Under a regulatory regime of "controlled competition," the business models of new competitors were evaluated *ex ante*, and infrastructure-owning carriers needed government approval to change prices. As a result, prices came down, but in lock-step with NTT.

In 1998, NTT was reorganized into a holding company, with NTT East and NTT West offering local telephony services to their respective geographic regions, and NTT Communications was given long distance. While some subsidiaries of power electric companies and cable companies began offering local telephony service, the NTT regional companies almost monopolized local telephony. Their business models consisted of charging per minute for local telephone calls, and receiving interconnection fees for incoming and outgoing calls to and from long distance/international, and cellular calls.⁴⁶ For NTT Communications and long distance competitors, the business model was to charge consumers

⁴⁵ See Kushida 2006.

⁴⁶ NTT charged different prices for access to different levels of switches – so for some competitors, connecting to higher-end (covering larger areas) cost them more in interconnection fees, but they did not have as much infrastructure investment requirements of their own.

per minute for long distance, according to the distance the call traveled, paying local carriers according to the level of infrastructure (for example, long distance or local) to which they connected.

Phase 1: Early Commercial IP Telephony

The very early VoIP in Japan, as in the US, utilized PC-to-PC connections. However, VoIP providers did not become the target of acquisition by larger companies, and they did not make headlines until several years later than in the US. PC penetration in Japan lagged behind the US through the early 2000s, limiting the potential market for PC-based IP telephony. Internet usage through PCs was also low until the widespread adoption of broadband around 2002.⁴⁷

The first notable commercial VoIP service began in 2001 with a PSTN-IP-PSTN service by startup-firm Fusion Communications. It basically acted as a long distance carrier, using VoIP to connect local NTT networks.

In February 2002, eAccess, another start-up firms noted for offering early DSL services, began a PC-to-PSTN service utilizing Windows Messenger. It offered domestic flat rates of 10 yen for 3 minutes (versus NTT's approximately 80 yen per 3 minutes from Tokyo to Osaka, with higher fees for farther destinations), and 7 yen per minute to the US, considerably lower than conventional carriers.⁴⁸ However, due to the aforementioned infancy of broadband and low PC penetration, these services were not a threat to incumbents' business models, and did not attract much attention.

⁴⁷ The late spread of broadband was partly because NTT actively suppressed the spread of DSL until regulatory changes forced it to alter its stance. (Kushida and Oh 2007)

⁴⁸ ii Akusesu ga PC to Phone no ryoukin wo happyou, raishuu kaishu e [eAccess reports pricing for PC to Phone, to begin service next week]. IT Media News, May 15, 2007 2002 [cited. Available from <http://plusd.itmedia.co.jp/broadband/0202/04/pctophone.html>. International callback services, in which users would call a domestic number, which connected to a computer that would contact a server in the US, which would in turn call back the Japanese subscriber, enabling a connection at lower US rates those of Japanese international calling firms, had put pressure on international service prices. However, usage was not mainstream among consumers, and several forms of callback services were deemed illegal.

Phase 2: The Softbank Shock and the Explosion of VoIP

VoIP made headlines in Japan when Softbank, a startup firm, launched its VoIP service, *BB!phone*, as a free bundle with its DSL services in April 2002. Softbank's aggressive business strategy strongly shaped the terms of competition in Japan's VoIP market. Softbank's focus was first and foremost to spread broadband usage in Japan, even at a loss, since it held a large portfolio of companies positioned to capitalize on broadband-enabled applications and services. Taking advantage of new regulations facilitating interconnection with NTT's infrastructure to offer DSL services, Softbank delivered a major price shock to broadband markets by pricing itself at half the prevailing market rates, and giving away DSL modems worth over \$100 for free at train stations. *BB!phone* was an extra enticement interest people in DSL.

With *BB!phone* hardware, consumers could plug their existing telephones directly into a VoIP box connected to their DSL modem. When receiving calls, the phone acted as a regular NTT telephone, but it could place outgoing calls as an IP phone.

Softbank delivered a price shock to communications by allowing free calls between *BB!phone*, and setting a flat rate anywhere within Japan at 7.5 yen per three minutes. Even more shocking, its price to the US was 8 yen per minute compared to the prevailing rate of 200 to 300 yen, which it reportedly delivered at below costs. This pricing attracted headlines, and combined with the low price of Softbank's broadband service, catapulted the number of Softbank's DSL and *BB!phone* subscribers to approximately 3.5 million by December 2003 – when all other VoIP subscribers combined were estimated at 470 thousand.⁴⁹ In the Softbank could not allocate phone numbers to allocate to *BB!phone* subscribers, enabling VoIP to

⁴⁹ MIC. 2005. Soumusho Heisei 17nendo ikou no setsuzoku ryou no santei no arikata ni tsuite; Setsuzoku iinkai dai ikkai shiryō "IP denwa no kongo no tenkai ni tsuite" [Regarding the Calculation of Interconnection Charges by MIC from 2005; Material for 1st meeting of Interconnection Committee "Concerning the Present and Future of IP Telephony]: Ministry of Internal Affairs and Communications.

PSTN calls, but not vice versa. VoIP at this stage therefore did not completely undermine the networks effects, and therefore business models of local incumbents.

Phase 3: DSL VoIP as a Threat, FTTH VoIP as a Solution

In the third phase, Japan's VoIP services received phone number allocations, making them close substitutes of conventional telephones. However, since unlike in the US, the Japanese government had quickly extended its regulatory framework over VoIP, there was little policy leverage that incumbents could exert against VoIP service providers who directly threatened their business models. Instead, they chose to adopt VoIP as a service of their own, running it on top of fiber optic broadband services offered to the home (Fiber-to-the-Home, or FTTH).

Under the new government regulations enacted in 2003, DSL-based VoIP providers received a dedicated array of numbers with a unique prefix ("050"), and VoIP services that met certain quality standards (usually only attainable if delivered via FTTH), received conventional telephone numbers. The latter were eligible for "number portability" in which subscribers could keep their previous telephone numbers, while also being required to connect to emergency services. Thus, VoIP services, especially delivered via fiber optic, became close substitutes for conventional telephones.

DSL-based VoIP providers such as Softbank were quick to embrace the numbering scheme, followed closely by NTT's long distance firm, NTT Communications, in March 2003 through its Internet Service Provider.⁵⁰ (Note that it was the long distance and data communications NTT firm rather than NTT East and NTT West, the local telephone firms.) By May 2005, 25 firms had received "050" number allocations.⁵¹

⁵⁰ NTT Press Release: http://www.ntt.com/release/2003NEWS/0002/0205_3.html [last accessed May 15, 2007]

⁵¹ For details, see MIC. 2005. 2005 Nendo Denki Tsushin Jigyoubunya ni Okeru Kyouso Joukyou no Hyouka [Evaluation of Status of Competition in the Telecommunications Business 2005]: Ministry of Internal Affairs and Communications. pp.34-35.

NTT's competitors also began offering FTTH-based VoIP. These included KDDI, a company created out of the privatized KDD which had merged with a long distance competitor DDI (and cellular competitor, IDO). KDDI began offering FTTH-based VoIP targeted at apartment buildings in late 2003, expanding service to ordinary households in January 2005.⁵²

In terms of business models, these FTTH firms differentiated themselves by conventional telephone subscriptions by offering lower per-minute fees, often flat-rate, for long distance. Unlike the US, in which VoIP service providers were able to get multiple telephone numbers, including those from any locality, Japanese regulations limited FTTH VoIP providers to use the same geographic scheme as conventional telephones to receive conventional numbers.

Japan's Regulatory Framework for IP Telephony

As we have already seen, the Japanese government's regulatory support for VoIP was decisive in shaping the market dynamics and depriving the incumbent of regulatory leverage to oppose VoIP service providers. In addition, the same issues facing the US, including how to classify VoIP services, interconnection, universal service and emergency obligations faced the Japanese government, but by moving quickly to define VoIP, Japan was able to extend its existing regulatory framework over VoIP quite easily.

Defining VoIP and Allocating Numbers

Soon after Softbank's headline-grabbing *BB!phone* service debuted, the Ministry of Internal Affairs and Communications (MIC) moved to actively foster the spread of IP telephony. In September 2002, MIC announced the allocation of a dedicated array of telephone numbers (with the prefix "050") to IP telephones. As a political and technical

⁵² KDDI press release: <http://www.kddi.com/corporate/news_release/2003/1008/index.html> [last accessed May 18, 2007]

matter, this was relatively easy; numbering schemes were under MIC's authority, and it only needed to revise Ministerial Ordinances rather than revise any laws.⁵³ (Revising laws would require policy coordination with, or approval from, several other parts of the government.) The rationale for creating a dedicated array of numbers was to differentiate it from conventional telephones, making the public aware that they were calling or receiving a call from an IP telephone, which may be of lower quality.

By stipulating quality requirements for service providers to receive 050 numbers allocations, the government actually extended its control over a previously unregulated portion of the market – a classic example of increasing the scope of regulation over particular markets to facilitate their function.⁵⁴ The idea of allocating a dedicated array of numbers to IP telephones was first raised in a study group in the Ministry of Posts and Telecommunications (MPT), predecessor to MIC. This study group raised the idea of allocating conventional numbers to IP telephones of high enough quality to be considered substitutes for conventional telephones, while creating a dedicated array of numbers to IP telephones that did not meet those criteria – along the lines of cellular services and another wireless service, PHS, which were allocated the “090” and “070” prefixes, respectively.⁵⁵

MIC took the next step in September 2003 by clarifying its position on allocating conventional Japanese telephone numbers to IP telephony.⁵⁶ This enabled VoIP running on

⁵³ For the list of Ministerial Ordinances revised, see MIC press release. MIC. 2007. *IP Denwa Saabisu no Honkakuteki na Fukyu ni Mukete [Towards the substantial diffusion of VoIP Services]*. Ministry of Internal Affairs and Communications 2002 [last accessed May 15 2007]. Available from http://www.soumu.go.jp/s-news/2002/020614_4.html.

⁵⁴ Steve Vogel makes the distinction in the concept of liberalization, an increase in the level of competition, between deregulation, a relaxing of rules, and reregulation, an strengthening of rules. Vogel, Steven K. 1996. *Freer Markets, More Rules: Regulatory Reform in Advanced Industrial Countries*. Ithaca, NY: Cornell University Press.

⁵⁵ MPT. 2000. Heisei 11 nendo Denki Tsushin Bangou ni Kansuru Kenkyukai [Study group on Telecommunications Numbers, 2000]: Ministry of Posts and Telecommunications.

⁵⁶ MIC. 2002. Heisei 14 nendo Denki Tsushin Bango ni Kansuru Kenkyukai Houkokusho Gaiyou [2002 Report Abstract of Study Group on Telecommunications Numbers]: Ministry of Internal Affairs and Communications. Requirements included 1) provider owns or has stable, contractual access to last-one-mile of infrastructure, 2) provide stability and voice quality equivalent to landline telephony, 3) submit operating plan to relate number with call origin, 4) submit an operating plan that is based on demand for numbers, and 5) be compatible with

high throughput broadband (in effect, FTTH) to receive conventional telephone numbers and be eligible for number portability, but also incurring emergency service connection obligations.⁵⁷

Classification of VoIP

Unlike in the US, where classification of VoIP as a “telecommunications” or “information” service entailed two different sets of regulatory obligations, MIC did not face a classification issue due to its ongoing regulatory “regime shift.”⁵⁸ Until the early 2000s, MIC had compartmentalized the ICT sector into different segments, carefully micromanaging *ex ante* the effects of new competitors on markets. Had VoIP appeared during this “controlled competition” policy regime, classification of VoIP may have become an issue, but by 2002, MIC had abolished most of its *ex ante* policy tools for micromanagement, including classification.

Regulatory Arenas

Despite the increase of regulatory actors in Japan’s telecommunications policymaking after around 2001, including the Fair Trade Commission and the Dispute Resolution Commission, MIC very much remained the central policymaking organization in telecommunications. In contrast to the US, where the judicial system played a role, the Japanese judicial branch rarely rules against the government in favor of business, and there was no precedent in Japan for NTT to attempt mobilizing the judicial system against the government. Unless the MIC violated administrative procedures as defined by the

emergency call services if replacing conventional telephones. For a summary, see RBB Today news update (Japanese), <<http://www.rbbtoday.com/hikari/ipphone/051117/>> [last accessed June 1, 2007.]

⁵⁷ MIC. 2002. Heisei 14 nendo Denki Tsushin Bango ni Kansuru Kenkyukai Houkokusho Gaiyou [2002 Report Abstract of Study Group on Telecommunications Numbers]: Ministry of Internal Affairs and Communications. Requirements included 1) provider owns or has stable, contractual access to last-one-mile of infrastructure, 2) provide stability and voice quality equivalent to landline telephony, 3) submit operating plan to relate number with call origin, 4) submit an operating plan that is based on demand for numbers, and 5) be compatible with emergency call services if replacing conventional telephones. For a summary, see RBB Today news update (Japanese), <<http://www.rbbtoday.com/hikari/ipphone/051117/>> [last accessed June 1, 2007.]

⁵⁸ Kushida 2006

Administrative Procedures Act, there was little ground from NTT to mount a legal challenge anyway.

Universal Service

In terms of universal service, until 2007, Japan’s regulatory system relied mainly on internal subsidies within NTT. A universal service fund existed, but it had never been put to use, since it was designed to receive contributions from other carriers only when NTT was unable to internally subsidize unprofitable areas.⁵⁹ Beginning in 2007, 7 yen per phone number was charged to carriers to contribute to the fund.⁶⁰

Table 6: VoIP Incumbent Market Challenges and Regulatory Developments – Japan

Phase	Challenge to Incumbent Carriers’ Business Model	Incumbent Responses	Regulatory Developments
1 – Early IP Telephony	Little competition	-	
2 – Softbank Shock IP-PSTN	Undermine Long Distance/International	-	Regulatory support with “050,” conventional numbers
3 – IP-to-IP	Bypass Local, Long Distance/ International	Begin offering own VoIP services via DSL	
4 – IP-to-IP over FTTH	Bypass Local, Long Distance/International, and Broadband	Begin offering own services via FTTH	

Understand The Lack of Regulatory Challenges in Japan

A comparison between the regulatory and market structures of the two countries goes a long way to understanding why NTT regional companies could not and did not mount

⁵⁹ MIC. 2005. Unibasaru Sabisu Kikin Seido no Arikata [Regarding the form of the universal service fund]: Information Communications Deliberation Council. <http://www.soumu.go.jp/s-news/2005/pdf/051025_5_2.pdf> [last accessed June 1, 2007]

⁶⁰ TCA. 2007. Unibasaru Sabisu (kihonteki denki tsushin yakumu) seido ni kakawaru shusei bangou tanka no kohyo ni tsuite [Regarding the publication of revised number units regarding universal service obligations]: Telecommunications Carriers Association. <<http://www.tca.or.jp/japan/news/070426.pdf>> [last accessed June 1, 2007] Japan’s universal service was also narrow in scope than the US, covering only fixed telephony, public telephones, and emergency services. See also *ibid.*

political challenges to the regulatory legitimization of, and therefore the increase in the level of threat posed by, VoIP services.

First, unlike the US, where Vonage and other companies used regulatory “gray” areas – means that were not stipulated as legal, but not illegal either – to obtain their numbers, the Japanese government explicitly extended its regulation over VoIP services by offering numbers. Moreover, the relative clarity of regulatory over interconnection charges in Japan, based on infrastructure, made the task of extending existing regulation over VoIP easier.

Second, while US VoIP service companies took advantage of the technological trait of American switching facilities – of charging interconnection fees based on the number of origin – to decouple location and numbers, the Japanese government’s scheme for allocating numbers placed VoIP services within the existing realm of numbering. The dedicated array of “050” numbers clearly identified for the caller and receiver that a geographically indeterminate IP telephone was being used, and IP telephones receiving conventional 0AB~J numbers were required to stay true to the conventional geography-based numbering scheme. Thus, the Japanese VoIP services, while receiving explicit, and therefore legitimating, policy support, were limited in flexibility. To incumbent telephone carriers, they became more of a legitimate low cost competitor rather than a competitor seen as exploiting the regulatory system.

Third, Japanese local carriers had far fewer means to mount regulatory challenges. As long as MIC followed proper procedures according to the Administrative Procedures Act, and the numbering scheme was under the discretionary authority of MIC, there was little means for contention. Unlike regions in the US, which offered several regulatory arenas, Japan’s prefectures do not have their own regulatory authorities for telecommunications that are independent of MIC, and the judicial system was known to evaluate legal to ministerial actions based on procedural legitimacy. While challenges to Ministerial policies have been

mounted in courts for the first time in recent years, they were by NTT's competitors and start-ups, rather than NTT itself.

Fourth, in terms of market structure, Japan's local carriers consisted mainly of the two NTT regional companies, who were under the same holding company.

Finally, some MIC officials (not the co-author) speculate that NTT's lack of resistance to allocating numbers to IP telephones was simply because no one expected VoIP to become as successful as it did.

Conclusion

Explaining the Growth of VoIP Services

To answer the question of why VoIP services, which seemed to favor the US institutional context, actually spread more quickly in Japan, we offer a number of propositions. First, regulatory support in Japan, facilitated by VoIP fitting easily into the existing regulatory framework, accelerated its deployment. Attaining regulatory legitimacy and receiving number allocations, VoIP became a close substitute to conventional telephony, pushing incumbents to adopt the technology. In addition, regulatory support for DSL and FTTH deployment had created a larger number of VoIP providers who also owned the pipes, in contrast to the US, where VoIP depended on leased infrastructure.

Second, the larger number of regulatory arenas available to US local incumbents, given the regulatory ambiguity, allowed incumbents to mount legal challenges to VoIP providers, slowing their growth. While the US long distance and international firms were clearly under the jurisdiction of the federal FCC, local carriers mobilized state governments and the judicial system to try to suppress VoIP technology offered by start-ups. In contrast,

Japanese local carriers had very little choice but to follow MIC, the locus of regulatory power.⁶¹

Reconsidering “Disruptive” Technology: Business Models and Services

We now return to the question of whether VoIP was a disruptive technology. If it was disruptive, we would have expected new firms to bring fundamentally new business models, supplier networks, consumers, and other “value propositions,” altering the terms of competition. Incumbents failing to adjust would be rendered obsolete and insignificant – exactly what many some observers argued would happen sooner or later. If VoIP was not disruptive, we would expect incumbents to incorporate it into their existing business models and “value propositions.” Using this set of criteria, we would have to conclude that VoIP was not fundamentally disruptive.

Yet, with the advent of VoIP services with new business models and those such as Skype, continuing to enlarge its network effects as more people join, and given its potential to run on any network, whether cellular or next generation wireless broadband networks, it seems foolish to dismiss VoIP as fundamentally not disruptive to existing firms. The potential may be around the corner in the near future – though that near future keeps receding, as incumbents adjust their business models.

This leads us to a significant point regarding the notion of “disruptive” technologies – the difference between technology and business models. The original definition hinges on whether incumbents, relying on existing technology, have been undermined new technologies allowing new business models. Hence, the conceptual difficulty in identifying a disruptive

⁶¹ It is also worth noting that the US had a large number of market players than Japan, further raising the likelihood that some would engage in regulatory arena-shopping.

technology *ex ante*. This study suggests that *disruptive technology can be more about the business models of incumbents than the technology itself*.⁶²

We take it a step further, to argue that for *products* in competitive markets, such as hard disks, from which the conception originated, a new, “disruptive” technology can quickly undermine existing products, firms, and markets. However, for *services* in which regulations matter in shaping the terms of competition, *potentially* disruptive technology may not translate into a disruption of existing firms and markets because market actors, business models, and the terms of competition may be shaped by these regulations.

Telecommunications is perhaps the most extreme case for this proposition. Regulations were critical, since VoIP service providers’ access to the network effects of PSTN networks (for example, telephone number allocation) depended heavily on regulations shaping the actors, terms of access, and therefore business models of both incumbents and new entrants.

Technology and Comparative Institutional Advantages: US and Japan

We now return to considering the “comparative institutional advantages” of the US and Japan in light of their VoIP markets. Especially if we add DSL to our comparison, it seems that the US excels at generating innovative technologies and facilitating experimentation in new markets, but if the technology is a service requiring regulatory support, its implementation can be politically messy and influenced by vested interests – especially when multiple regulatory arenas are available. Japan can facilitate the rapid implementation of technology by providing regulatory support, but it may be foregoing opportunities for innovation by defining a service to facilitate its diffusion.

⁶² Weber, Steve. 2005. Christensen right and wrong. *QED* (1).

How is this different from the existing conceptions of comparative strengths? We emphasize that for technologies in which regulations matter, Japan can shape the trajectories of technology by influencing the terms of competition – a particular aspect of “managing competition,” more subtle than heavy-handed licensing or price management. The US, on the other hand, does not necessarily excel at facilitating competition in heavily regulated areas, since incumbents have multiple regulatory arenas at their disposal.

Implications for Next Generation Networks

We end with some implications for Next Generation Networks (NGN). Current debates over how to configure NGNs in both Japan and the US focus on giving more “intelligence” to core networks to allow some applications or content to be prioritized over others. Japan has been actively promoting a specific vision for NGNs, and NTT has been moving aggressively to invest in new core networks. This study provides further evidence that Japan has the ability to rapidly implement a particular technology, or run along a particular technological trajectory. However, as recent experiences in telecommunications have shown, Japan is quite capable of running quickly, but in a direction that isolates them from rest of the world – examples such as ISDN, rendered obsolete by DSL, ATM, rendered irrelevant with the advent of TCP/IP, PDC, Japan’s proprietary domestic cellular standard that isolated them from global markets, and PHS, a domestic alternative to cellular services, to name a few.

In the US, more intelligence in the core networks leads to more control by incumbent telecom firms of not only the infrastructure, but of the applications layers as well. America’s experience with VoIP, as well as DSL, suggest that the more that applications are dependant on particular features of physical networks, and the more that regulatory involvement is possible in their interface, the more difficulty startup firms have in implementing their

breakthrough innovations and technology in service offerings. In other words, if not careful, Japan can run in the wrong direction, and the US cannot profit from its own innovations.