

INTERNET TELEPHONY AND OPEN COMMUNICATIONS POLICY

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Introduction

This chapter discusses communications policy models and advanced Internet services, such as Internet telephony.¹ Pricing and cost issues arising from Internet telephony services are briefly addressed. In particular, this chapter provides a theoretical framework to define the desirable contours of a communications policy model for the Internet and all media, and describes, as an example of what is needed, the features and attributes of a new intermediary institution, the Internet Telephony Consortium (ITC). In McKnight (1989), such an impermanent intermediary institution was defined as an ad hoc, corporatist organization. This chapter concludes that an Open Communications Policy framework, as described by Neuman, McKnight, and Solomon (1997), is consistent with the technology and economics of the Internet, which relies heavily on ad hoc, corporatist, intermediary organizations for standards-setting and other governance functions. Both new pricing strategies and a supportive policy framework are needed for Internet telephony services to recover costs and to integrate successfully the Internet and telecommunications industries for the benefit of customers and suppliers.

The Internet Telephony Consortium's work on Internet policy has benefited from cross-industry collaboration and has been informed in part by an Internet telephony cost model developed by ITC Research Assistant Brett Leida. Leida's thesis (1998), as well as other papers (McKnight and Leida 1997), analyze the costs and trade-offs for an Internet Service Provider to support such services as Internet voice and multimedia conferencing. Costs for the provision of Internet telephony services are concentrated in the modem banks and transport services of the

ISP. However, in addition to these technical items, items such as customer service, sales, and marketing still represent a substantial portion of an ISP's costs with Internet telephony. This work on Internet Service Provider costs is summarized in this chapter.

Pricing and industrial structure questions have motivated further inquiry within the Internet Telephony Consortium (Clark 1997a, Clark 1997b, Lehr 1997). Pricing models supporting Internet voice services might be employed for pricing other Internet integrated and differentiated services. The policy implications are that a convergent regulatory framework will be required to formulate policies for multimedia services, which would not distort the prices for those services. It would be desirable if government policymakers could study and understand these issues and develop appropriate policies without introducing economic and technical distortions into the nascent Internet telephony market.

Internet Telephony

Initially, Internet telephony developed to provide interactive voice communications over the existing IP-based Internet. The process required the use of personal computers (PCs) with the same application software running on both the originating and receiving computers.² Both PCs needed to be connected to Internet Service Providers (ISPs) and equipped with a sound card (multimedia-enabled), a microphone, and speakers. This form of connectivity using PCs was the primary focus for the first stage of development of Internet telephony technology. The extension of PC connectivity from a single network across the Internet was the greatest advantage made possible through the early application of Internet telephony technology. Access to advanced integrated services, as well as access to services enabling interworking across the Public

Switched Telephone Network (PSTN) to and from the Internet, is still at an early stage, due to limited bandwidth, processing power, service development, and interoperability.

The development of voice communication capabilities, using the Internet protocol (IP) over the Internet, has progressed to where these capabilities may be viewed more accurately as IP telephony than as Internet telephony. IP telephony capabilities are now becoming widespread. The limitations of the circuit-switching techniques of conventional telephony may now be overcome through integration with IP technologies. The areas IP telephony address include: delivery of incoming calls from the Internet to existing call centers, provision of virtual office capabilities for at-home workers (telecommuters), provision of mobile desk-top capabilities for traveling employees, multimedia-enabling of enterprise Wide Area Networks, and the provisioning of cost efficient disaster recovery plans.

A key element in making effective use of the emerging IP telephony technology is the development and use of gateways that bridge the IP environment of the Internet and the circuit-switched environment of the public telecommunications network. Such gateways are devices that make it possible to construct application-specific network structures that provide for real-time, two-way communication between circuit-switching and packet-switching technologies to create an integrated, networking fabric. Enabling interoperability between the public telecommunications network and the Internet, as can be done with gateways, is one of the original objectives in the formation of the ITC.

The public Internet is not a controlled network environment. The IP technology currently employed on the Internet uses non-deterministic switching (datagrams), which offers little potential for approximating real-time voice connectivity in that environment, except through overprovisioning of bandwidth. As a consequence, Internet telephony over the public Internet is not, as yet, a significant direct competitor in the field of voice telephony. However, using IP

networks, either conceived as Intranets or Virtual Private Networks, to provide voice services across a well-managed, over-provisioned, best-effort network, is technically feasible today. In fact, entrepreneurs and established businesses large and small are beginning to use IP technologies in just this fashion. Typically, the end user or customer may not know or care that her voice was carried across a packet network rather than across a circuit-switched network along a portion of its transmission path.

INTERNET TELEPHONY REQUIREMENTS.

Definition, Mechanisms, and Regulation or Self-Regulation of:

- authentication and certification
 - billing
 - customer service
 - emergency messaging
 - liability and fraud
 - network management
 - performance measurement
 - Quality of Service (QoS)
 - security
 - signaling
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Table 1. Internet Telephony Requirements.

Internet Telephony and Regulation

Internet telephony's initial market niche was as a consumer-related “Chat” product, possessing an appeal similar to that of amateur (HAM) radio, with broader accessibility. Internet telephony software is available to anyone who wishes to purchase and use it. However, the deployment of gateways has been relatively limited to date. The most immediate potential for gateways lies in the expansion of commerce by providing direct and immediate access from the World Wide Web to existing businesses that operate in the PSTN (public-switched telephone network) environment.

The near-term value of Internet telephony resides in private intranets and in the provision of value-added services for circuit-switched networks. The use of gateways in applications where the non-real-time characteristics of Internet telephony are adequate would be severely limited by premature regulation of ill-defined Internet telephony services. Furthermore, premature regulations could limit the introduction of IP-based enhancements to public networks. Regulation

could also slow the development of new networks to support a full range of multimedia communications across heterogeneous networks.

Internet telephony is at a point where it can be compared favorably to traditional voice telephony for serving potential customers on the Web, and in fact, can offer higher quality services to discriminating audio consumers. Nonetheless, both the technology and the market for Internet telephony are immature and require further development to reach their potential. Regulation of Internet telephony could hinder innovation. Regulation by individual nations would likely cause only their domestic telecommunications industry to suffer, as the industry in other states embraces and develops Internet telephony. Additionally, even if Internet telephony were to be regulated, voice over the Internet may still be used by some alternative technological method. Premature regulation of Internet telephony would be an ineffective and inappropriate response to this developing technology and market.³

Further development of Internet telephony threatens the telecommunications industry, as it is an emerging competitive alternative to the traditional voice telephony market. In such a competitive state, both industries must innovate to remain competitive. Competition between traditional and Internet telephony will accelerate the move toward cost-based tariffs. In the many countries where tariff rebalancing is just beginning or still underway, this may be of greater importance to consumers than anything else about Internet telephony—at least until advanced Internet services become widely available. With the trend of deregulation and the opening of telecommunication markets to competition, it is inappropriate to advocate increased regulation of the Internet. By allowing continued innovation and development of Internet telephony, a true alternative to traditional voice telephony and a more competitive market are closer to realization. Constraints placed on the development of Internet telephony would only stifle innovation in

Internet telephony technology and applications, as well as potentially stifle innovation in traditional telephony as well.⁴

The Internet and Open Communications Policy

The Internet is a network of networks using public protocols to share resources and economic benefits. Having arisen outside the realm of broadcast, telecommunications or print media, the Internet has effectively resisted classification and regulation within the models of other media and services. National regulators, political authorities, international agencies, and multinational firms from a variety of industries have all sought to control the Internet. All have failed. Seemingly, the Internet is a new species of technical-economic-political activity—self-organizing and self-governing; truly existing only in the minds of its users due to their choice to receive and send messages, using its language and methods. The Internet's seemingly mysterious, self-governing and fluidly reorganizing capabilities are not unique, however. Other entities, such as expert commissions, standards organizations and public-private research consortia, exhibit similar qualities and possess comparable strengths and weaknesses (McKnight 1989, McKnight and Neuman 1995).

As the Internet evolves, it reaches ever more deeply into the broadcast, telecommunications, computing, and publishing industries, to name a few. The display of Web site addresses by advertisers in broadcasts, cable and satellite TV, as well as in print publications, were only the first demonstrations of the Internet's interpenetration of other media.

With the Internet acting as "change agent," the collapse of the old regulatory models is inevitable. In their place, more flexible government programs monitoring the information and communications technology and services markets are needed. In addition, continued support of research, education, and the provision of information access to targeted disadvantaged users is socially justifiable and supports the continued provision of a new public good—the Internet.

The international implications of the communications policy transformation underway that is attributable to the growth of the Internet is profound. The notion that the Internet is intrinsically border-less and outside the control of national governments is false. Especially with the growth of new naming and numbering schemes for intellectual property protection, taxation, and directory services, as well as provisions for varying qualities of service, there are several levels of influence that governments may exert over Internet users. This leaves aside, for the moment, the issue of personal privacy, data protection, and information security for Internet commerce. In particular, debates about government roles and private sector needs with regard to encryption are beyond the scope of this chapter (McKnight 1997). This controversial area of international communications policy does not yet seem ripe for resolution, given the conflicting views of much of the private sector, many users, and the federal government—in particular, the FBI and NSA.

Despite these caveats and qualifications, the Internet eventually will have an equally profound impact on national communications policy in many other nations. The Internet Telephony Consortium is playing a role globally, by helping educate governments, industry, and users about the potential and the limits of the Internet and advanced Internet services such as Internet telephony, as the Internet and telecommunications industry continue their convergence.

Communications policy for information infrastructure that ignores the lessons of the Internet model is unlikely to succeed. Internet technology was created by agile government technology policy programs, while the Internet, as a communications and interaction environment, is a key infrastructure for virtual governance (McKnight and Neuman 1995). The Internet model is used increasingly by standards organizations, but also by distributed "organizations" (often, communities of interest). The consensual nature of most interactions on

the Internet is important in facilitating ad hoc, corporatist governance of the information infrastructure.

The principles of ad hoc, corporatist governance can guide policymakers, industry, and academia in structuring communications policy so that it serves national interests in economic growth and job creation, as well as supports democratic discourse and social interaction. The principles are compatible with and supportive of an information or networked society. The features of ad hoc, corporatist organizations allow them to process, analyze, and sort an exploding information base which is beyond the ability of any individual, firm, or government body to understand in all its facets. The growing number of business alliances, joint ventures, consortia, and networks is a result of this factor (McKnight 1989). Impermanent, agile networks of industry, government, and academia created through these processes are at work in the United States, Europe, Japan, and elsewhere. They operate in a sea of public discourse and debate, and rely increasingly on the Internet as a communications backbone. The International Engineering Task Force (IETF) may be conceptualized as an ad hoc, corporatist organization whose mission is to support and integrate the results of pre-competitive, generic research and development of Internet protocols. The principles of ad hoc corporatism are:

- 1) Create impermanent, publicly sanctioned organizations to develop and implement public policy.
- 2) Cross institutional boundaries.
- 3) Employ interdisciplinary teams to analyze problems, identify opportunities, and assess outcomes.

Source: McKnight (1989).

An open communications policy combines the diversity and dynamism of American cultural values with a coordination and planning mechanism that serves to strengthen industry and improve government performance. U.S. communications policy should take cognizance of the attributes of ad hoc, corporatist policy processes to improve flexibility, accelerate decision-making, reduce risks, and share costs.⁵ Any technology and industrial policy, whether for communications markets or other sectors, that does not possess these attributes is ultimately doomed to failure.

The U.S. benefits from years of accumulated experience with the Internet. New industries which conduct business on the Internet are beginning to emerge. For example, electronic publishing is providing ample information at low cost and in digital format. The cost of information lies not in the creation of content, but in the storage and efficient delivery—in essence, the cost of paper, printing, trucks, warehouses, and other physical distribution mechanisms, plus the cost of personnel. The Internet demonstrates that electronic networks can reduce delivery costs by orders of magnitude.

An Internet-centric model of policy development, i.e. one that relies on voluntary cooperation of autonomous agents to achieve goals defined through interaction, is admittedly imperfect. However, the alternatives, fetishizing or embracing proprietary models of network design, are fatally flawed. Communications policymakers must recognize the critical features of the global information economy and fashion policy instruments suited to networked firms and the principles of ad hoc, corporatist policymaking. The central tenets of an Open Communications Policy are listed in Table 2 below. Given technological convergence, it is necessary that the policy framework for communications also converges along the lines identified—distinctions between wired and wireless, local and long distance—are artifacts from the past.

OPEN COMMUNICATIONS POLICY

- Fully competitive provision of all communication services
 - *No regulatory distinctions* between:
 - Wireline and Wireless
 - Narrowband and Broadband
 - Broadcast and Switched Service
 - Content and Conduit
-

Table 2. Central tenets of OCP. (Source: Neuman, McKnight, and Solomon 1997).

Internet Telephony Pricing

This chapter has argued against premature regulation of Internet telephony and for an ad hoc, corporatist approach to an Open Communications Policy framework. If the reader accepts all my arguments up to this point, the question of the market viability and, in particular, the pricing of Internet telephony and other Internet integrated and differentiated services remains.

Internet service providers face increased costs due to Internet telephony. Whether this is viewed as a concern for regulators or businessmen, understanding the costs involved in service provision and further, the costs which may be attributed specifically to regulatory requirements (e.g., access charges) should be understood. In a comparison of an ISP offering Internet telephony services to an otherwise identical firm which doesn't, costs in all categories increase; however, some categories are affected more than others. The bottom line for an ISP is that *revenues will increase slightly, while costs will almost double with only a moderate use of Internet telephony* (McKnight and Leida 1997). Hence, Internet telephony service providers (ITSPs) need to consider how to minimize the cost impact of Internet telephony and/or how to

gain additional revenue to operate at profitable levels. A variety of approaches to the pricing of Internet services have been proposed (McKnight and Bailey 1997; MacKie-Mason and Varian 1997; Clark 1997a; Paschalidis, Tsitsiklis, and Kavassalis 1997). It is as yet unclear, however, which is preferable in practice.

For ISPs to remain in business, they eventually will need to recover these increased costs through tiered pricing, a higher flat price, or other mechanisms such as advertising or transaction fees. The Resource ReSerVation Protocol (RSVP) developed by the Internet Engineering Task Force (IETF) could be used as one mechanism for implementation of usage-sensitive pricing to recover those costs. However, whether and where the current specification and its guaranteed service and controlled load variants is useful has not yet been determined. It is clear that RSVP by itself is not capable of resolving the host of network architecture and Quality of Service constraints on Internet pricing models. For example, how RSVP traffic could cross multiple networks has not been resolved.

When developing pricing schemes, service providers will have to look beyond the Internet telephony service and consider how to price integrated Internet services, one of which is Internet telephony. Additionally, an integrated regulatory framework will be required to permit the provision of such integrated services. In Bailey and McKnight (1997), a variety of proposed approaches to Internet pricing, including flat-rate, tiered, and usage-sensitive, as well as approaches at the infrastructure level for network interconnection, are presented.

Experimentation with a variety of pricing models that permit service guarantees for multiple qualities of service, including guarantees for both real-time multimedia and multicast conferencing may lead to increased understanding of what features Internet services are valued by consumers (Varaiya, Edell, and Chand 1996). Additionally, one must consider the state of technology when considering cost-recovery alternatives. Usage-sensitive pricing will not be an

option until protocols and systems that monitor the use of Internet telephony are developed and deployed.

The Internet Telephony Consortium and Communications Policy Processes

There are a wide variety of policy issues raised by Internet telephony in particular and integrated Internet services in general. The ad hoc, corporatist policy processes in which the ITC engages is demonstrated by examples of its research results which have been communicated to the Federal Communications Commission (FCC), European Union (EU), and International Telecommunication Union (ITU) during its first years of existence. Its parallel interactions with technical standards bodies and its role as an intermediary for firms from a variety of industries should also be noted. Here, we focus particularly on a quantitative estimate of the costs for Internet telephony service providers. Additionally, we touch briefly upon the regulatory discussions surrounding Internet telephony within the European Union.

Access Charges

The Internet telephony scenario described below represents a case in which moderate use of Internet telephony creates a large cost increase to an ISP. For comparative purposes, one might wonder how other changing factors would affect an ISP's costs. One such factor is the Federal Communications Commission's (FCC) recent revamping of access charge rules (1997a, 1997b, 1997c, 1996). Under the new rules, ISPs will see an increase in cost of their analog dial-in lines.⁶ Two principal changes cause this increase: an increased subscriber line charge (SLC) and the pre-

subscribed interexchange carrier charge (PICC). The SLC rose from a cap of \$5.60 per-line, per-month to \$9.00 on January 1, 1998 (although few local exchange carriers, LECs, will be able to charge as high as the cap, the average has been calculated to be \$7.61). The PICC increases from \$0.53 to \$2.75 per-line, per-month. Using the average charges, the impact on ISPs (or any multi-line business) will be a \$4.23 per-month increase for each analog line.⁷ Inserting these updated costs into the ISP cost model, previously developed by the Internet Telephony Consortium, yields an increase for the analog dial-in subscribers' cost for both the baseline and Internet telephony (IT) scenarios.

Table 3 shows the initial results for the two scenarios compared to the results for the two scenarios with the access reform, calculated on a per-subscriber basis.

	BASELINE	BASELINE W/ ACCESS REFORM	IT	IT W/ ACCESS REFORM
Capital Equipment	\$2.70	\$2.70	\$3.90	\$3.90
Transport	\$2.98	\$3.44	\$7.72	\$8.37
Customer Service	\$7.50	\$7.50	\$10.80	\$10.80
Operations	\$3.07	\$3.07	\$3.26	\$3.26
Other Expenses	\$6.52	\$6.57	\$7.73	\$7.78
<i>Total</i>	\$22.77	\$23.27	\$33.42	\$34.12

Table 3. Analog Dial-in Subscriber Costs for 4 Scenarios.

Note that while cost increases due to access reform, this increase is minor in comparison to the potential increase due to Internet telephony. While no cost increase is advantageous to ISPs, the recent FCC actions should be considered much less threatening than the potential impact of Internet telephony, as of the broader impact of, for example, the imposition of universal service

charges on ISPs in addition to on the lines they purchase from Local Exchange Carriers (LECs). A principal conclusion that one reaches based on these cost results is that ISPs need either to prevent widespread use of Internet telephony, or to change the current pricing structure of Internet access services in order to recover the increased costs. What other actions the FCC may take with regard to Internet telephony are unclear, though a ruling with regard to the ACTA petition of 1996 is said to be imminent.

European Internet Telephony Policymaking

As we have noted above, perhaps the greatest challenge for Internet telephony is how it will be treated by governments. The Internet is indeed growing in importance in the United States, and therefore has been focused on at the highest levels of the U.S. government—more than in most other nations. However, it would be a mistake to ignore regulatory dilemmas and proposed approaches arising elsewhere. In particular, the European Commission's approach to determine policy for Internet telephony merits attention, because of the obvious impact such policies may have in enabling or inhibiting the continued growth of a worldwide market for advanced Internet services.

Heterogeneity has been a key characteristic of the Internet from its beginning. The question of how much heterogeneity in Internet policy is tolerable for various classes of service will soon be answered in practice by policymakers and Internet users. As discussed by Short (1997), the European Commission (1997) has established several criteria that Internet telephony must meet before it will be subject to regulation. These criteria are presented in Table 4.

Such communications are subject of a commercial offer.
Such communications are provided for the public.
Such communications are to and from the public switched network termination points on a fixed telephony network.
Such communications involve direct transport and switching of speech in real-time.

Table 4. EU Criteria for Voice Telephony.

Based on these criteria, Internet telephony is not as yet considered voice telephony because Internet telephony does not meet the criterion of "real-time" communication, due to the current, high levels of delay experienced by Internet telephony users on the public Internet.⁸ Hence, Internet telephony services in Europe are not subject to regulation at this time. How long "this time" will last is open to speculation.

Conclusions

Internet telephony service providers confront a variety of challenges. The costs, the technologies, the pricing models, and the policy environment for Internet telephony are all unsettled and in a state of rapid evolution. To date, a relatively hands-off policy approach has been taken by the FCC (Werbach 1997) and the White House in the U.S. A similar policy position has been taken by the European Union. In spite of misguided efforts in some countries to ban Internet telephony, we believe the real challenge is how to align the costs, technologies, prices, and policies to enable a rich new class of integrated and differentiated Internet services to

flourish, subsequently bringing substantial benefits to consumers. An Open Communications Policy model, supported by ad hoc, corporatist technology and policy intermediaries, is best suited to this task.

The ITSP cost model, developed by the Internet Telephony Consortium (ITC), of Internet telephony service providers places the ITSP's costs into five categories: capital equipment, transport, customer service, operations, and other expenses (sales/marketing and general/administrative) (Leida 1998; McKnight and Leida 1997). This work shows that even a moderate use of Internet telephony causes total ISP costs to almost double while revenues increase only slightly. This paper and the further work to be found on the ITC's web pages⁹ may help policymakers and the convergent Internet and telecommunications industries evolve toward a sustainable industry structure and stable regulatory environment. Assisting regulators, users, and policy analysts in understanding what Internet telephony is and is not will help facilitate the development of a market for Internet telephony and other Internet integrated and differentiated services. An Open Communications Policy model for the Internet and other media, as argued for here and in *The Gordian Knot*, is the most suitable framework for integrated policy development for convergent services such as Internet telephony.

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² This section of the paper draws upon the "Comment to the European Commission Concerning the Status of Voice on the Internet under Directive 90/388/EEC," submitted by the Internet Telephony Consortium European Regulatory Task Force, July 1997.

³ *ibid.*

⁴ *ibid.*

⁵ Lee McKnight, "Ad Hoc Corporatism and Expert Commissions," (American Political Science Association Annual Meeting, Washington, D.C., September 1989).

⁶ While the change in cost will be specific to the LEC that serves each ISP, an average change in cost, based on (FCC

1997c), is used when carrying out the subsequent calculations in this paper.

⁷ $(\$7.61 - \$5.60) + (\$2.75 - \$0.53) = \$4.23.$

⁸ Short 1997.

⁹ <http://itel.mit.edu>.