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Practical Solutions for Communications Policy

Abort, Retry, Fail? The Need for New Communications Policies

July 11, 1994; Revised October 10, 1994

*Presentation at the July 1994 NARUC Meeting
San Diego, CA*

Abort, Retry, Fail? **The Need for New Communications Policies**

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Project Information

**Telecommunications Industries Analysis Project:
Abort, Retry, Fail? The Need for New Communications Policies**

Carol Weinhaus, Teresa Pitts, Rob McMillin, Mark Jamison, *et al.*
July 11, 1994.

Presentation at the July 1994 NARUC Meeting, San Diego, CA.

The Telecommunications Industries Analysis Project is associated with the Public Utility Research Center at the University of Florida College of Business Administration.

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List of Participants in the Telecommunications Industries Analysis Project, 1994

List of Participants in the Telecommunications Industries Analysis Project, 1993

State Regulators	NARUC representatives from: Iowa Utilities Board New York Public Service Commission Washington Utilities and Transportation Commission
Regional Holding Companies	Ameritech Bell Atlantic BellSouth NYNEX Pacific Telesis Southwestern Bell U S WEST
Large Independents	GTE Sprint Local Telecom Division Anchorage Telephone Utility
Interexchange Carrier	AT&T Sprint
Foreign Domestic	NTT America InfoCom Research, Inc.
Local, National, and International Services	BT
Materials Manufacturers	Corning

Sponsors:

Corporation for Public Broadcasting

Assisting with *public* data:

Federal Communications Commission
National Exchange Carrier Association

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I. Introduction

Introduction

Existing public policies for communications industries - publishing, telecommunications, broadcasting, and computers - do not match technological and market realities. These public policies are based on traditional assumptions about technologies and markets that no longer apply. If public policies do not change to match the changing realities, people may not get the advanced services that are becoming available elsewhere. Policies need to promote both universal service and advanced technologies. The companion papers¹ provide alternative policies for resolving these problems.

The well-known computer error message - *Abort, Retry, Fail?* - illustrates policy makers' choices:

- **Abort** - Abandon the old traditions and create a new framework for communications policies.
- **Retry** - Make incremental changes to the current policies. While this approach may appear to work initially, it will eventually lead to Fail because this system will be overcome by the speed of change.
- **Fail** - Allow the current policies to run their course.

This paper provides a concise statement of why a new framework is needed for communications policies. *Retry* and *Fail* are not good long-term options because the current policies:

- Are based on outdated industry boundaries.
- Are intertwined with regulatory pricing systems for telephone and cable television (cable TV) that conflict with competition and new technologies.
- Assume old technologies.
- Maintain vested economic and political interests that do not match the new market realities.

¹ *Long-Term Restructuring Idea 1: Layering or Integrating Networks and Services* consists of a series of options or ideas for a new regulatory framework. This paper is the first of a planned series on these issues. *Facing the Future: Ideas for Restructuring Subsidies – Subsidy Paper #1* contains ideas for long-term policies for subsidies in the telecommunications industries. *Universal Service Tool Kit, Part 1: Getting from Here to There: Transitions for Restructuring Subsidies* provides ideas for moving from current to new long-term subsidy structures. *Universal Service Tool Kit, Part 2: Beyond Cost Allocations: Benchmark Subsidy Method* presents a single mechanism for subsidies regardless of whether a market is competitive or not. The *Benchmark Subsidy Method* provides incentives to service providers to be efficient and allows competitive markets to operate efficiently.

I. Introduction, cont.

This paper is based on previous research by the Telecommunications Industries Analysis Project and its predecessor, the Alternative Costing Methods Project.

The sections in this paper set the foundation for project papers that develop new ideas and options for communications policies:

- **Section II** describes changes in the traditional industry boundaries.
- **Section III** explains mismatches between the current regulatory pricing system and the customer and industry needs.
- **Section IV** demonstrates how the current public policies do not match current technologies.
- **Section V** illustrates how vested interests make it difficult to make significant changes in current policies.
- **Section VI** concludes with a summary of why a new framework is needed.

Background on the Telecommunications Industries Analysis Project

The goal of the Telecommunications Industries Analysis Project is to provide information to support the development of alternative communications policies to meet the needs of stakeholders in an environment that includes competitive and non-competitive markets, federal and state regulatory jurisdictions, and a proliferation of new services made possible by technological advances. The purpose of the project is to produce research and analysis which will assist policy makers in making informed decisions.

The project is a neutral forum of communications industry stakeholders exploring multiple viewpoints of selected issues. This forum incorporates the following elements:

- **Broad representation:** The current forum includes local exchange carriers, interexchange carriers, materials and equipment manufacturers, and regulators. The project actively seeks expansion of this forum to include other communications industry representatives such as competitive access providers, cable television companies, computer companies, electric power utilities, and publishers.
- **Multiple viewpoints:** Participants are required to have an active role in the research and analysis, to represent their own interests, to understand and to assist in developing others' perspectives, and to work toward the common goal of representing multiple views.

I. Introduction, cont.

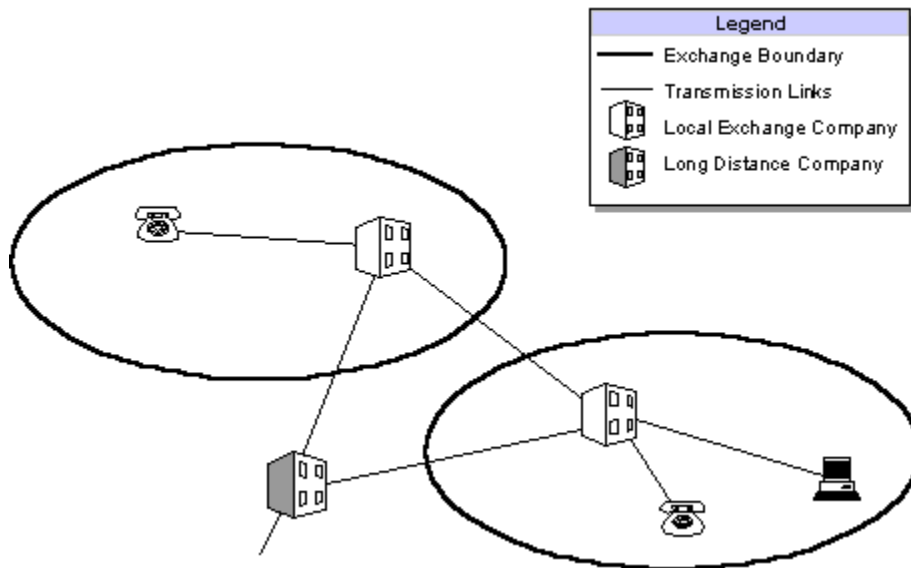
- **Analysis and results of alternative policies:** Research tools, including a jointly-produced data base and computer software models, and data analysis developed by this forum create a common language for examining issues. The common language allows the participants to focus on underlying issues. Appropriate computer software tools are developed, and existing tools are modified.
- **All data, analysis methods, and results are public:** Data used by this project must be publicly available on a nationwide basis. Research products become public domain information.
- **Neutral setting:** The project resides in a neutral setting, free of partiality, thereby ensuring objective and independent research.

What the Project has Done

The project has conducted public workshops at the national meetings of the telecommunications industry regulators. The project's research papers have been the basis for meetings with the Federal Communications Commission, Congressional staffs, the Congressional Research Service, and the National Telecommunications Information Administration.

The project has also produced a number of papers plus software modeling tools for the analysis of financial impacts of new technology deployment and of changes in the financial structures themselves.

II. Changes in Industry Boundaries



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Source: Adapted from Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock: The Need for a New Regulatory Response to Technological Change*, November 13, 1993, Figure 1, page 5.

Figure 1
Traditional View of Telecommunications Networks

Many assumptions about the future are based on the old world. Two assumptions from the old telecommunications world are affecting policies for competition, interconnection, pricing, and subsidies:

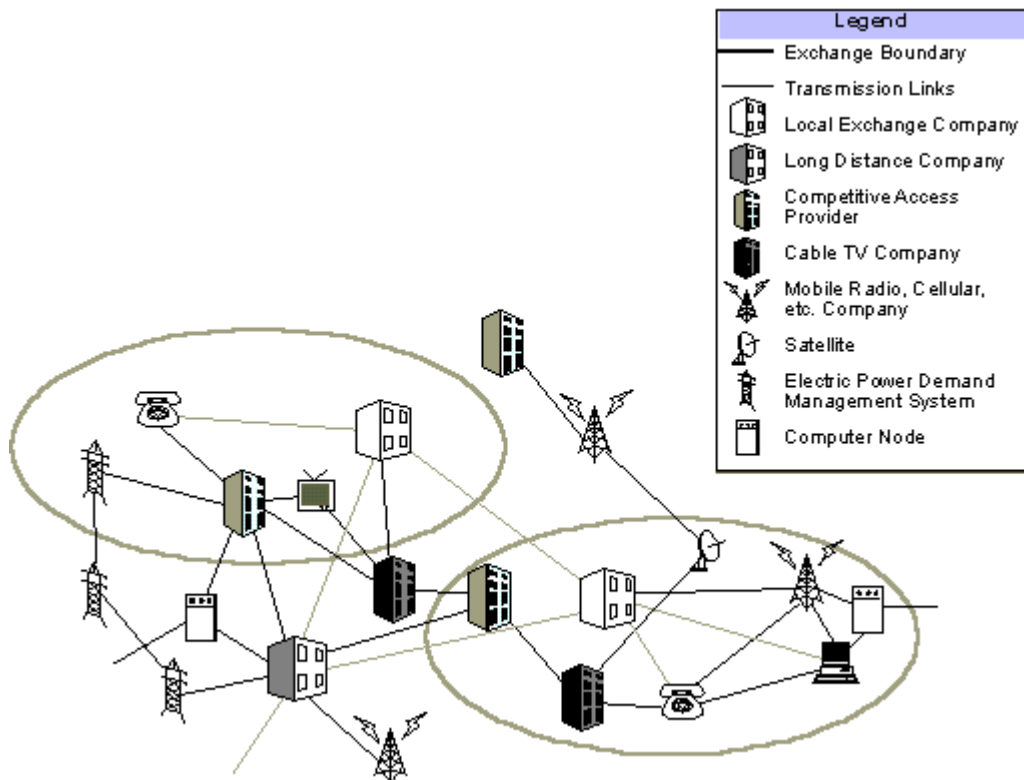
- ***Local exchanges and long distance are distinct markets.***

Local exchange companies provide networks for voice and data communications. These local exchange networks are connected to each other through long distance networks, also designed for voice and data communications.

- ***Single wire or connection for communications.***

Each home and business has one connection or wire — the telephone line — that allows instant communications with the outside world. Public policies restrict competition.

II. Changes in Industry Boundaries, cont.



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Source: Adapted from Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock: The Need for a New Regulatory Response to Technological Change*, November 13, 1993, Figure 1, page 5.

Figure 2
Current Environment - Multiple Networks

These assumptions based on the old world contradict two facts:

- ***Exchange boundaries are blurring.***

Local calling areas are growing larger, taking in markets that used to be long distance. Long distance companies are beginning to enter traditionally local markets. Local exchange companies are seeking to provide long distance.

- ***Multiple connections exist.***

There are multiple paths over which customers could communicate. The paths have different uses because of traditional industry lines. The networks serve some similar customer needs and are beginning to use similar technologies. Some networks do not follow the traditional boundaries. Also, some of the networks interconnect, and some do not.

II. Changes in Industry Boundaries, cont.

Traditional Industries	Publishing	Local Exchange Companies	Long Distance Companies	Cable TV	Television and Radio Stations and Networks	Computer Hardware and Software
Existing Government Policies	Copyright Cross-Ownership Restriction Antitrust	Cross-Ownership Restriction Antitrust Price Earnings and Entry Regulation Patents		Cross-Ownership Restriction Antitrust CATV Pricing Licensing, Franchising and Standards Federal and Local		Copyright 1956 Consent Decree Patents Licensing
Examples of Companies		MCI enters local market; MCI and Comcast invest in Nextel		AT&T purchase of NCR and McCaw Cellular; Partners with TCI		
		Southwestern Bell purchase of Hauser Communications				
		Cox owns the Atlanta Journal and Constitution; Cox and TCI buy Teleport				
		United purchase of Sprint and Centel		Microsoft and Intel develop two-way communications equipment for Cable TV		
				Prodigy, CompuServe, Internet, etc.		

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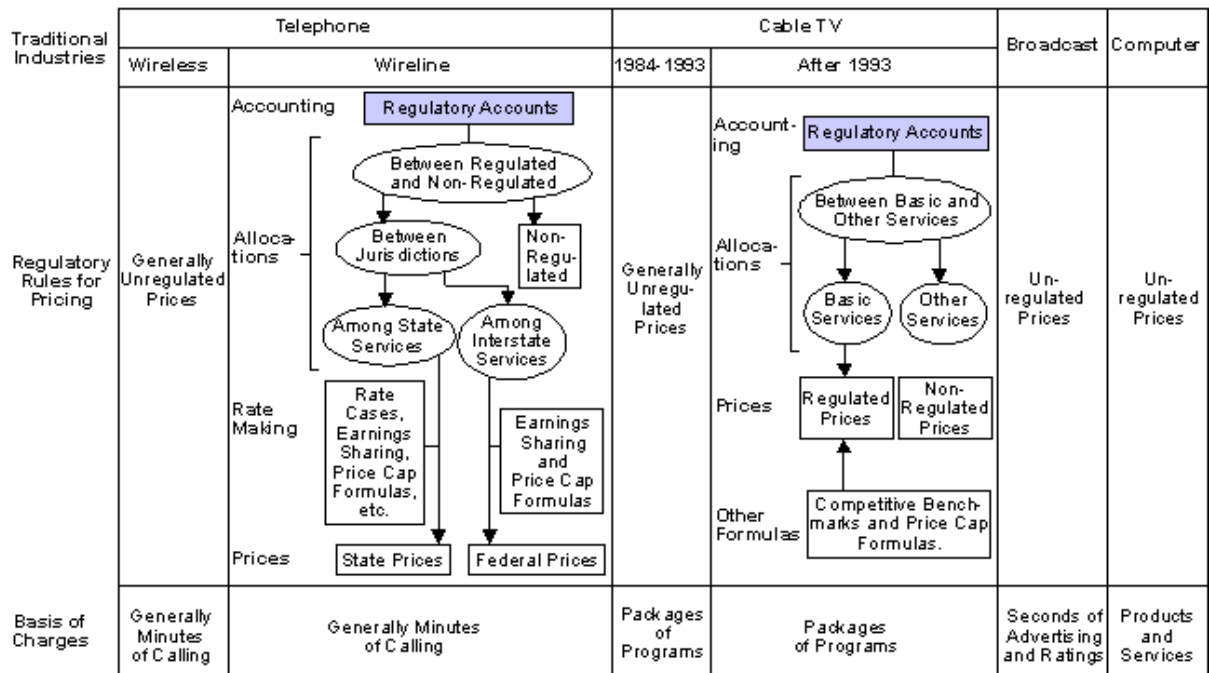
Source: Adapted from Weinhaus, Carol; Jamison, Mark; et al., Square Pegs and Round Holes: Mismatches Between Government Policies and Converging Communications Markets, Figures 4 and 5, pages 5-6.

Figure 3
Existing Government Policies, Traditional Industries, New Alliances

Different public policies were developed for each traditional communications industry - publishing, telecommunications, broadcast/cable TV, and computer. These industries are no longer separate.

- Communications companies - publishing, telecommunications, broadcasting/cable TV, and computer - developed within the traditional industry boundaries. These boundaries were determined by technology and, in some instances, reinforced by public policy.
- Public policies developed along these traditional industry boundaries. Policies for each industry were based on assumptions about technology, markets, and industry boundaries.
- Today, companies are crossing traditional industry boundaries to form new hybrids. These companies use technologies that allow products and services to become increasingly interchangeable.
- Public policy continues to treat each industry's products and services differently, depending on the traditional regulation of the industry. In some instances, public policies create artificial barriers between industries.

III. Differences in Pricing Policies



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Figure 4
Different Regulatory Rules for Pricing in Traditional Communications Industries

Regulatory pricing policies differ for each of the traditional communications industries. As companies enter each others' markets, different regulatory policies apply to essentially substitutable services. This makes it difficult to develop new services that combine telephone, cable TV, broadcast, and computer.

- **Unregulated prices**

Wireless telephone (cellular, mobile radio, etc.), broadcast radio and television, and computer are generally unregulated.

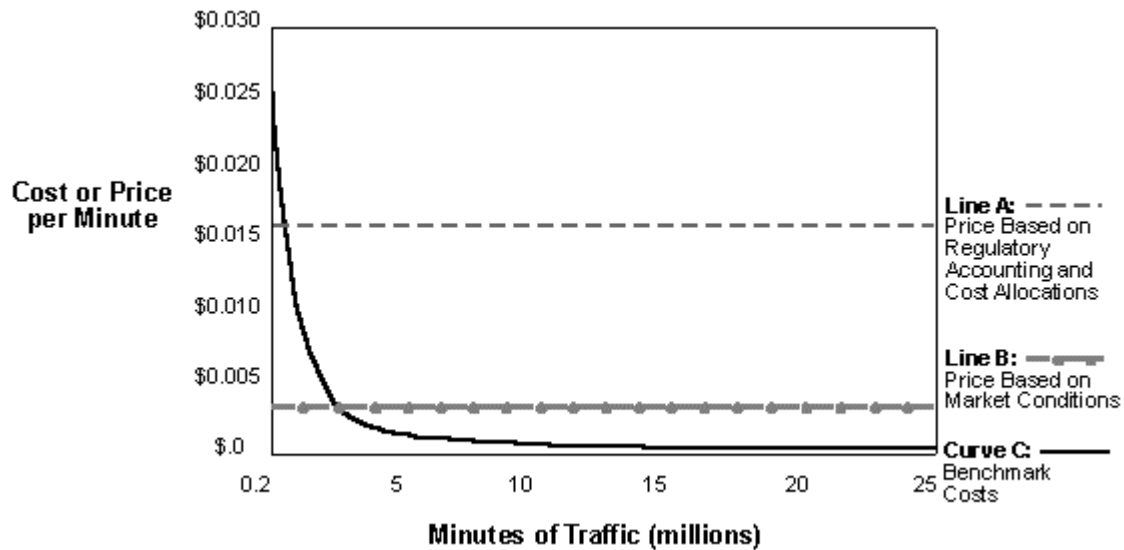
- **Prices based on cost allocations**

Telephone companies have been regulated as monopoly utilities. Prices are based on profits, telephone cost allocations, policy goals, and inflation indices. Paradoxically, the emergence of competition has led to more detailed regulation.

- **Prices based on benchmarks, service bundles, and cost allocations**

From 1984 to 1993, cable TV prices were generally unregulated. Now cable TV prices are regulated according to benchmarks, cable TV cost allocations, service bundles, and inflation indices.

III. Differences in Pricing Policies, cont.



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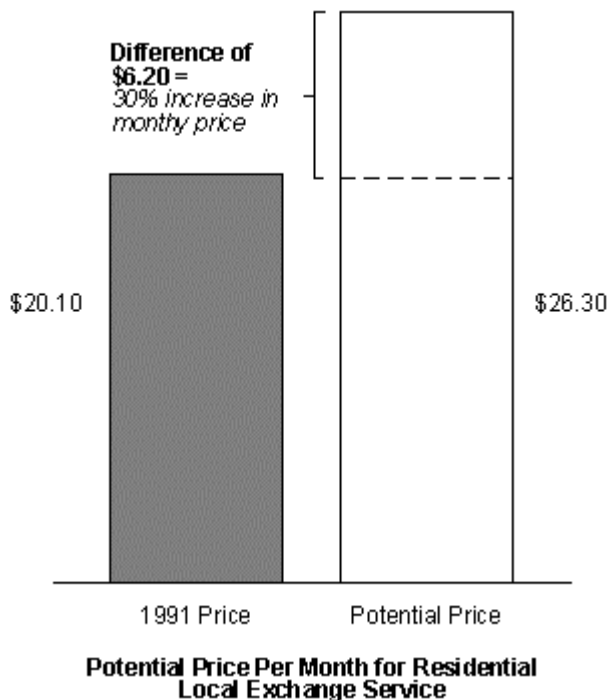
Source: Adapted from Weinhaus, Carol; Jamison, Mark; et al., *New Wine and Old Wineskins: Modeling Effects of Competition and Expanded Interconnection in the Local Exchange*, July 27, 1992, Figure 21, page 38.

Figure 5
Comparison of Pricing: Current Telephone Industry Costs versus Regulatory Accounting Costs

Traditional pricing rules for telephone companies can send false signals to markets.

- Traditional prices in telecommunications are often higher than underlying costs due to regulatory subsidy and pricing policies. **Line A** shows a nationwide average price for a telephone company service - local transport - before competition entered the market.
- **Curve C** is a benchmark for the cost of local transport. This benchmark could represent costs for new competitors. The benchmark was significantly below the original regulated price.
- When competition entered this market, telephone companies and regulators lowered the telephone companies' prices to make it easier for telephone companies to compete (**Line B**).
- The difference between the old price (**Line A**) and the new price (**Line B**) represents a decrease in telephone company revenues. To make up this revenue decrease, telephone companies raised other prices and cut costs.

III. Differences in Pricing Policies, cont.



Note: Prices include existing subscriber line charge. Potential price assumes a loss of 30% of business market share and that business prices decrease to their underlying costs.

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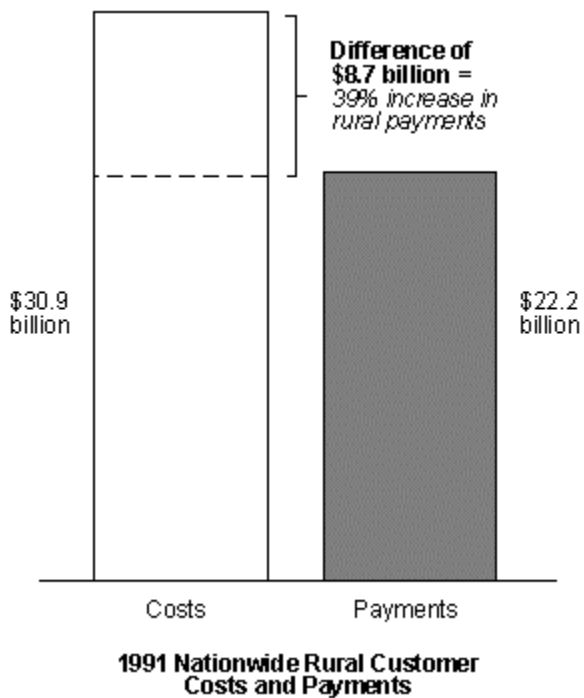
Source: Adapted from Weinhaus, Carol; Jamison, Mark; et al., *New Wine and Old Wineskins: Modeling Effects of Competition and Expanded Interconnection in the Local Exchange*, July 27, 1992, pages 32, 47, 55, 57, 59, and 63.

Figure 6
Potential Effects of Shifting Costs to Captive Customers

The current regulatory pricing system for telephone companies is based on recovering past costs.

- When competition enters a market, telephone company revenues initially decrease because of price decreases and decreases in market share. This revenue loss is often made up in part by price increases in less competitive markets. This price increase protects telephone company revenues. However, it also invites competition into these remaining non-competitive markets.
- The traditional pricing system causes price increases in markets where there is no competition. For example, repricing and a 30% loss of market share in business exchange services would cause a 30% increase in prices for residential customers. This might threaten universal service. In other instances, competitors pay part of the revenue loss. This hinders competition.

III. Differences in Pricing Policies, cont.



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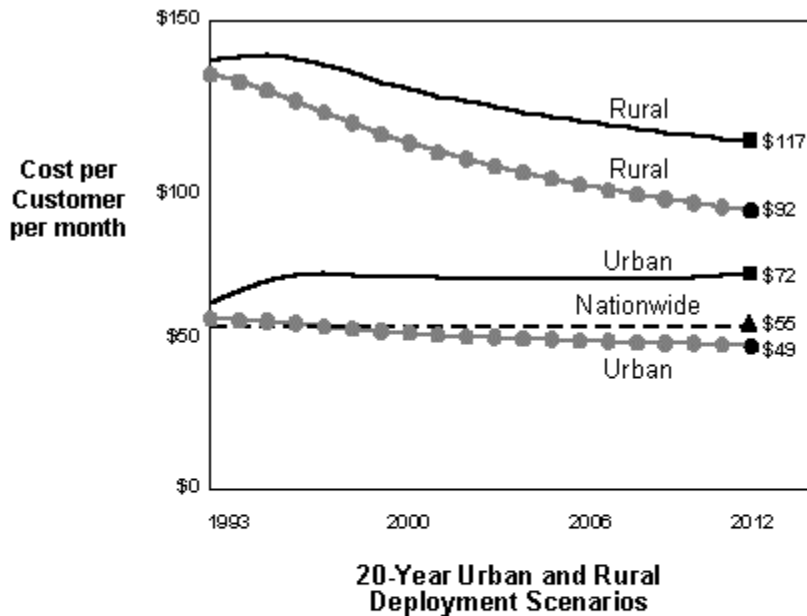
Source: Adapted from Weinhaus, Carol; Makeeff, Sandra; et al., What is the Price of Universal Service? Impact of Deaveraging Nationwide Urban/Rural Rates, July 25, 1993, Figure 3, page 11.

Figure 7
One Potential Effect of Deaveraging

Traditional telephone practices keep prices for rural customers low since urban customers pay for a portion of the cost of rural telephone service. These practices are called price "averaging" — prices are averaged across areas with higher costs and areas with lower costs. Averaging was possible because there was no competition.

- Competition in lower cost areas is increasing pressure to deaverage prices. Customers in these areas are beginning to have competitive alternatives that allow them to avoid the higher prices caused by the averaging process.
- A potential effect of urban/rural deaveraging is that prices paid by rural customers increase to cover the costs of rural telephone service. If this occurs, prices in rural areas would increase \$8.7 billion, or 39% (1991 dollars).
- Higher prices in rural areas have implications for universal service, for rural economic development, and for the ability of rural customers to access advanced communications services.
- In 1991, rural consumers spent approximately 2.4% of their household budgets on telephone service.

IV. New Technologies and Traditional Policies



<p>Line A: ■ Cost for Modern Telephone Network Also Carrying Broadband Services</p>	<p>Line B: ▲ 1992 Telephone Revenues per Telephone Line</p>	<p>Line C: ● Cost for Modern Telephone Network Carrying Just Traditional Telephone Services</p>
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Note: Assumes a 2.35% annual growth in nationwide access lines. Line A: Each year the total number of lines equipped to provide broadband services increases by 5% of the total lines. Line B: Derived from Total Tier 1 local exchange carrier operating revenues (including basic service, state toll, and access).

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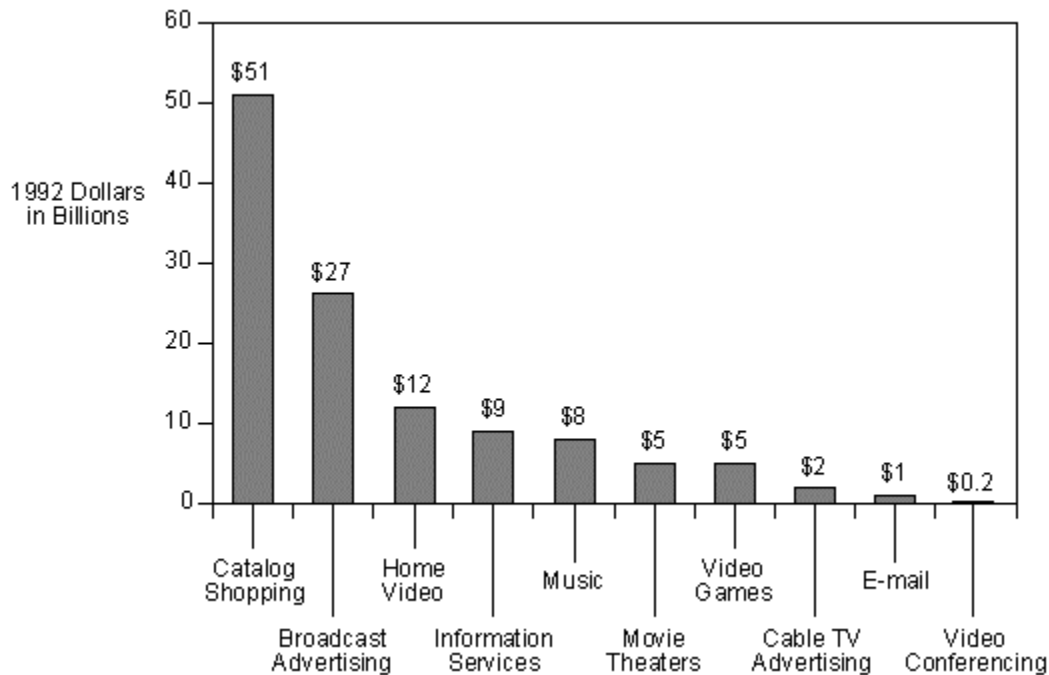
Sources: Data from revised version of New Technology Deployment Model, Weinhaus, Carol; Garbanati, Linda; et al. Adapted from methods developed in Weinhaus, Carol; Pitts, Teresa; et al., Beyond Future Shock: Need for a New Response to Technological Change, November 13, 1993, Figures 4 and 6, pages 21 and 25.

Figure 8
Cost of Local Exchange Company Deployment of Broadband: Urban and Rural

New technologies make it possible to offer more services over telephone networks. But old rules make it difficult for this to happen by limiting the services that can be provided.

- Existing telephone revenues on average (**Line B**) are adequate to cover the cost of building and maintaining modern (fiber optic infrastructure) telecommunication networks in some markets (**Urban, Line C**), but only if the networks provide just traditional telecommunications services. In other markets deployment costs require revenues from additional services (**Rural, Line C**).
- Upgrading these modern telecommunications networks to actually carry broadband services increases costs (**Urban and Rural, Line A**). New revenues from broadband services will be needed to cover these additional costs.

IV. New Technologies and Traditional Policies, cont.



Note: The catalog shopping number includes the gross cost of goods, and some small percentage of this \$51 billion would apply to communications.

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Sources: Weinhaus, Carol; Pitts, Teresa; et al., Beyond Future Shock: Need for a New Response to Technological Change, November 13, 1993, Figure 10, pages 33 and 79. Also, Miller, Matthew D., "A Scenario for the Deployment of Interactive Multimedia Cable Television Systems in the United States in the 1990s," Proceedings of the IEEE, Vol. 82, No. 4, April 1994, page 585.

Figure 9
Potential Markets for Interactive Multi-Media

New revenues from broadband services will be needed to cover the additional costs of broadband networks.

- New services could include catalog sales, movies, video games, and more. Some of these services exist today in other forms. Some portion of their existing revenues could be used to cover the costs of the new networks.
- Public policy barriers limit access to these revenues:
 - Cable TV and other companies are restricted in their ability to integrate these services with traditional telephone services.
 - Except in some rural areas, traditional telephone companies are restricted from obtaining revenues by providing cable TV programming.

IV. New Technologies and Traditional Policies, cont.

	Wireless	Wireline	Cable TV	Broadcast	Computer
Basis of Charges:	Generally Minutes of Calling	Generally Minutes of Calling	Packages of Programs	Seconds of Advertising and Ratings	Products and Services
Who Pays?					
Receiving Customers	x	x ^a	x		x
Sending Customers	X	x			x
Advertisers			x	x	^b
Program Providers		x ^c	x	x ^d	x ^e
Network Providers	x	x	x	x	x
Tax Payers				x ^f	x ^g

- Notes: ^aOnly with 800 or similar services.
^bGenerally not, but Prodigy, for example, is an exception for the computer industry because advertisers pay to use their service.
^cSome call-in services pay network providers.
^dProgram provider pays local station in addition to sharing advertising revenues.
^ePrivate contracts.
^fPublic broadcasters.
^gTax payers help pay for part of the Internet.

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Figure 10
Comparison of Different Communications Industries' Pricing Structures

There are differences in how the traditional industries price their products and services.

- Telecommunications services are generally priced on a per-minute basis. The person making the call traditionally pays for the call, except in the case of 800-number calls or collect calls. In some instances, customers may also pay content providers such as computer (CompuServe or America Online) and 900-number services.
- Cable TV programs are packaged. Viewers generally pay monthly fees, but pay-per-view is also available. Cable TV companies pay for programs.
- Broadcast radio and television charge advertisers. Viewers are not charged. Broadcasters pay for programs.
- Computer companies charge customers for products and services.

IV. New Technologies and Traditional Policies, cont.

	Services are Changing	Old Tools	New Tools
Old	Basic local Service Long distance Access for long distance companies Directory listings Yellow pages Data services Calling features Operator services Unlisted numbers Inside wire Telephone sets Caller Identification Blocking telemarketing Calling cards Billing and collecting Teleconferencing Electronic directories Cellular Voicemail Fax mailboxes Gateways Online services File sharing Set top boxes Video conferencing Voice response	Accounting Audits Cost allocation Rate of return limitations Barriers to entry Provider of last resort Subsidies	Accounting Audits Cost allocations Barriers to entry Provider of last resort Subsidies Incentive regulation Price caps Competition Open networks
New			

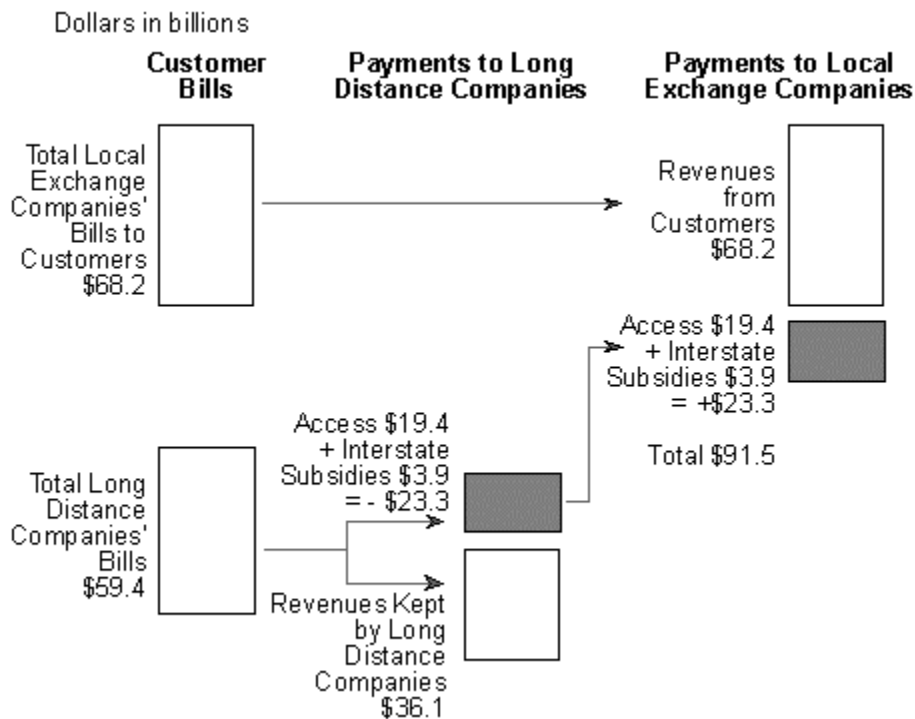
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Figure 11
Public Policies for Telecommunications Services

Old structures for public policy are being applied to new services.

- Traditional telephone services were primarily basic local exchange service and long distance services. Public policy focused on price and profit — public policy used accounting and complex cost allocations to keep prices for basic service low and telephone companies profitable - but not too profitable.
- New telecommunications services and technologies are being introduced all the time. National public policy now emphasizes new services, competition, and privacy. Traditional regulatory frameworks were not designed for these new objectives.

V. Vested Interests in the Current System



Note: Subsidies shown are explicit interstate subsidies only. Access is state and interstate.

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Source: Adapted from models used in Weinhaus, Carol; Makeeff, Sandra; et al., Who Pays Whom? Cash Flow For Some Support Mechanisms and Potential Modeling of Alternative Telecommunications Policies, November 15, 1992, Figure 7, page 14. Data from Federal Communications Commission, 1991/1992, and United States Telephone Association, 1992.

Figure 12
1992 Cash Flow for Some Support Mechanisms

Changing traditional boundaries is difficult because existing business and financial interests are threatened.

- Traditional industry boundaries created local exchange companies and long distance companies. These two types of companies are interdependent, and this creates tensions. Approximately 45% of the long distance companies' costs are payments to potential competitors - local exchange companies. Local exchange companies, dependent on long distance for large portions of their revenues, are concerned about competition from long distance companies.
- Public policies created a payment system to promote things people wanted. Some explicit subsidies from long distance companies to local exchange companies are shown above.
- These and other subsidy mechanisms are inconsistent with the new competitive environment. Customers and companies who pay subsidies look for ways to avoid them.
- Existing subsidy payments favor some companies over others. The favored companies have a financial stake in preserving the current system.

VI. Conclusion

Conclusion

There is a need for a new framework for communications policies. Traditional policies are based on industry boundaries and old technologies that no longer apply. These policies also set prices on a paradigm - one of separate monopolies for local telecommunications and cable TV - that is quickly becoming outdated. If policy changes are not made, gains of the past, such as universal service, will be threatened; expectations for the future, such as new technology deployment, may not be achieved.

The changes in communications markets and technologies are occurring rapidly. New policies and transitions must be developed quickly and implemented by the appropriate groups. Otherwise, there could be large dislocations of customers, companies, and governments. Incremental changes to the current system will fail.

This paper provides a foundation for other project papers on new frameworks for communications policies. Each of these papers presents one option or idea for a new framework. Policy makers in government and industry must look at each idea and weigh the consequences against their own objectives.

VII. Sources

Sources for Figures

For copies of publications by the Telecommunications Industries Analysis Project, please contact Carol Weinhaus, the project director, at the following address: Meeting House Offices, 121 Mount Vernon Street, Boston, MA, 02108; telephone: 617/367-6909; fax: 617/367-7127.

Figure 1:

Adapted from Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock: The Need for a New Regulatory Response to Technological Change*, Telecommunications Industries Analysis Project, Center for Telecommunications Management, University of Southern California, November 13, 1993, Figure 1, page 5.

Figure 2:

Adapted from Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock*, Figure 1, page 5.

Figure 3:

Adapted from Weinhaus, Carol; Jamison, Mark; et al., *Square Pegs and Round Holes: Mismatches Between Government Policies and Converging Communications Markets*, Telecommunications Industries Analysis Project, Center for Telecommunications Management, University of Southern California, Figures 4 and 5, pages 5-6.

Figure 4:

For local telephone companies and for cable TV companies the regulatory process is much more complicated than indicated in the diagram. Federal, state, and local jurisdictions all come into play in the oversight of these industries. In addition, there are further subdivisions of the service categories, each with their own rules.

Figure 5:

Adapted from Weinhaus, Carol; Jamison, Mark; et al., *New Wine and Old Wineskins: Modeling Effects of Competition and Expanded Interconnection in the Local Exchange*, Alternative Costing Methods Project, Program on Information Resources Policy, Harvard University, July 27, 1992, Figure 21, page 38.

VII. Sources, cont.

Figure 6:

Adapted from Weinhaus, Carol; Jamison, Mark; et al., *New Wine and Old Wineskins*, pages 32, 47, 55, 57, 59, and 63.

Figure 7:

Adapted from Weinhaus, Carol; Makeeff, Sandra; et al., *What is the Price of Universal Service? Impact of Deaveraging Nationwide Urban/Rural Rates*, Telecommunications Industries Analysis Project, Center for Telecommunications Management, University of Southern California, July 25, 1993, Figure 3, page 11.

Percent of Household Budgets: Federal Communications Commission, Common Carrier Bureau, *Reference Book: Rates, Price Indices, and Household Expenditures for Telephone Service*, Washington, DC, May 1993, Table 7, page 34; and *What is the Price of Universal Service?*, Figure 5, page 14.

Figure 8:

Data from revised version of *New Technology Deployment Model*, Weinhaus, Carol; Garbanati, Linda; et al., Telecommunications Industries Analysis Project, Public Utility Research Center, University of Florida, June 7, 1994.

Chart adapted from methods developed in Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock*, Figures 4 and 6, pages 21 and 25; cumulative investment based on pages 29 and 30. The cost per line is based on a specific architecture and deployment schedule. Other technologies, policy changes, and deployment schedules would result in a higher or lower cost per line.

Definitions for Figure 8:

- Line A: Cost for Telephone Network Carrying Broadband Services:**
100% broadband capable and 100% broadband equipped lines.
For a customer to receive broadband services (beyond the ONU), additional costs over those associated with converting an access line to being broadband capable are required. Since a line must be broadband capable in order to be equipped, equipped lines are a percent of only those lines that are already broadband capable.

VII. Sources, cont.

Line B: 1992 Telephone Revenues per Telephone Line:

Derived from total Tier 1 local exchange carrier operating revenues (including basic service, state toll, and access). See pages 75 and 76 for development of \$54.72 for the 1992 cost per line per month.

Line C: Cost for Modern Telephone Network Carrying Just Traditional Telephone Services:

100% broadband capable and 0% broadband equipped lines.

Broadband capable means that a wire center and its associated copper lines are converted to a broadband switching capability out to the optical network unit (ONU). All customers subscribing to narrow-band services will continue receiving these services. See page 22.

Cumulative Investments:

Figure 8 looks at broadband deployment on a monthly per line basis. This cost per line includes overheads and other costs. Another way to look at the cost of broadband deployment is to examine different scenarios for the investment output. The investment for providing the fiber optic infrastructure, **Figure 8, Line C** (100% capable and 0% equipped), produces a cumulative nationwide investment of \$233 billion over 20 years. This \$233 billion is the estimated cost for the entire network - including loop, switching, and interoffice transport for both business and residential customers. The components of the \$233 billion for urban and rural deployments are as follows:

		Cumulative Investment, 20-Year Deployment 100% Capable, 0% Equipped			
		Urban		Rural	
		Dollars in Billions:	Percent of Total:	Dollars in Billions:	Percent of Total
Line:	Investment Categories				
1	Loop Electronics	62.0	51.4%	18.7	16.6%
2	Cable and Wire	34.0	28.2%	86.1	76.6%
3	Circuit Equipment	24.3	20.1%	6.2	5.5%
4	Digital Switching	0.4	0.3%	1.4	1.2%
5	Total	120.7	100.0%	112.4	100.0%

VII. Sources, cont.

The investment for providing broadband services, **Figure 8, Line A** (100% capable and 100% equipped), produces a nationwide investment of \$424 billion dollars. This \$424 billion is a conservative estimate that overstates the costs due to the selected technology platforms and the deployment schedules used in the model. The components of the \$424 billion for urban and rural deployments are as follows:

		Cumulative Investment, 20-Year Deployment 100% Capable, 100% Equipped			
		Urban		Rural	
Line:	Investment Categories	Dollars in Billions:	Percent of Total:	Dollars in Billions:	Percent of Total
1	Loop Electronics	121.7	43.5%	29.6	20.6%
2	Cable and Wire	34.0	12.2%	86.1	59.8%
3	Circuit Equipment	25.6	9.2%	6.4	4.4%
4	Digital Switching	98.3	35.2%	21.9	15.2%
5	Total	279.6	100.0%	144.0	100.0%

A 1992 benchmark of \$21 billion per year in additional investment for local exchange carrier facilities over 20 years results in a cumulative investment of \$440 billion if current spending levels continue (see *Beyond Future Shock*, pages 29 and 30). There is a \$207 difference between current spending levels and providing the fiber optic infrastructure. There is a \$16 difference between current spending levels and equipping everyone for broadband services.

Other Modeling Assumptions:

The default assumption for access line growth was revised from 3% in *Beyond Future Shock* to 2.35% in this paper. In the model, the point at which the capable curves cross the 1992 revenue line is sensitive to the percent of access line growth.

It should also be noted that both rural and urban scenarios represent averages. In reality, the decision to deploy broadband is determined by a number of individual market characteristics such as access line growth, length of lines (affects cost of technology), company costs, and demographics. Normally a local exchange carrier performs a cost-benefit analysis to determine where and when the new technology should be deployed. In some cases, the decision to deploy a particular technology would be made even if it were not immediately economically justifiable.

X. Appendix B: Background for LEC Cost Categories

However, it would be expected that a service would be deployed with an established demand and a plan for cost recovery.

Figure 9:

Weinhaus, Carol; Pitts, Teresa; et al., *Beyond Future Shock*, Figure 10, pages 33 and 79.

Multi-Media Services: *The Wall Street Journal*, May 19, 1993, page A4.

Broadcast Advertising: *The Wall Street Journal*, May 19, 1993, page A4.

Cable Television Data: National Cable Television Association, *Cable Television Developments*, Washington, DC, May 1992. See page 9-A for advertising revenues.

Telephone Directory Advertising: FCC, *ARMIS 43-04 Reports (ARMIS Access Report, for Tier 1 local exchange carriers. Data Specifications and reporting requirements are described in the Automated Reporting Requirements for Certain Class A and Tier 1 Telephone Companies (Part 31, 43, 67, and 69 of the FCC's Rules), Errata, CC Docket 86-182, DA 90-30, Released January 16, 1990.*

Also, Miller, Matthew D., "A Scenario for the Deployment of Interactive Multimedia Cable Television Systems in the United States in the 1990s," *Proceedings of the IEEE*, Vol. 82, No. 4, April 1994, page 585.

Figure 12:

Adapted from models used in Weinhaus, Carol; Makeeff, Sandra; et al., *Who Pays Whom? Cash Flow For Some Support Mechanisms and Potential Modeling of Alternative Telecommunications Policies*, Program on Information Resources Policy, Harvard University, November 15, 1992, Figure 7, page 14.

Figure 13:

Weinhaus, Carol; Ralston, Teresa; et al., *Breaking the Mold: Changing Policies to Meet Customer Needs*, Telecommunications Industries Analysis Project, Center for Telecommunications Management, University of Southern California, , July 25, 1993, Figure 12, page 35. Adapted from Nadel, Mark, "U.S. Communication Policymaking: Who and Where," *Hastings Communications and Entertainment Law Journal*, Vol. 13, Winter 1991, page 290