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**Strategic Liberalization:
Development Through Competition
in Wireless Communications**

**In Fulfillment of the Ph.D. Dissertation
Requirements of the Fletcher School of
Law and Diplomacy**

**Submitted on March 1, 1996
by Brian Regli**

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Table of Contents

Abstract	Page 1
Preface: Interesting Times in the Telecommunications Industry	Page 2
Chapter 1: Competition and Development	Page 7
1. The Problem of Development	Page 8
2. Development as Institutional and Structural Change	Page 11
3. The Theory of Strategic Liberalization	Page 32
4. Reconstructing Liberalization: Taking Advantage of New Opportunities	Page 43
Chapter 2: Telecommunications and Development	Page 47
1. The Legacy of Government Involvement in the Telecommunications Industry	Page 48
2. Linking Telecommunications to Development	Page 78
3. Institutional Constraints and Market Competition in Telecommunications Development: A Historical Perspective	Page 85
4. Conclusions: Sustainable Institutions and Effective Competition	Page 95
Chapter 3: Wireless Communications: A Foundation for Competition and Development	Page 97
1. The Evolution of Wireless Access Services	Page 97
2. Technologies, Markets and Politics: Defining Service Models for Wireless Access	Page 118
3. The Marketplace for Wireless Access: Creating New Economic Institutions	Page 140
4. Strategic Liberalization: The Challenge for Regulators	Page 153
5. Wireless Access for Strategic Liberalization: A New Service Model	Page 163
Chapter 4: Across the Spectrum: Case Studies and Areas of Analysis	Page 166
1. Choosing Case Studies	Page 167
2. Comparing the Performance of Telecommunications Systems: A Quantitative Analysis of the Four Case Study Countries	Page 169
3. Connecting the Theory of Strategic Liberalization to Case Study Examples	Page 187
4. Strategic Liberalization and Institutional Change	Page 190

Chapter 5: Through These Portals: Strategic Liberalization in the American Context	Page 192
1. The American Market for Telecommunications Services	Page 194
2. Wireless Access in the American Context	Page 212
3. Strategic Liberalization in the American Context	Page 233
4. Conclusion: Service Through Wireless Portals	Page 241
Chapter 6: Strategic Liberalization in the UK: Defining the Insitutional Consensus	Page 242
1. The History of Telecommunications in the United Kingdom	Page 243
2. Wireless Communications in Britain	Page 268
3. Strategic Liberalization in the UK	Page 290
4. Conclusions	Page 294
Chapter 7: Strategic Liberalization for Russia: Establishing an Open Communications Environment	Page 295
1. Understanding the Russian Telecommunications Industry	Page 298
2. Overcoming Barriers and Constraints to Implementing a Strategic Liberalization Program in Russia	Page 314
3. The Opportunities for Wireless Access in Russia	Page 322
4. Conclusions: Making the Grass Roots Development Model Work in Russia	Page 330
Chapter 8: Defining the Procedural Entente: Strategic Liberalization in Brazil	Page 332
1. The History of Brazilian Telecommunications	Page 334
2. Wireless Communications in Brazil	Page 356
3. Strategic Liberalization for Brazil	Page 362
4. Conclusions	Page 367
Conclusion: Welcome to the Jungle	Page 368
Bibliography	Page 382

Strategic Liberalization: Development Through Competition in Wireless Communications

Abstract

The continuing transformation of the telecommunications industry requires new institutional responses from the public and private sector. This thesis describes how public and private sector institutions can navigate in an increasingly complex marketplace through a policy of strategic liberalization. Strategic liberalization is defined as the implementation of specific measures to increase competition in the market for wireless access services, such as cellular, wireless local loop and satellite communications. This thesis argues that a strategic focus on wireless communications will provide a sustainable foundation for the continued growth of the telecommunications sector and the successful introduction of new products and services in an environment of facilities-based competition.

An extensive review of existing research in telecommunications policy and comparative economic and political development provides the foundation for the articulation of this policy. New conceptual findings regarding the history of wireless communications and its effect on competition in the telecommunications sector are also presented. The thesis also examines telecommunications development and the potential impact of a strategic liberalization policy in four specific countries: The United States, The United Kingdom, Russia and Brazil. In each case study, the thesis uses primary research and additional historical analysis to show how the policy of strategic liberalization can change the course of telecommunications development. Finally, the conclusion of the thesis points to further directions for analysis and discussion in the ongoing conversation on the future of global telecommunications development.

Preface:

Interesting Times in the Telecommunications Industry

May you live in interesting times, the old Chinese curse goes. For corporate managers and government policy makers throughout the world, our interesting times might certainly be seen more as a curse than a boon. The institutions which have been constructed to provide telecommunications and information services to the people of the world are under increasing pressure. The pressure from customers is evident in both the developing and developed world: Improve the quality of existing services, lower the cost and make advanced services more accessible to everyone. At the same time, new technologies are quickly making parts of the traditional telecommunications network obsolete. The development and introduction of new services requires a further institutional transformation for the world's private and public telecommunications providers. So there are forces driving the transformation of public and private institutions in the sector, affecting both the nature of demand for telecommunications and information services and the means by which these services are supplied.

It has not always been this way. Since the inception of public telephone and telegraph service in the middle of the 18th century, the primary models for the development of national and global telecommunications networks have been dictated by economies of scale and national interests. Centralization and monopoly have been the key, resolving the problems of both supply and demand in a neat, tightly regulated package. But we live in a world which can no longer sustain that paradigm of development, and the well rehearsed debate about the importance of economic intervention by government and the value of free-market policies offers limited direction in these interesting times.

Competition and Development: Defining the Basis for Policy

We have to get back to basics and define the basis for policy in terms of two issues central to the future of the telecommunications sector: Competition and development. This thesis has been written to make a contribution to this conversation about the role of government in the telecommunications industry, written from the perspective of both telecommunications policy research and the theoretical tradition of comparative economic and political development. By drawing on both of these

perspectives, our goal is to develop a new conception of how the telecommunications sector can evolve towards a more open, market-driven model for the provision of services.

Particular parts of both of these traditions will be central to our discussions, especially in the first chapter as we attempt to define a more market-driven approach to the provision of infrastructure services in general and telecommunications services in particular.

Nevertheless, it is important that the basic orientation of this thesis be made clear from the outset. This thesis will argue that enhancing and expanding competition in the telecommunications market is a critical part of the ongoing attempts by the countries of the world to foster telecommunications development. From there, the thesis goes one step further. Certain kinds of competition are more likely to connect telecommunications development to the traditional goals of national development, such as reductions in the incidence of poverty and increases in the resources made available to the members of each nation's citizens.

Our starting point for an analysis of the various kinds of possible competitive models for the development of the telecommunications sector is the public and private institutions responsible for providing services. The thesis argues that certain kinds of institutional arrangements will allow service providers to sustain themselves in the marketplace. By combining microeconomic and management theory with comparative politics, we hope to understand the dimensions of institutional evolution and the impact of new technology on institutional structure and practice.

The grounds for asserting the validity and importance of a competitive telecommunications policy are based in a specific conception of economic and national development in the modern age. Even with all of these troubles and concerns validly expressed by a variety of political and social interests, we are living in an age where existing political institutions are less and less able to manage resources and positively affect social development. Public policy rooted in competitive principles can foster the necessary impetus for investment in and participation through the telecommunications network, which, in turn, will allow people to gain access to further economic and political benefits. In addition, the policies for the next generation of telecommunications development need to take advantage of the specific social, economic and technological changes driving change in the provision of telecommunications and other infrastructure services worldwide.

*Competition in the Telecommunications Industry:
The Role of Wireless Communications*

The policy articulated in this thesis is called strategic liberalization. Strategic liberalization is defined as the implementation of specific policy measures to increase competition in the market for wireless access services, such as cellular, wireless local loop and satellite communications. This thesis argues that a strategic focus on wireless communications will provide a sustainable foundation for the continued growth of the telecommunications sector and the successful introduction of new products and services in an environment of facilities-based competition. But why should public and private sector managers place a strategic focus on wireless communications, as opposed to the variety of other possible access technologies and service offerings that may be made available in an increasingly competitive market?

As the research which is examined in the second and third chapters of this thesis makes clear, examples of competition in the telecommunications sector are few and far between. Only recently have governments been open to the possibility of a fully competitive marketplace for access to telecommunications services, but, even today, competition policy is constrained by a belief prevalent among many regulators and industry participants that facilities based competition is not desirable or economically sustainable. The cost of constructing and supporting new service infrastructures are thought to be far too great. Therefore, most competitive models for the telecommunications industry are based on interconnection pricing and arcane legal disputes, not on providing better services and lower cost.

Wireless communications is the exception. While officials have hotly debated the privatization and deregulation of traditional telephone monopolies, wireless communications systems, such as cellular telephony in the United States, have developed in an environment which can serve as the foundation for open competition. This is because of one simple fact: The competition between providers is facilities-based. This thesis shows that wireless communications companies have been compelled by technological and economic necessity to behave as competitive firms in competitive markets, funding the construction of their own infrastructure and reaching out directly to customers through their own service platform. In turn, wireless communication has become a direct competitor to the traditional wireline form of telecommunication services, opening new opportunities to introduce competition into a marketplace where little has existed before.

The growth of wireless communications represents a fundamental shift in the telecommunications industry. Since the invention of the telephone and the growth of telephone networks throughout the world, telecommunications has been defined by wires. Providing access to services has meant stringing a wire from an established network to a given location, then connecting the new subscriber at that location. Wireless access dramatically changes how telecommunications companies can provide access to consumers, and the results are already evident in much of the developing world. Instead of waiting a year for a wire to connect them to the traditional telephone network, a residence or business subscriber can be connected almost immediately to a wireless network regardless of the country's stage of infrastructural development.

Our discussions lead us to a central argument for this thesis: Telecommunications platforms based on wireless architectures represents the only possible opportunity for full, open and direct competition between a variety of service providers. The economics of wireline access and the politics of interconnection between providers make it extraordinarily difficult to establish competitive environment. Multiple wireless service platforms, which integrate wireless access to the telecommunications network with a broad variety of services, represent the best option for true competition in the telecommunications sector.

Adopting such a vision for the future of telecommunications development is a critical part of the overall struggle to establish a sustainable framework for national and global development. There is a clear correlation between the development of a country's telecommunications capacity and such dependent variables as productivity, economic growth, and improved living conditions. More access and better service will have an impact in all of these areas. That is what wireless communications systems can potentially provide, and, in brief, why the policy of strategic liberalization points to wireless access as a mechanism for achieving the goals of national development through increased competition and investment in the telecommunications infrastructure.

The Organization of the Thesis

The thesis is separated into two sections. The first section is divided into four chapters and articulates a policy of strategic liberalization for the global telecommunications infrastructure. The first chapter discusses the theoretical underpinnings of the strategy as they relate to development theory in general and competition in the provision of infrastructure services in particular. The second chapter applies the theory to the telecommunications sector, pointing out the specific links between investment in

telecommunications and national development. The third chapter characterizes the market for wireless access services worldwide and connects the policy of strategic liberalization to wireless access. The fourth chapter discusses our specific case studies in light of the telecommunications performance of a wide range of countries and companies.

The second section is devoted to a discussion of four specific case studies: the United States, the United Kingdom, Russia and Brazil. Each of these countries face unique challenges in establishing open and competitive environments for the provision of telecommunications services. By examining in depth the realities and potential opportunities for the use of wireless access in spurring competition in each of these countries, we will be able to ground our policy proscriptions in specific contexts.

In outlining the opportunities for strategic liberalization, the purpose of this thesis is to describe a policy that can be of use to both corporate and public sector managers. As such, the foundations for the policy proscriptions are based in a combination of academic and industry research to create a more complete understanding of the potential for and impact of competition in the telecommunications sector. As is often the case with an interdisciplinary, cross-functional approach to research and discussion, there will be points where the depth of discussion may seem insufficient for a specialist in a particular portion of the field; in those areas, I have attempted to demarcate the limits of the analysis and suggest further direction and grounding.

We are living in interesting times, but that does not have to be the curse implied by the ancient proverb. For the telecommunications sector, and for policy makers in general, this is a time of opportunity. Understanding what wireless communications means for telecommunications, and how public policy decisions can enhance the potential advantages of technological change, is the first step in grasping that opportunity. Pandora's box is already open; it is now time to begin the discussion in earnest about what we, as a global society, can do about it.

Chapter 1

Competition and Development

The relationship between government and private institutions defines the ability of nations to actively determine their progress towards the goals of development. A combination of legal structures, bureaucratic arrangements, and social compacts guide institutional interaction, which, in turn, affects how resources are allocated and goals are set. The effort to use corporate and public policy to fuel economic and political development depends upon understanding the potential of new institutional structures and arrangements; changes in technological, economic and social facts open new opportunities to improve how a community allocates resources and sets goals.

So many new opportunities have opened in the telecommunications sector over the past decade. Talk of an emerging global information infrastructure and a world wired for information and telecommunications services represent only the tip of the iceberg when we begin to examine the broader innovations at the micro-level; there is no denying that children in the classroom, parents in the home, executives in the boardroom and virtually every person in the world with access to the technology has seen their lives revolutionized. This is the kind of opportunity that comes once in an epoch, and we must step back to examine how best to increase access to these services as part of a broader effort to reach another stage of human development.

But our communities are largely rudderless when it comes to addressing these issues, in part because we are on the verge of a new frontier where old definitions are found wanting. No framework exists to bring together the interests of the various corporate and political institutions to ensure that access to services is increased and the quality of information and telecommunications services is improved over time. In other words, progress needs a paradigm, and apparently there are none which encompass both the traditional values of development and the new realities of technological and economic change.

To understand what kinds of telecommunications development policies would be most appropriate to the goals of national development, we need to start with the idea of development itself. This chapter outlines some of the most significant issues in the literature of economic and political development and specifically addresses the role of infrastructure services in the development process. At the end

of the chapter, we revisit the idea of strategic liberalization and set the stage for the application of such a policy to the telecommunications sector.

1. The Problem of Development

Development is a messy process. No matter what the formal definition, no matter what the benefits and costs that technological and social advances may have for a community, broad social change is not a simple thing for those who have to live through it. Even when that social change comes in the form of nominally defined technological and social advances, altering the structures on which our present lives depend creates an uncertain future. And no one likes too much uncertainty.

For that reason, there are as many different definitions of development as there are kinds of social and economic uncertainty. There is the kind of development that focuses on jobs and higher wages, which is a reaction to the fear and reality of unemployment and underemployment. There is the kind of development that concentrates on open political participation, which counters the fear of disenfranchised economic, ethnic or racial minorities. There is development based on technological revolution, founded on the demand for progress rooted in all kinds of social fears and concerns.

Students of the literature of development employ common descriptions of the development process: Countries start low, move up the development ladder, and begin to take on the characteristics of the developed world. Or, to use language that has become largely obsolete after the end of the cold war, countries move from the third world (or the fourth world), into or past the second, then up to the first world. Institutional needs and characteristics change as development proceeds. The strategic management of resources attempted by corporate and public institutions during the process alters as new institutions arise to stake out their claim of authority over economic sectors, geographical regions, or communities of interest.

The textbook definitions bear these distinctions out, but also add a fundamental principle which will be critical to our ongoing discussion. One of the most widely available textbooks on developmental economics refers to development as a fundamental change in the economic and political structure of a community such that the individuals in the community become the major participants in the process

that brought about the change.¹ The implications of such a definition are clear enough: Management of strategic resources, such as infrastructure or natural wealth, needs to be enhanced and focused by making members of the community more productive and improving the quality and character of leadership. The value to be enhanced through policy and research is the enfranchisement of citizens through changes in the economic and political process.

Needless to say, there are a host of conceptual and practical assumptions which undergird that understanding of development. By reviewing some of the common themes, and addressing the open issues that exist in the academic literature, we can not only unveil some of the assumptions but perhaps reconstruct elements of the theory so that they correspond better to new national and international realities.

1.1 A Brief History of Developmental Theory

It would be impossible to cover all of the different intellectual trends of development theory as they have appeared and disappeared through the ages. One could argue that the intellectual tradition goes all the way back to early philosophers; certainly, the ancient Greeks and the great thinkers of the Moslem communities during the Middle Ages were greatly concerned with the nature of governance and social advance. Modern Western thinkers such as Thomas Hobbes, John Locke, Jean-Jacques Rousseau directly addressed the issues of institutional arrangements that would affect the allocation of social resources and national development.² The political discourse of the 19th century, with the rise of what have now become the established fields of the social sciences such as sociology, economics, psychology, and political science helped to establish the focus of all discussions of corporate and public policy: Institutional control. How can a community control the resources they have at their disposal, and what kinds of institutions ensure the best kind of control?³

¹ Malcolm Gillis, Dwight Perkins, Michael Roemer and Donald Snodgrass, Economics of Development: Second Edition (New York: W.W. Norton and Company, 1987).

² For a more complete discussion of the philosophical implications and history of developmental theory, one of the most relevant texts is Robert Nisbet's The History of the Idea of Progress (New York: Basic Books, 1980). Although he does not directly engage the reader on the subject of political and economic development, his review of "progress" in the modern and pre-modern age says much about the historical weight of developmental theory.

³ The use of the word "control" in this context refers not only to the fact of control over resources, but also in deference to the work of James Beniger and others in the social science field. As we will discuss in more

Thinking about development has taken on a different tone in the past 50 years. The ideological battle of the West and East more than spilled over into the academic and intellectual discourse. It dominated the discourse.⁴ From the laissez-faire 1940's through the 1950's, a traditional development paradigm was founded in the West under the aegis of the great names of modern political sciences: Harold Lasswell, Walter Lippmann, Daniel Lerner, Gabriel Almond, Samuel Huntington, and others too numerous to mention. Economic theorists with a similar focus on free-market institutions and open political systems took the forefront of the economic debate, such as Robert Solow, Simon Kuznets, and Amartya Sen. What they had in common was a shared foundation in the basic values of the Western system: The free flow of ideas, goods and services within and between countries.

By the late 1960's and early 1970's, a countervailing trend was taking shape in the West. With its feet firmly planted in the neo-Marxist tradition of the European left, a number of scholars began to directly address the dangers of the open systems advocated by the traditional theorists. Dependency theory, as it was called, focused on the role of multinational corporations and superpower interests as they eroded the ability of indigenous populations in developing countries to develop according to their own needs.⁵ In the field of economics, political economy, communications and all across the range of the social sciences, an effort was undertaken to quantify and describe the effects of multinational corporations and the continuing superpower conflict on the development process. There was a very good reason why such an examination was critical at the time: with all the talk of development, little improvement could be found in many of the developing countries throughout the world as the 1970's came to a close.

depth during the first chapter, institutional organization and technology are closely intertwined, and changes in the technological foundations for communication have concrete consequences for the transformation of all of a society's institutions. There are, according to most researchers in this field, different kinds of institutional control associated with different phases of historical development. See, in particular, James Beniger, The Control Revolution (Cambridge, MA: Harvard University Press, 1987)

⁴ Everett Rogers, "The Passing of the Traditional Paradigm" and A History of Communication Study: A Biographical Approach (New York : Maxwell Macmillan International, 1994) See also, Gabriel Almond, A Discipline Divided: Schools and Sects in Political Science (Newbery Park, CA: Sage Publications, 1990)

⁵ The most often quoted sourcebook for dependency theory is Fernando Henrique Cardoso and Enrique Faletto, Dependency and Development in Latin America (Berkeley: University of California Press, 1983)

Then, things changed dramatically. By the early 1980's, it was clear that some of the countries of the world had overcome some of the barriers to development. The Asian tigers became significant players in the international economy. Japan became a dominant force and Japanese investors were purchasing foreign assets in a fashion that had many in the United States and Europe scared. The commentary of the dependency theorists seemed to fly in the face of cold, hard fact: These countries had been successful even in the face of international competition from the developed world.⁶

By the early 1990's, the collapse of the Soviet Union and the continuing transformation of the Chinese version of communism dramatically changed tone of discussions about economic and political development.⁷ Development models based on centralized command structures have been largely discredited by the evident lack of economic success and the cost in political illegitimacy in the Eastern block. The focus of discussion about development, as we will detail during the course of this analysis, has shifted to the possibilities of competition and free-market allocation of resources.

2. Development as Institutional and Structural Change

Keeping up with the pace of change requires an understanding of the institutions driving (and being driven by) change. This is where serious analysis of institutions becomes critical in the overall discussion of developmental theory and practice: The management of strategic resources is guided by the corporate and government institutions that define the development process. These institutions act as a center of gravity to attract social meaning and energy, using the bureaucratic science of the modern age to provide a rational and legal structure to manage participation by members of the community.⁸

⁶ W. Scott Thompson, The Rise and Fall of Third World States (Medford, MA: Unpublished Monograph, 1993)

⁷ At the beginning of the post cold war era, a few were quick to suggest that the ideological battles of the past had subsided, leaving the door open to a different era of economic and political conflict that was based on the ideological consensus of democratic and free-market principles. The most visible proponent of that view has been Francis Fukuyama, detailed in his essay entitled "The End of History." See Francis Fukuyama, The End of History and the Last Man (New York: Maxwell Macmillan International, 1992)

⁸ This is the classic sociological formulation of Max Weber, from his seminal work, The Theory of Social and Economic Organization, A.M. Henderson and Talcott Parsons trans. (New York, The Free Press, 1968, c1947). The kinds of authority which hold institutions together, according to Weber, include the rational-legal form alluded to above as well as charismatic and traditional forms of authority. Quite often, development is considered to be a function of the level and inculcation of rational-legal authority within a community.

Under the pressure of evolving technology and shifting social demands, institutions are altered. So, for example, agricultural institutions changed dramatically at the time of the industrial revolution, and labor demand shifted from the countryside to the cities. This is nothing new. The agricultural revolution that occurred between the 3rd and 4th millennia BC radically changed communities from hunter-gatherers to cultivators of crops and agricultural surpluses.⁹ The organization of society changed with the technology of agriculture, altering both the language and physical forms of communication between peoples.

But just because social, economic and political change is nothing new does not mean that it is any better understood. That is in part because the character of the changes differ from age to age. If we are to take a basic taxonomy of institutional change over the last 500 years, for example, we would find a wide variety of social and economic institutions rise and fall without finding a fundamental explanation that would apply to all cases.

That is in great part because the institutions that support certain social and economic practices vary from community to community, and, within each community, certain kinds of social configurations are more important than others. A prevalent example in today's discussions on privatization throughout the world concerns the institution of the credit market in certain European countries as compared to the United States. German banks traditionally have wide latitude in determining the management of those companies where their money is invested, while in the United States, banks and lending institutions do not play as central a role in the private-sector management of other economic institutions.¹⁰ That historical arrangement has a definite impact in a privatization program, for example, by defining how financial instruments will be structured and how people will understand the change in economic and social relationships.

Differences in institutional arrangements are reflected in a wide variety of social facts, although the linkages between institutions and facts are not as tangible as many social scientists would like. The very idea of credit, for example, depends on a sense of mutual trust. A lending institution believes

⁹ Colin Renfrew, Archaeology and Language (New York: Cambridge University Press, 1992) Renfrew's main argument throughout the book is that technological, organizational and linguistic change came together at the origin of the agricultural revolution.

¹⁰ Roman Frydman and Andrzej Rapaczynski, Privatization in Eastern Europe: Is the State Withering Away? (Budapest, London and New York: Central European University Press, 1994).

that you will pay the money back after they have loaned it to you, and has taken steps to assess whether or not you are telling the truth about your ability to repay. What that trust means, and the character of that trust, is at the core of many arguments about development.¹¹

One thing we can be sure of, though, is that social facts such as trust do have a direct impact on institutional performance, even though they might not easily be quantified or accounted for in the courtroom, legislatures or boardrooms of the world. Social facts and values determine the success or failure of business ventures, the sustainability of investment and growth, and, to a significant degree, the success or failure of efforts to achieve political and economic development.

There are a lot of possible ways to begin addressing the relationship between institutions, values and social facts. For our purposes, though, the best starting point is offered by Robert Putnam. He grounds his work on civic traditions in Italy with one basic question: "What are the conditions for creating strong, responsive, effective representative institutions?"¹² It is the issue of institutional performance that will be critical for us as we begin to assess the impact of competition on the public and private institutions of the telecommunications sector.

Putnam begins with two fundamental points:

1. *Institutions shape politics.* The roles and standard operating procedures that make up institutions leave their imprint on political outcomes by structuring political behavior. Outcomes are not simply reducible to the billiard-ball interaction of individuals nor to the intersection of broad social forces. Institutions influence outcomes because they shape actors' identities, power and strategies.
2. *Institutions are shaped by history.* Whatever other factors may affect their form, institutions have inertia and "robustness." They therefore embody historical

¹¹ For example, since credit institutions are not very deep, or are non-existent in many parts of the developing world, what are some of the social regularities that would be required as the foundation of credit institutions and markets? That is the question which is at the heart of Robert Putnam's recent work on "social capital," which he defines as the ability of groups of people to construct the open environment required for strong institutions. A variety of social commentators have recently picked up the mantra of "values" as a key to social and economic development, including Ben Wattenberg, Francis Fukuyama and William Bennett.

¹² Robert Putnam, Making Democracy Work: Civic Traditions in Modern Italy (Princeton: Princeton University Press, 1993), p. 6.

trajectories and turning points. History matters because it is "path dependent": whatever comes first (even if it was in some sense "accidental") conditions what comes later. Individuals may "choose" their institutions, but they do not choose them under circumstances of their own making, and their choices in turn influence the rules within which their successors choose.¹³

Clearly, if we want to change the world in which we live, we need to construct institutions that take root in the social environment in which they are planted. Putnam's guidelines tell us a few things about how to judge the sustainability and effectiveness of institutions. First, no institution lives in a social vacuum, which means they can not be engineered in a vacuum. There is always an element of social engineering at the basis of public policy, insofar as the very idea of policy assumes that institutions shape politics, but the tendency is to start as if the slate were clean and institutions can be constructed as if in an ideal world. Putnam makes clear the impossibility of such a project, which means that our search for sustainable institutions that can serve the objectives of national development has to be infused with historical and social facts.

Second, our analysis should (and will) focus on how institutions interact with each other, and determine some of the patterns and dynamics revealed by institutional interaction. Private and public sector institutions, for example, establish historical trends which shape the viability of emerging institutions and the possibilities for the transformation of existing institutions. A close examination of the patterns of institutional interaction should tell us a great deal about what kinds of developmental needs require evolutionary institutional change, and which necessitate revolutionary change.

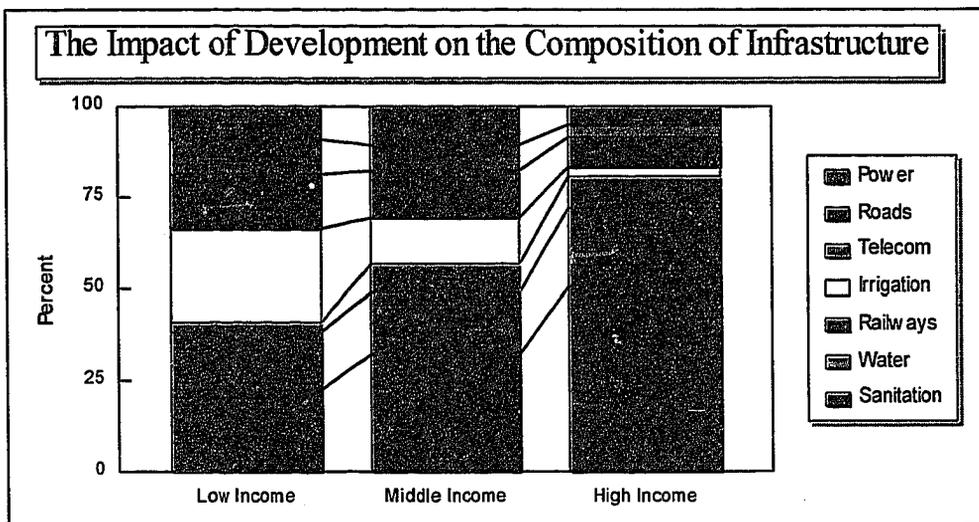
2.1 The Institutions of the Modern Age

The above discussion has sidestepped a number of issues, perhaps most obviously the issue of which institutions are to be the focus of our analysis and discussion. Having set broad parameters for institutional performance during developmental change, we can focus on identifying the institutions of the modern age which will be central to the research and analysis presented in this thesis.

¹³ Ibid, p. 7-8. Adding the word "economic" beside the word "political" is, to my mind, a fair alteration of Putnam's articulation of these two points; institutions change economics as much as they do politics and the institutions which define, in part, economic relationships have similar characteristics to the political relationships that are shaped by history.

In the past section, we used the example of the credit markets to illustrate a number of points about developmental theory. Certainly, credit markets have been critical for the developed world's progress from the Enlightenment all the way up to the present day. But credit markets are far from being the only source of institutional energy to spur economic and political development. In the past century, other kinds of institutions have moved to the forefront in our discussions of modernity and development. Of critical concern in the modern age are the institutions that provide the infrastructure that is required of developed societies: power, roads and communications.

The following chart is adapted from the 1994 World Bank Development Report, and provides a basic overview of the institutional change that would likely occur as a community "develops" from a low-income to a high-income community.



The graphic shows one of the most significant elements of this institutional shift: Countries with higher per capita income levels are likely to have a different mix of infrastructure than those with lower levels of per capita income. The process of development, as most commonly perceived, is a linear trend directed by the arrow of time; countries move from lower to higher income levels as they develop their resources. In the process, different economic institutions become more significant.

The chart clearly shows how the economic infrastructure of a developing country changes in the process of development. Of those infrastructural elements, three become more important as income levels increase: Power, roads, and telecommunications.

Most would argue that power, roads and telecommunications have brought improvements in the quality of life to those individuals who have access to the services. Power has allowed us to function more effectively and produce more. Roads have given us further mobility. Telecommunications have given us new sources of entertainment, information and education. The application of these technologies has contributed to increased literacy, improved standards of living in terms of per capita product and income, decreased incidence of disease and infant mortality, and a host of other changes considered real improvements in the quality of life worldwide.¹⁴

Changes in the infrastructural mix is an adaptation to those social and economic needs, and, in turn, changes in infrastructure reinforce social and economic trends.¹⁵ In developed countries, we have a highly mobile work force and capital base, which depends upon and often contributes to the construction of infrastructure resources. The transition from a manufacturing to a service economy that has been a consistent theme of economic and political literature in the developed world has depended, in great part, on the technologies of the modern (or, even, post-modern) age.

These services are critical to the developmental process, and have been the subject of special focus and concern by researchers and decision makers in this field for many years. The most common connections between these “modern” services and development are drawn through variables such as productivity, social and economic mobility, and quality of life factors, such as the health and welfare of all members of society. The particular analysis of telecommunications investment on economic

¹⁴ There is a Luddite stream in Western thought that would enjoy smashing the machines that bind us to a particular form of organization. The synthesis of these concerns and the progressive orientation of our modern society has resulted in what is perhaps a more appropriate question: How can this technology be used to further the quality of our lives, rather than just the quantity of our production?

¹⁵ This description is echoed in the work of Max Milliken and Donald Blackmer from The Emerging Nations: Their Growth and United States Policy (Boston: Little, Brown and Company, 1961), p. 47. Milliken and Blackmer are credited for coining the term “social overhead services,” of which transportation, telecommunications and electric power are listed as the most critical. Although we will not discuss in depth their theories, it is important to point out that these areas are considered broadly significant by almost all development thinkers.

and political development have covered a great deal of ground in linking sector development to all of these factors, and we will spend some time reviewing that research in the second and third chapters of this thesis.

The approach we have mapped out above, however, does not begin with social science variables. It begins with institutions and their political and economic history. A variety of public and private-sector institutions provide these modern services, and the manner in which service provision is made is both shaped by and a shaper of social facts in every community throughout the world. Through the course of this next section, we will begin to sketch out some basic characteristics of the institutions that have traditionally been responsible for these services, directly entering into the ongoing discussion about the role of the public and private sector in the developmental process. By starting with broad historical factors, we will be prepared to revisit the idea of development and look to the specific changes in technology and social organization which need to be addressed and incorporated into our analysis.

2.2 Ownership and the Management of Institutions

Behind each of these infrastructural elements is an institution, or number of institutions, that is responsible for the provision and maintenance of the infrastructure. The critical variables for us to examine in these initial phases of our discussion have to do with the purposes and goals of those institutions. We will then connect the purposes and goals of the institutions we examine to how the institutions provide the services.

Even though public and private-sector institutions are very different, there are a number of similarities when it comes to the problems and techniques of management. A politician, as a representative of the people, chooses to use the authority she has at her disposal to change policy on a given issue. A corporate chief chooses to implement one plan over another, and alters his balance sheet and the kinds of products and services available to the community that corporation serves. Both of them are working to control resources in a fashion that serves either their interest or the interest of the community as a whole.

Nevertheless, it is the different ownership structure of private and public institutions that determines many of the differences between the two. Ownership determines the purpose of management by articulating the business goals of the company. In turn, those goals shape the character of the job

functions and the measurements for success and failure. In the case of economic institutions, such as a company that provides telecommunications services, one can reasonably speak of a continuum of ownership options available.

Continuum of Public and Private Ownership



Represented at both ends of the arrow are the opposite extremes: Total ownership by the state, and total ownership by the private sector. There are various alternative arrangements that exist along that continuum, and many economies in transition have decidedly complex arrangements whereby ownership between government and the private sector is shared.

The main difference between the two extreme cases is the management goals.¹⁶ The goal of any privately held corporation is ostensibly to maximize the value of shareholder investment.¹⁷ It is the shareholders that determine the management by appointing directors, who then appoint executive officers to carry out the management directives. Publicly held companies are often in the position of having their goals set for them by the politicians. Returns on investment are tightly regulated,

¹⁶ Max Weber, Basic Concepts in Sociology (London: Peter Owen Limited, 1962) p. 115

¹⁷ Vincent M. O'Reilly, Murray Hirsh, Philip L. DeFliese and Henry R. Jaenicke, Montgomery's Auditing Eleventh Edition (New York: John Wiley and Sons, 1990). The whole concept of returning shareholder value is deeply enmeshed in the practice of accounting. A strict financial interpretation would argue that returning shareholder value occurs through increases in the value of equity or increases in the dividend stream made available to investors. But others would argue for a broader definition of returning shareholder value, and include certain social and quality-of-life values in the equation, such as investments in environmental protection and the like.

competition is simulated through certain kinds of incentives and disincentives to invest, investment requirements are mandated, and personnel is often assigned by the political decision makers.

Differences between public and private-sector institutions are defined, in great part, by this fundamental difference in goals. Even though the elements of bureaucratization, a professional managerial strata, and technological implementation may be similar in a public and private-sector institution, the fundamental orientation of the institution is nonetheless different. The responses to the external environment are also different; a private-sector institution relies only on its ability to respond to competitive change, while a public-sector institution often concentrates on the single shareholder which has a vested interest in its success and profitability (namely, the government).

This difference in orientation is especially important with regard to the provision of infrastructure services, which have often been defined as "strategic" sectors for economic development. Roads, bridges, telecommunications lines, water and energy are critical components of the development process, and represent not just economic capital for citizens, but also political capital for government officials. For many of the modern services essential to the development process, the traditional kind of management was a centralized state bureaucracy that allocated all resources and made all decisions. The transportation ministry took care of the roads. The ministry of communications took care of the phones. For many countries, this arrangement weakened these institutions, which often could not be separated from the political institutions that managed them.¹⁸ This, in turn, weakened the ability of states to use public enterprises to contribute to the goals of development.¹⁹

As a result, public and private-sector decision makers have turned to privatization in an attempt to make these public sector institutions more responsive to the interests and needs of citizens.²⁰ When

¹⁸ For a general discussion on the relationship between democratic politics and ministry administrations during the period of privatizations, please see Raymond Duch, Privatizing the Economy: Telecommunications Policy in Comparative Perspective (Ann Arbor : University of Michigan Press, 1991)

¹⁹ Christopher Clapham, Third World Politics (London : Croom Helm, 1985), p. 90-111.

²⁰ We will not review the justifications for privatization in depth, and work under the assumption that privatization is, in many cases, justified. Generally speaking, privatization is justified if the "sum of the social value of the enterprise in private hands plus the social benefit of the monetary transfer from the private to the public sector associated with the sale proves to outweigh the social value of the enterprise in government hands." From Privatization in Latin America, Manuel Sanchez and Rossana Corona, eds., (Washington, DC: The Johns Hopkins University Press, 1993), p. 2. See in particular L.P. Jones, P. Tandon and I. Vogelsand, Selling Public Enterprises. (Cambridge, MA: The MIT Press, 1990) The

we survey the political and economic policies of countries around the world, it is safe to say that the general trend in recent years has been from the left to the right; from public ownership to private ownership. The reasons suggested for this trend are more than enough to fill an entire thesis, but, in the end, it comes down to performance.

Privatization has finally come into the development mainstream as a result of a gradual but profound shift in attitudes worldwide... This shift is based on the experience of the third world itself. Many countries have found that state-owned enterprises have failed to generate high rates of growth that are critical to development.²¹

Performance is defined as the ability to sustainably increase the capacity and capability of the institutions providing services to citizens. Improving performance becomes the key part of the discussion, both in the developing and developed world.

In order to achieve higher levels of performance, privatizations of formerly monopolized public enterprises have taken place throughout the globe.²² Starting in Great Britain during the Thatcher administration, policy makers found a new opportunity to turn over the management and provision of certain services to the private sector. Although Great Britain did not privatize more than 5% of existing social and government services, the big headlines garnered by a few of them were large enough to be seen around the globe.²³ British Telecommunications completed the £ 20 billion sale of shares to the public in 1993, after seven years of preparation and initial sales.

In the United States, a different kind of market shift was occurring. Since the negotiation of the 1956 consent decree, which governed the activities of AT&T as the regulated private monopoly provider of telecommunications services in the United States, competition in key markets increased the pressure for further liberalization and deregulation. The confrontation between the Justice Department, with

“inconveniences” caused by political management of economic institutions are also a compelling justification for privatization policies.

²¹ M. Peter McPherson, “The Promise of Privatization,” from Privatization and Development, (San Francisco: International Center for Economic Growth, 1987), p. 18.

²² For a full taxonomy of privatizations throughout the globe, see The World Bank Development Report 1994 (Washington, DC: The World Bank Press, 1994)

²³ John Redwood, “The Case of Britain,” from Privatization and Development, Steve H. Hanke (ed.), p. 181-188

its historic role as the enforcer of anti-trust legislation, and AT&T reached a new *modus vivendi* in 1982, when a modification of the 1956 decree was proposed. The agreement broke up the Bell System, spinning off seven Regional Bell Operating Companies (RBOCs) to provide local telephone service while reconstituting AT&T as a long-distance provider and manufacturer of telecommunications equipment. The centralized model for telecommunications development collapsed under the weight of political pressure, opening the door for a new era of competition in the United States.

The fall of the Berlin wall served to further discredit the centralized model of state-sponsored institutional development. Communist governments that had once owned all the means of production according to good Marxist-Leninist traditions have sold everything from the big Stalinist steelworks right down to the corner kiosks. Businesses have been sold to the private sector, sometimes distributed to citizens in the form of privatization vouchers, sometimes auctioned, and at times simply given away to those who had the ability to manage the assets.²⁴ In both the East and West, the privatization decision came down to performance: The ability of economic institutions to sustain growth and profitability depended on reducing the linkage between the public and private sectors.

At the same time, the developing world faced economic pressures which made privatization an even more attractive policy. Most countries in the developing world found itself strapped for cash after the drop in oil prices at the end of 1982. With overextended lines of credit, countries began to face the realities of difficult austerity programs and severe cutbacks of social services. Increasingly, the privatization of traditional state-sponsored services began to look more and more attractive as an opportunity to receive fresh and productive capital investments. The trend has spread to even the poorest countries of the world, where many governments have begun to consider what privatization can do for their economic and political interests. The issue, again, is the performance of these institutions, ensuring their ability to serve the people who are customers and recipients of critical services.

Privatization is meant to improve performance in three areas:

²⁴ Roman Frydman and Andrzej Rapaczynski, Privatization in Eastern Europe (New York: Central European University Press, 1994)

- 1) By reducing the interference from government officials, thereby permitting a more efficient allocation of productive resources;
- 2) By changing the property rights that define the administration of the enterprise, diminishing the information gap between owner and administrator and defining appropriate incentives for management; and,
- 3) By removing the possibility of government subsidization, which improves financial discipline.²⁵

Privatization is therefore meant to have a macroeconomic and microeconomic impact. The macroeconomic impacts are increases in foreign exchange if foreign investors take part in the privatization process, a reduction of public debt (which is often part of a privatization package), and a better fiscal picture for the country as a whole. Privatization is meant to restructure the operations of the company so as to ensure the improved performance sought after by each of these countries.

We can also speak of a macro and micro political impact. A privatization policy removes from the hands of government one of the strongest potential levers to garner political support: political patronage through jobs in state-run enterprises. The long-term dynamics of the political system will be altered, especially in countries whose dominant part has traditionally been connected to labor unions.²⁶ That means systemic political change and the changes for the individual institutions that embody political authority.

The immediate result of this privatization trend has been a reordering of capital flows worldwide; from the growth of diversified mutual funds in the developed countries to the increased lending from major international institutions, the developing world and the former east bloc has been soaking up capital in this wave of privatizations.²⁷ But, on the microeconomic and micropolitical level, there is still only incremental change. Many of the now privatized enterprises throughout the world still have

²⁵ Taken from Jones, L. P, Tandon and Vogelsang, Selling Public Enterprises (Cambridge: The MIT Press, 1990).

²⁶ This is particularly important for the Latin American privatization experience. See, in particular, Botelho et. al, on Mexican labor relations for the Telecom market.

²⁷ *The Economist*, December 10, 1994. This trend reversed itself in the third quarter of 1994 and in early 1995, the devaluation of the Mexican peso and the rapid decline of the American Dollar resulted. The present predictions are that the American insurance companies will be the next major investors in developing markets, thereby sustaining the flow of resources to these newly liberalized markets.

a long revolution to go before the management of those enterprises is truly transformed. There is one simple reason for the limited degree of institutional change on this level: It is not privatization which compels alterations in institutional structures, but competition.

2.3 Competition and the Transformation of Monopoly

Ownership is not the only determinant of management and institutional structure. If it were, privatization would be the end of the story. We would find universal characteristics of all publicly and privately held companies, determine which was better, and move on.²⁸ Ownership sets ostensive goals and a framework for management, but it is the response to the environment external to the corporate institution that determines economic behaviors and institutional practices. Characterizing the environment, therefore, is almost more important than characterizing the ownership structure.

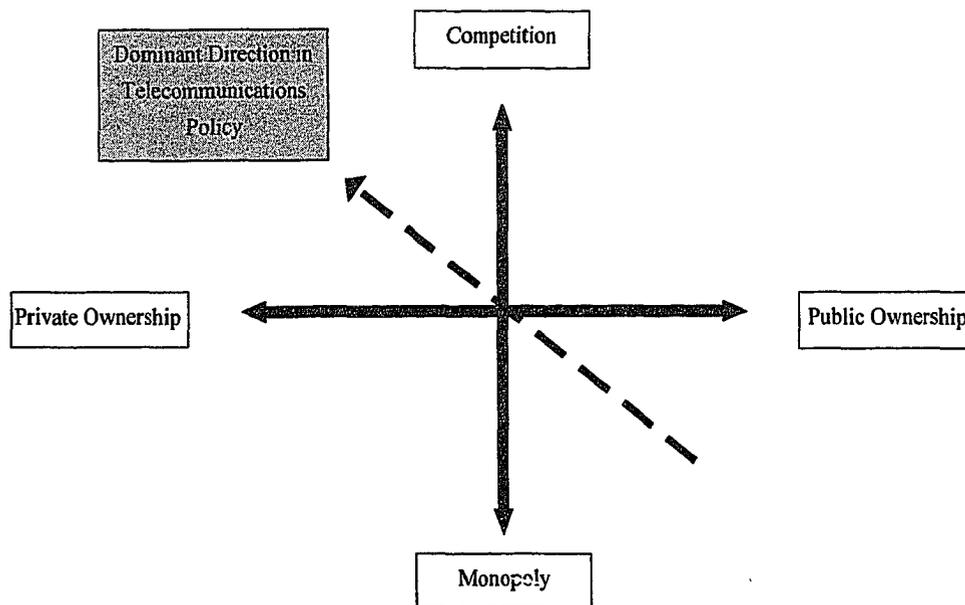
To illustrate this point, we take the polarities of public and private-sector management and overlay another dimension: Competition and monopoly.

²⁸ Raymond Duch, Privatizing the Economy, p. 2. Duch writes:

Looking to political variables to explain variations in the performance of government-owned firms only makes sense where an economic explanation is clearly insufficient. There would be little unexplained variance if most government-owned firms performed poorly and most private entities performed well. This is not the case; a considerable amount of variation in the performance of firms cannot be accounted for by the ownership variable.

How, for example, do we explain the dismal performance of such large French companies as Thompson and Rhone-Poulenc under private ownership and their dramatic turnaround under nationalization? Why do French banks continue to perform well under nationalization? How do we account for the significant improvement in the performance of the British nationalized sector in the late 1970's and early 1980's - British Steel being one of the prime examples?... The point here, of course, is that we need to look beyond economic explanations that focus simply on ownership.

The Path of Institutional Transformation in the Telecommunications Industry



Competition, on the one hand, is traditionally defined by economists as an environment where a number of institutions offering similar or identical goods or services have access to a customer and compete for a customer's money. Monopoly is a condition where one firm supplies everything for a particular good or service within a specific market. Although there are many different kinds of monopolies and classifications for competitive environments offered by economists, this portion of the discussion defines competition generally so that we can focus on the differences between monopolies and competitive institutions.

Without delving into the complex political and economic justifications for monopolistic versus competitive marketplace arrangements, it suffices to say that the management of a competitive enterprise and the management of a monopolistic enterprise are completely different. The production of a monopolist is determined not by marginal cost but rather by economies of scale. Because the

addition of other producers would increase the overall cost of production, economists have argued that certain industries have the characteristics of a natural monopoly.²⁹

The alternative environment to a monopoly is competition. Generally put, a competitive environment has a number of different service providers that attempt to gain market share for their products through product differentiation based on price or quality. Classic microeconomic theory has a number of definitions for different kinds of competitive markets, from oligopolistic competition with its constraints to market entry to a open market competition where there is no barrier to entry and real price differentiation.

It is important to note that a large number of firms do not necessarily mean that there is a competitive market. Likewise, the absence of more than a few players does not indicate that an oligopoly exists.³⁰ The critical issues are the barriers to entry and the ability of entering institutions to sustain themselves in the face of aggressive pricing strategies on the part of existing players. If because of regulation of technological cost, the barriers to entry are too high, or, if for reasons of regulation or preponderant market advantage, competing institutions can not sustain themselves, the market for a particular service can not be characterized as competitive.

²⁹ In the next chapter, we will examine the particular arguments for the monopolistic provision of telecommunications services throughout the world, but for this stage in the discussion it is the consequences of the general argument that are most important. From a microeconomic point of view, the structure of a monopoly firm is based on setting prices that reflect the value of the product demanded and producing accordingly. The critical issue that we are ignoring at this juncture is: where do monopolistic companies get the information required for pricing certain products? Since there is no market mechanism, information has to be from other sources. Most significantly, the government has played the role of “price setter” in many of the monopolized industries throughout the world. See, in particular, William Baumol et. al, Contestable Markets and the Theory of Industry Structure (New York: Harcourt, Brace and Jovanovich, 1982). The institution created in a monopolistic arrangement is therefore based on the assumption that a centralized source of production and management is best.

³⁰ The problem of identifying collusive behavior versus competitive behavior in the private sector remains one of the most studied and contentious issues in modern economic theory. For an examination of some of the fundamental issues in this field, see, in particular, George Stigler, The Organization of Industry (Chicago: The University of Chicago Press, 1968). One possible way to address the difference between real competition and collusive behavior is to determine the variance in economic strategies and results of strategy implementation between firms within the same sector. See Omar Toulan, “Sources of Local Variation and their Implications for Strategy,” Unpublished Manuscript at the Alfred P. Sloan School of Management, Massachusetts Institute of Technology.

Although changes in ownership structure have occurred in many places throughout the world, we have seen less of an attempt on the part of governments to create a competitive environment for the provision of infrastructure services. In many cases, it can be argued that privatization has left in place a private monopoly where once a public monopoly existed. "If the government wants privatized enterprises to play an efficient social role," one commentator notes, "the regulatory regime should foster a maximum level of competition."³¹

This is not to say that privatization represents a less than significant change, but rather, it is to point out that privatization is not and should not be the whole story. Far too often, political and economic commentators link privatization to free-market economics without recognizing the fact that a free market for goods and services requires, by definition, open entry for other competitive concerns; a privately held, but tightly regulated monopoly certainly does not allow for such a condition. Competition requires the wholesale alteration of certain political and economic institutions that determine the provision of services under a monopoly regime, a shift that is more of a transformation than a shift in ownership structure.

A recent OCED study on the impact of privatization offers the following perspective on increasing competition.

Market competition lies at the root of economic efficiency. The transfer of ownership rights results in improvements in efficiency, but these are limited by the uncertain effect of privatizations on market structures. In the operations carried out in the sample countries, we are bound to note that the transfer of ownership has not particularly encouraged the development of competition. In certain countries, privatization has even strengthened the movement towards industrial and financial concentration (see the examples from Chile from 1973 to 1982 and Mexico since 1983). From the viewpoint of the impact on economic efficiency, the most satisfactory method is to increase the role of market forces during the privatization process, in order to avoid the exploitation of oligopolistic or monopolistic market structures for private ends. Accordingly, the transfer to the private sector must be accompanied by genuine liberalization of the conditions relating to domestic and foreign competition. The breaking up of monopoly market structures, which does not necessarily imply deconcentration at the national level, should enable the emergence of private producers, either local or foreign, with levels of competitiveness close to those on the international market. Genuine liberalization

³¹ Sanches and Corona, p. 33

comprises a number of deregulatory measures, that is to say, measures that reduce the number and scope of existing regulations (prices, customs barriers, import restrictions, etc.). To achieve a sustainable increase in the role of market forces, however, it is also essential to adapt the regulatory framework to the new competitive situation and new behavior.³²

The key is liberalization. Liberalization establishes competition by reducing and eliminating restrictions which protect monopoly service provision. That means less (or at least different) regulation, prices and quality of service demands that respond to market forces, and new entrants into the market.

What are the benefits of such a further transformation? It will be argued throughout this paper that if we are to push down the cost of essential infrastructure services, and generate worldwide technological innovation, it will be necessary to introduce further competition into markets that have been heretofore monopolized. By pushing down prices and setting the stage for introducing new technology, essential goals of national development will be achieved. In the words of the World Bank report:

Providing infrastructure services to meet the demands of businesses, households, and other users is one of the major challenges of economic development. The availability of infrastructure has increased significantly in developing countries over the past several decades. In many cases, however, the full benefits of past investments are not being realized, resulting in a serious waste of resources and lost economic opportunities. This outcome is frequently caused by inadequate incentives embodied in the institutional arrangements for providing infrastructure services. While the special technical and economic characteristics of infrastructure give government an essential role in its provision, dominant and pervasive intervention by governments has in many cases failed to promote efficient or responsive delivery of services. Recent changes in thinking and technology have revealed increased scope for commercial principles in infrastructure provision.

³² O. Bouin and Ch.-A. Michalet, Rebalancing the Public and Private Sectors: Developing Country Experience (Paris: The Development Center of the Organization for Economic Co-Operation and Development, 1991), p. 14-15. For a further discussion of specific instances in which regulation and liberalization policies are appropriate in developing country contexts, see Regulatory Reform, Privatization and Competition Policy (Paris: OECD Secretariat for the Committee on Competition Law and Policy, Organization for Economic Co-Operation and Development, 1992).

These offer new ways to harness market forces even where typical competition would fail, and they bring the infrastructure user's perspective to the forefront.³³

Liberalization is the key to realizing the benefits of privatization. In turn, it is an essential part of any strategy to push the benefits of infrastructure investment directly to the fore of our discussions of national economic and political development.

Although the first axis is very important to our discussions, it is the monopoly-competition axis that is most critical to our understanding of development in general and development in telecommunications in particular. For the past century, monopoly has been the assumed fact of economic production and political organization for these industries. But technological, social and economic changes have altered the environment for many of these industries. There is now an opportunity to reassess our understanding of these institutions and change the environment in which these institutions act.

2.4 Competition and Monopoly in the Telecommunications Sector

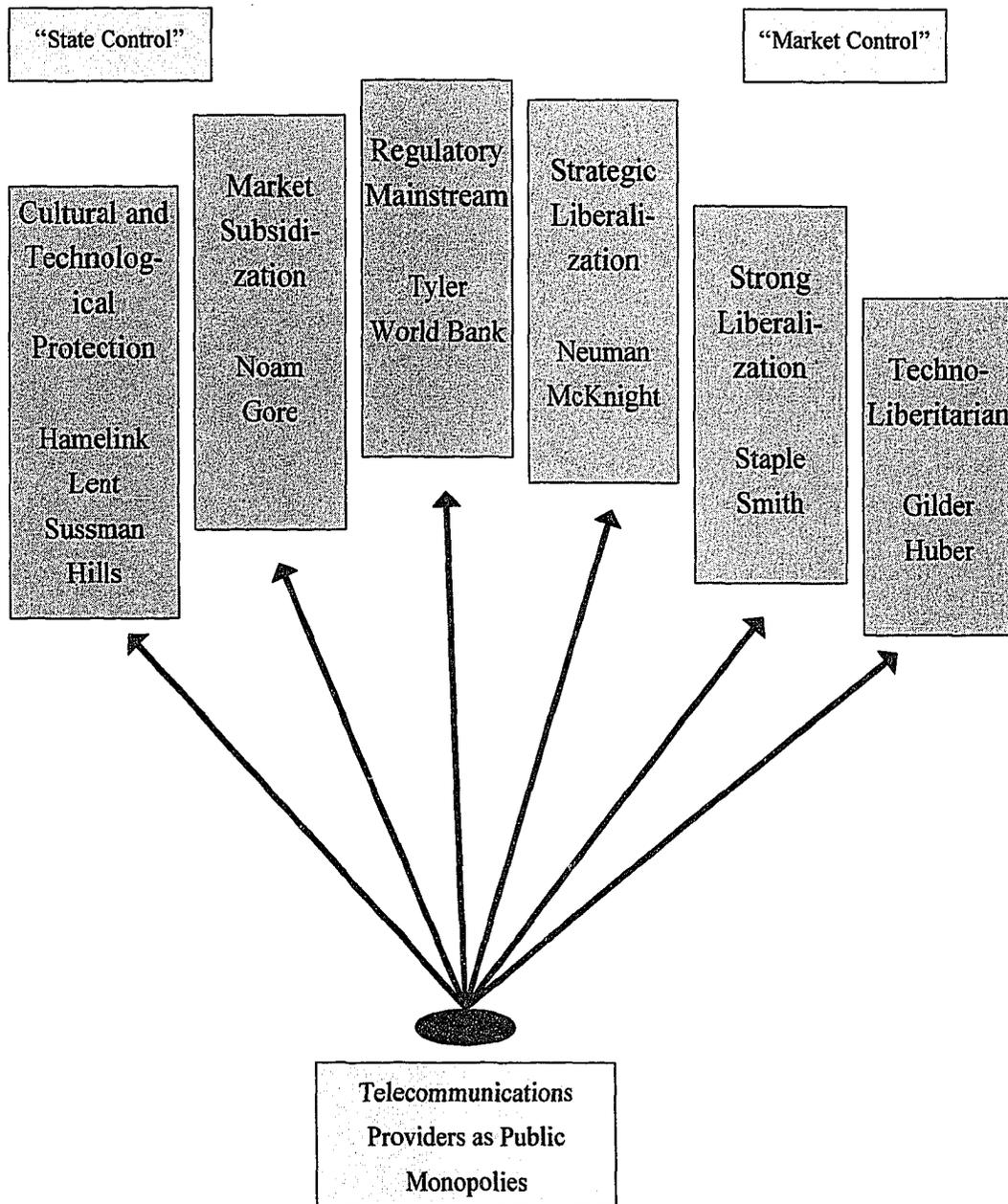
The opportunity is widely recognized by policy researchers and industry participants in the telecommunications industry. There is a good deal of consensus on the need for further liberalization and competition in the provision of services. The chart which we have already used to illustrate the polarities of monopoly and competition, private and public ownership, also contained an arrow showing the dominant direction in telecommunications policy today; from monopolistic, public ownership to competitive private institutions.

Even though the need to make that transition is largely agreed upon by members of the global telecommunications policy community, there is a great deal of potential variation in the possible paths and results of this dominant trend. Most of the debate centers on the implementation and nature of liberalization appropriate to the telecommunications sector; there are a range of possible institutional arrangements as the market transformation continues, and a variety of economic, political and social justifications are brought to the fore in the analysis of the future of the telecommunications sector.

The chart that follows lays out some of the most prevalent theories and perspectives on the future direction for the global telecommunications sector.

³³ The 1994 World Bank Development Report, p. 13

The Paths to Liberalization: Theoretical Models



Having established that the environment needs to change, we now need to identify some of the values that should form the basis of the transformation from state-owned monopoly to a variety of companies competing in open markets. There is a great wealth of development literature from which we can draw theoretical and practical direction. By identifying specific changes within the technological, economic and social fabric that present new opportunities for development, we will set the groundwork for assessing the variety of options suggested for the continuing transformation of the telecommunications industry.

The preceding chart offers a basic classification of some of the policies suggested for the transition from a market dominated by state-run monopolies. On the left, and leaning towards greater government involvement in and protection of certain policies the telecommunications marketplace, are those who subscribe to the theories of cultural and technological protectionism. The critical concern for these advocates is the predominance of developed world exploitation in the patterns of media and telecommunications investment throughout the world, and the increasingly large gaps between the technological “haves” and “have nots” in the developed world. Writers such as Gerald Sussman and John Lent draw heavily from the tradition of dependency theory to advocate a central role for the state in protecting the cultural heritage of various national groups, as well as the technological capabilities of local firms.

Closer to the center are writers like Eli Noam and Vice President Albert Gore. They center on many of the same concerns as the advocates of cultural and technological protection, but are more likely to suggest subsidization and the imposition of certain social goals, such as universal service, on information and telecommunications providers. The economic and social models which bolster this kind of thinking include the traditional analysis of scarcity in the telecommunications industry, and the belief that the sector can not sustain widespread facilities-based competition.

Then there is the regulatory mainstream, typified by the work of Michael Tyler and the predominant official policies of the World Bank. The focus is on the opportunities for using regulatory bodies, such as the Federal Communications Commission in the United States, as the focal point for the introduction of new competitive markets. Usually, the approach involves an assessment of a variety of different kinds of competition and the most effective regulation for sustaining each. Quite often,

though, questions of broad-based competition for local services, for example, are not addressed, simply because there are few working regulatory models to point to.

To the right, there are three policies listed which try to move the focus of the competitive transformation away from the state and regulatory institutions and towards the institutions responsible for providing the services, namely the telecommunications and information companies. The next policy listed on the center right is Strategic Liberalization, which is also the title of this thesis. Building on the work of Russ Neuman of the Fletcher School of Law and Diplomacy and Lee McKnight of the Massachusetts Institute of Technology, strategic liberalization argues for the implementation of specific policy measures to increase competition in the market for wireless access services, such as cellular, wireless local loop and satellite communications. This thesis argues that a strategic focus on wireless communications will provide a sustainable foundation for the continued growth of the telecommunications sector and the successful introduction of new products and services in an environment of facilities-based competition.

But before we speak further about strategic liberalization and the factors which differentiate it from other theories in the field, we should describe the two remaining boxes on the right. Strong liberalization is a term used to describe the work of Greg Staple and Peter Smith, both of whom have argued for a more complete liberalization of the telecommunications industry than is advocated by those in the regulatory mainstream or on the left. Their argument is centered on the proposition that liberalization in niche services, such as data transmission and value-added services, should take place in conjunction with the introduction of competition for all services in the local loop.

Finally, there are techno-libertarians like George Gilder and Peter Huber, who argue from the basis of technological opportunity. At its core, the techno-libertarians feel that the technologies of the emerging telecommunications marketplace are inherently competitive and, if given the freedom to grow and expand, will provide a sufficient foundation for sustainable market conditions.

Strategic liberalization differentiates itself from all of the above approaches in two critical ways. First, it is based on the proposition that the history and development of certain technologies offer greater opportunity for the development of sustainable, facilities-based competition than others. Such a fact opens the door for a constrained, targeted contribution for the state in facilitating the transformation of the telecommunications industry.

Second, and perhaps most importantly, the perspective of strategic liberalization incorporates the perspectives of mainstream political and social scientists who are particularly interested in the problems of development, but do not subscribe to the arguments of dependency theorists and protectionists on the left portion of the political spectrum. The rich tradition of comparative politics forms the basis for many of the values expressed in the policy of strategic liberalization.

The next portion of the thesis takes this second point and further expands on how these ideas make a critical contribution to the ongoing discussion of the transformation of the telecommunications industry. We will look to the literature of comparative political and economic development to identify new opportunities opened by technological and social change. We will also begin to identify key opportunities for public and private-sector managers in the telecommunications industry which can be captured through the implementation of a policy of strategic liberalization. After we set the stage for our specific examination of the telecommunications industry, we will open a new chapter and offer further connections between the theoretical approach of strategic liberalization and the practical implementation.

3. The Theory of Strategic Liberalization: Identifying New Opportunities for Development

The theory behind strategic liberalization draws from both the social science and economics traditions within the comparative developmental field. In both of those fields, there are three particular themes which are of interest to our discussion:

- o Participation;
- o Modernization; and
- o The Role of Public Policy.

Since the origin of development thinking, various ideas and models have dealt with each of these issues. For each of these themes, we will briefly review a range of thinking about the issues and connect them to specific challenges that need to be addressed. The challenges will lead us back to a set of propositions about constructing a new institutional environment to foster competition in the provision of certain services.

Participation

An opportunity exists to define new channels for economic and political participation through emerging technologies. The literature of development makes it clear that better participation means better production by firms and more responsive political institutions. If liberalization can focus on providing a further impetus for economic and political participation, liberalization will add to the goals of development.

It is a fundamental assumption of the modern age that a society is only productive when it uses the capabilities of each of its members to the fullest. This is true in both an economic and political sense. Individuals who do not participate in the political system do not do as much as possible to promote its vitality, and without educated citizens, participatory institutions are likely to falter. Those who consume more in services than they are able to give take away from the economic efficiency and productivity of a nation, and those who opt out of the economic system do not promote the level of allocative efficiency that a market structure has to offer.³⁴ By allowing the open marketplace to aggregate the needs and wants of a society, many thinkers presume that the direct connection between services and people in both the political and economic sphere is best made.

Development theory is “ultimately... concerned with what people can or can not do.”³⁵ But the how and what of this statement depends largely on the issues that the individual brings to the table. For Amartya Sen, the author of the quote just presented, a person’s action is determined largely by his or her entitlements, defined as the commodity bundles a person can handle. Although the definitions and terminology are very different, a political scientist like Barrington Moore would express the same concern: Political participation is based on the kinds of opportunities offered to the citizen. The viability and successfulness of the system depends on the opportunities available.

³⁴ It is important to point out that both economic and political institutions have been constructed to be participatory, as Albert Hirschman has lucidly stated in many occasions. See, in particular, Exit, Voice and Loyalty (Cambridge, Mass., Harvard University Press, 1970). Firms and enterprises thrive on the information they receive from the participation of consumers in the marketplace, and that means more than simply choosing or not choosing to purchase products.

³⁵ Amartya Sen, Collective Choice and Social Welfare (San Francisco: Holden Day, 1970)

How we participate, both economically and politically, is radically changing with the introduction of new technology. It is technology that defines the opportunities for participation in any open society.³⁶ For example, the opportunities to receive information through televisions and radios have dramatically altered the political landscape in developing and developed countries.³⁷ The possibility of electronic plebiscites and direct democracy in the developed countries of the world have captured the imaginations of some who see information technology as the great liberator of democracy.³⁸

In the last 20 years, we have seen a dramatic shift in the technologies of communication, from the computer and digital revolution to the possibilities of wireless communication that will be discussed in this thesis. These new technologies are emphasizing horizontal relationships over vertical ones, connecting individuals to each other and reordering corporate and public institutions.³⁹

Many have spoken of a "flattening" that needs to happen among large, bureaucratic institutions so that they become more responsive to the needs of the people they employ and serve.⁴⁰ That kind of institutional shift has broad consequences for the opportunities for participation in the process of development. Instead of concentrating solely on vertically oriented management of resources, we can begin to speak again of horizontal relationships as the foundation for resource allocation and open political communications.

³⁶ Harold Innis, Empire and Communications (Toronto: University of Toronto Press, 1972). Innis argues that the structure of politics and economics in any society is based on the structures and mediums of communication. For example, communication by paper and pen has certain structural characteristics that differentiate it from the printing press; Innis claims that the paper and pen of the monastic culture had a direct impact on the closed and centralized political and economic structures of Europe during the middle ages. Shifts in communication from one medium to another also shift political structures. The advent of the printing press altered the nature of communication which in turn, undermined the monastic, Latin-based culture and replaced it with nation state organizations. For further information on this particular transition, see Elizabeth Eisenstien, The Printing Revolution in Early Modern Europe (Cambridge: Cambridge University Press, 1991).

³⁷ Elihu Katz, Broadcasting in the Third World : Promise and Performance (Cambridge : Harvard University Press, 1977)

³⁸ Benjamin Barber, Strong Democracy: Participatory Politics for a New Age (Berkeley: University of California Press, 1984)

³⁹ W. Russell Neuman, The Future of the Mass Audience (New York : Cambridge University Press, 1991)

⁴⁰ Steven L. Goldman, Roger N. Nagel and Kenneth Preiss, Agile Competitors and Virtual Organizations: Strategies for Enriching the Customer (New York: Van Nostrand Reinhold, 1995)

As institutions flatten and move to a new structure of internal and external communication, they will have an opportunity to improve both the quality and quantity of participation. Since development depends on the ability of social and economic organization to enhance the productive and effective participation of its people, changes in the structure of participation represent a unique opportunity and challenge.

But, in order for people to use technology to participate in improving the economic and political institutions, they need to have access to those technologies. A common concern voiced by many writers is the very real possibility that there will be a technological divide between rich and poor.⁴¹ There is already a clear distinction within and between countries when it comes to technology use; the poorer the country or community, the less technology like telephones and electricity is used.⁴²

In a world of scale economies, the easy answer has been to subsidize the users who could not afford the service. Combined with further technological penetration through education, subsidization policy is certainly a critical element in enhancing economic and political participation through new technological opportunities.⁴³

In a rich country or community that wishes to make that political decision, it is possible to subsidize to the point where we can reasonably speak of 100% penetration by a service.⁴⁴ Few countries have

⁴¹ Al Gore, *Scientific American*, March 1991. This issue is especially critical considering the recent debate in the United States on the relationship between genetics and cognitive tests, as it appears in Richard J. Herrnstein and Charles Murray, *The Bell Curve: Intelligence and Class Structure in American Life* (New York: The Free Press, 1994). There are clear reactions in the developing world to the widening gap in economic and educational opportunities across class and racial divides. For an effective and, to my mind, devastating critique of the arguments in the book, see Leon J. Kamin, "Behind the Curve," from *Scientific American*, February 1995.

⁴² See Jorge R. Schemet, Alex Belifante and Larry Povich, "Telephone Penetration 1984-1994," from the Twenty-second annual Telecommunications Policy Research Conference. See also Bruce Egan and Steve Wildman, "Funding the Public Telecommunications Infrastructure," from the Twenty-Second Annual Telecommunications Policy Research Conference. The correlation of telephone penetration to the statistical measures often used for gauging national development is detailed in the second chapter of this thesis.

⁴³ "Information Haves and Have-Nots: Dueling Superhighways," from *The Working Papers of the Edward R. Murrow Center*. (Medford, MA: 1994)

⁴⁴ That service can have a number of components to it; in the United States, universal service is mostly telephony. In France, the advent of Minitel systems, which are data terminals that offer information on everything from recent political decisions to the weather, are made available to every citizen at no cost.

that luxury, and even communities within the richest country in the world do not have that luxury.⁴⁵ The only starting point for addressing this problem is to lower the cost of service as much as possible so that it can be made available to as many people as possible.

When we look at the opportunities for liberalization in light of the changes in the possibilities for participation, we clearly need to concentrate on low-cost technological applications. If liberalization only touches those areas where high-cost technology and services are dominant, we will miss the opportunity to use liberalization as a tool to enhance participation and, through participation, development.

Modernization

Technology changes culture. That much is clear from the experience most of us have had with the introduction of new technologies in our lifetime, such as the television, telephone and computer. There exists a whole wealth of literature on the relationship between technology and culture, ranging from the examination of printing presses and stirrups, to the development of the city, the sciences, and the technologies of the modern age. There is less consensus on what kinds of consistent patterns can be drawn from these diverse examples, but, nevertheless, the political and economic scientists have largely agreed on a term for the process: Modernization.

The tension in the field has, in recent times, focused on the need for a centralizing force to direct and shape modernization. The corporation or the state, through its bureaucratic form of organization and ability to collect resources, has been countered by the diversity of activity in open economic and political systems throughout the world.

For that reason, modernization is a difficult term to define, especially considering how politicized it has become during the last forty years of the development debate. In general, modernization is connected with technological innovation and change; Schumpeter, for example, divides his "modern" and "non-modern" classes by technological use more than simple income levels because of the large

⁴⁵ Some have even begun to argue that scale economies themselves are becoming extinct in light of new technological changes. Comments of Undersecretary of the Treasury Bowman Cutter, from the Coopers & Lybrand Info-Comm Industry Meeting, November 23, 1994 at the Hotel Intercontinental Washington.

pockets of high technology that drive production and politics in many parts of the developing world.⁴⁶

Modernization and development are not “neutral” words; they are connected to certain kinds of social structures and economic practices prevalent in the developed world.⁴⁷ It is not considered a modern practice to bar women from holding political office, for example. But, in many countries in the middle east, the high technology of oil production coexists side by side with the traditional practices of male dominated politics.⁴⁸

Generally speaking, social, economic and technological modernization are thought to be connected, but it is difficult to determine the causal linkages. Without attempting to assign causal links, the conversation usually begins with technology for a number of reasons. From the perspective of theory, it is technology that drives economic growth and productivity.⁴⁹ In these theories, it is understood that economic growth is not the same as development, especially for developmental economists who have made it their point to correct the heavy bias on quantity and growth embodied as assumptions in many economic theories.

This theoretical clarification is especially critical as the world economy continues to move towards a larger service sector and the importance of other sectors diminishes in proportion to the service

⁴⁶ Joseph Schumpeter, The Theory of Economic Development: an inquiry into profits, capital, credit, interest, and the business cycle (Cambridge, Mass., Harvard University Press, 1934)

⁴⁷ Marc Uri Porat, The Information Economy (Washington, DC: US Government Printing Office, 1977), p. 75

⁴⁸ Professor Andrew Hess, The Fletcher School of Law and Diplomacy, Unpublished monograph and personal conversations.

⁴⁹ Take, for example, the Solow growth model:

$$\Delta Y = (\Delta k \cdot W_k) + (\Delta l \cdot W_l) + a$$

where ΔY is the change in national income, Δk is the change in the capital stock of the country, Δl is the change in the labor force; both Δk and Δl are modified by the share of each in the national income, which is represented by the W_k and W_l in the equation. For our purposes, the critical element is the letter “a.” Encapsulated in that one letter is the increase in output not explained by increases in capital or labor. In short, “a” represents the role of new technology as a factor in the growth of national income.

economy.⁵⁰ The economic revolution underway today will be driven “not by changes in production, but by changes in coordination.”⁵¹ What we are witnessing is a new kind of control revolution brought about by distributed information systems and global communications networks.⁵²

Many economists would use the term coined by Simon Kuznets to describe these technological developments: we are in the midst of an epochal innovation, which, to his way of thinking, is the key to modern economic growth.⁵³ Here we can parrot some of the wide-eyed descriptions of the popular media, which range from the “information age” and “information superhighway” phraseology, all the way to the “cyberspace” jargon of the emerging popular culture.

The political scientists, too, have focused a great deal of intellectual energy on describing the institutional framework of modernization. Most commonly, they have described the modernization element of the development process in terms of stages. Perhaps the most famous metaphor that surrounds talk of development is Walter Rostow’s concept of the “take off” point.⁵⁴ By assembling the requisite resources and bringing the appropriate institutions to bear, a country can “take off” and “drive to modernization.”

Summarizing both the staged descriptions of the political scientists and the technological emphasis of the economists, Samuel Huntington casts the issue of modernization in a broadly social frame:

Those aspects of modernization most relevant to politics can be broadly grouped into two categories. First, social mobilization... means a change in the attitudes, values, and expectations of people from those associated with the traditional world

⁵⁰ Daniel Bell, The Coming of Post-Industrial Society. (New York: Basic Books, 1973) Also, we can speak of William Baumol’s hypothesis that there are “convergence clubs,” which outlines courses of development that bring groups of countries into the developed world at different times.

⁵¹ Thomas W. Malone and John F. Rockart, *Scientific American*, p. 92 (Sept. 1991)

⁵² W. Russell Neuman, The Future of the Mass Audience (New York: Cambridge University Press, 1991)

⁵³ Simon Kuznets, “Modern Economic Growth: Findings and Reflections.” Also, Economic Change: Selected Essays in Business Cycles, National Income, and Economic Growth (New York: W.W. Norton, 1953) It is important to point out that Kuznets’ turn of a phrase is not much different than the earlier expression of similar ideas by Joseph Schumpeter and Adam Smith.

⁵⁴ Similarly, A.F.K. Organski outlines his stages of development, which are meant to describe the character of political relations in each stage of development. The politics of modernization figure prominently as one of the stages, which includes the politics of bringing new technologies to bear on existing social and economic problems.

to those common to the modern world. It is a consequence of literacy, education, increased communications, mass media exposure, and urbanization. Secondly, economic development refers to the growth in the total economic activity and output of society. It may be measured by per capita growth, national product, level of industrialization, and level of individual welfare gauged by such indices as life expectancy, caloric intake, supply of hospitals and doctors. Social mobilization involves changes in the aspirations of individual, groups and societies; economic development involves changes in their capabilities. Modernization requires both.⁵⁵

Part of the problem in understanding these two transformations sketched out by Huntington is that commentators often focus on modernization as an undifferentiated force for good that penetrates a society along the pattern of a traditional diffusion curve. But the simple fact of the matter is that all good things do not go together, and modernization does not have to start and seldom does begin from a single point. What the research from the field has made clear is that certain segments or classes of society begin by adopting a certain social practice or technology, they are seen as leaders, the leaders are eventually followed by the rest of a community, and the community is thereby transformed.⁵⁶

That finding, according to some, provides the grounds for justifying a highly centralized and undifferentiated approach to development. This is especially true for advocates of traditional Marxist or socialist theories of modernization, where the state becomes the key source of policy and specific vanguard groups carry the message of social change throughout their communities. With the fall of the Soviet Union and the broad discrediting of these kinds of efforts, though, a variety of alternative directions have been considered for driving modernization within specific underdeveloped countries.

Some of the most compelling visions of a modernization driven by technological diffusion comes from the established literature which connects social policy with appropriate technology.⁵⁷ The ability of developing countries to gain access to their own technological sources is a critical concern. The forward and backward linkages of technological modernization become the critical ground for planning and understanding the organizational consequences of new technology.⁵⁸

⁵⁵ Samuel Huntington, Political Order in Changing Societies, (New Haven: Yale University Press, 1968), p. 35.

⁵⁶ See, in particular, Everett Rogers, The Diffusion of Innovation (New York: Free Press of Glencoe, 1962)

⁵⁷ E.F. Schumacher, Small is Beautiful (London, Blond and Briggs, 1973)

⁵⁸ Hirshman, Exit, Voice and Loyalty: Responses to Decline in Firms, Organizations and States (Cambridge, Massachusetts; Harvard University Press, 1970) and, more particularly, The Strategies of Economic Development (Cambridge, England: Cambridge University Press, 1980).

This literature suggests an opportunity to balance state involvement with a distributed, decentralized model for national development. Modernization can be driven through appropriate technology that fuels energy at multiple locations throughout a community, allowing the goals of economic and political development to be achieved through a decentralized pattern of community empowerment. If such a design can be connected to a liberalization policy, we could begin to construct a coherent map for achieving the social, economic and political goals associated with modernization.

The Role of Public Policy

For public policy to be successful in the development process, it is commonly assumed that government must bring resources to bear that would not be available otherwise. The opportunity for new kinds of participation and a decentralized form of modernization can alter how public policy informs the liberalization process: By emphasizing the sustainability of competitive providers, the institutions of government can help to organize resources that presently exist effectively instead of struggling with the apparent lack of resources.

One of the critical assumptions of development thinking has been that the state is the central focal point for social action.⁵⁹ Economic and political development theorists share one conviction: planning is essential. We can add to that another truism of public policy: success is survival. The burden of development rests on the institutions of public policy that are thought of as the directing force for development. Through revolution or election, leaders who do not provide for development

⁵⁹ Theda Skocpol's concluding paragraph has an interesting point to make on this issue:

The causes and outcomes of the great social revolutions of the past could hardly be recapitulated in future democratic-socialist revolutions in advanced industrial countries. Still, the past does have something to say about the future: It suggests that future revolutions, as in those of the past, the realm of the state is likely to be central.

The quote is from The State and Social Revolutions (Cambridge and New York: Cambridge University Press, 1979) Leaving aside the neo-Marxist philosophy she espouses, there is an important point to reiterate: Revolutionary change must focus on transforming the political process. Whether or not the state will truly be at the heart of future political organization is a different issue that, to my mind, is much less assured.

are removed; even in the case of the communist bloc, for so long seen as unshakable, the lack of economic prosperity and development eventually brought down the governments.⁶⁰

But planning is not easy, especially in developing countries that are often characterized by the “weak states” that govern them.⁶¹ Developing countries often do not have the intellectual and physical resources necessary to perform the long-term strategic planning that many developed countries have integrated into their governing structure.

At the center of these successes and failures are the institutions of management: the government and corporation. When it comes to the strategic management of infrastructure resources, the responsibility has traditionally fallen to the public sector. The main reasons for this are both theoretical and practical. Economists have identified economies of scale that would be appropriate to monopoly production, and have advocated, in some cases, the strong regulation of a monopoly provider for infrastructure services. At a practical level, much of the capital required for the construction of such projects would have to come from deep pockets, and, no matter how inefficient they may be, there are few deeper pockets in world history than modern Western governments.

The origins of the electric, gas, and telecommunications industry were all dependent on direct government intervention, and governments have traditionally used their role in such projects to maintain control over resources that were thought essential to the well-being of the nation. During the cold war, one of the best rehearsed arguments in favor of retaining the monopoly structure of the Bell System was that AT&T represented the most critical asset in the maintenance of national security.

Even in developed countries, the existing monopoly cultures make change difficult, if not impossible. Established interests will continue to collude and cross-subsidize services in order to retain a monopoly position. But in many cases, the policy institutions are not independent from the providers of services and are not willing to take a proactive stance in the introduction of competition.⁶²

⁶⁰ Zbigniew Brezezinski, The Grand Failure (New York: Macmillan, 1990)

⁶¹ Clapham, Third World Politics

⁶² Michael Tyler, Susan Bednarczyk, Stuart Brotman and W. Russell Neuman. “The Changing Role of Government in an Era of Deregulation: Options for Telecom Regulatory Processes and Procedures.” (Medford, MA: Published for the International Telecommunications Union by the Fletcher School of Law and Diplomacy. January, 1993).

Public policy will still have to be focused on managing social assets and resources, but the kind of management that will be required is changing rapidly. The traditional explanations of how and why policy is important to the management of infrastructure sectors no longer is sufficient guidance for corporate and public-policy makers. A new understanding of how public and private sector can cooperate will be essential to the construction of new institutions that match competitive realities.

How communities adapt and adopt new institutional frameworks will determine, in great part, how successful they are in providing these essential services to their community. As the World Bank notes, “the performance of infrastructure [services] are derived, not from general conditions of economic growth and development, but from the institutional environment.”⁶³

This brings us back to the concept of a “weak state.” A government without the institutional means to effectively allocate resources is left adrift, with few means of guiding social or economic development. Quite often, that requires the political leadership to use the military as a crutch to support themselves in power.⁶⁴ Yet there are some instances where countries with limited resources and lacking an institutional framework to guide development have succeeded.

It is a quality of political and economic leadership that has helped many developing countries to move forward; observers point to the successes of Korea, Singapore, Taiwan and the other newly industrialized countries of Asia with a view to promote their strong sense of leadership. Whether or not the “Asian values” of Lee Kwan Yew are to be emulated in other countries or not is not the issue for our purposes. It suffices to say that a strong leader or leadership group that can help to manage what are limited resources becomes an essential asset in the struggle for economic and political development.

This is also true in developed countries, but in a very different sense. There are plenty of experts that are willing to testify in front of a congressional committee that such and such a policy is a good idea. There are hundreds of consulting organizations that are willing to explain to a corporate manager why he or she should follow such and such a policy.

⁶³ The World Bank Development Report, p. 6 Emphasis mine.

⁶⁴ Clapham, Third World Politics

Many countries lack the leadership required to make informed policy decisions because they are unaware of the resources that actually exist.⁶⁵ Liberalization needs to reconstruct the role of public policy as the mechanism to identify resources that might help to sustain competitive institutions.

4. Reconstructing Liberalization: Taking Advantage of New Opportunities

We are facing a stage in historical development where the traditional definitions are transforming themselves. At the same time, it is clear that many of these elements need to be included in our discussions of development, if only for the reason that so many of the questions they raise remain unresolved.

That combination has left corporate and government managers unsure of their footing. Have the goals of privatization been achieved? Yes and no. Yes, inasmuch as the ownership of public sector companies has been transferred to private hands. The transfer has often met the two traditionally defined goals of development mentioned above: It has increased participation by the distribution of wealth and allowing for further private sector contributions, and provided the capital needed for continued modernization of services.

This returns us full circle to the issues that appeared at the beginning of the chapter. Privatization is an unfinished business, and liberalization is the best opportunity to fulfill the promise of privatization: lower costs, better service and national development. But a policy of deregulation and privatization is not in itself a policy which will improve the provision of services. A different kind of market liberalization is required if privatization is to truly achieve the aim for which it was intended: Improved services and truly sustainable development of infrastructure resources. The term we will use to describe that kind of liberalization is “strategic liberalization.”⁶⁶

⁶⁵ W. Scott Thompson, The Rise and Fall of Third World States

⁶⁶ W. Russell Neuman and Lee McKnight are responsible for much of the ongoing work on the possibilities for Strategic Liberalization. The phrase was coined by Neuman as part of an extensive analysis of the Telebras ownership and provision structure in Brazil. The work on that and other projects has been the stimulus for much of the telecommunications theory articulated in this thesis.

4.1. Strategic Liberalization: A Strategy for Infrastructure Management

Strategic liberalization is a strategy for infrastructure management that attempts to take advantage of the social, economic and technological changes that have driven the alterations in the provision of infrastructure services worldwide. We have already provided a definition: The implementation of specific policy measures to increase competition in the market for wireless access services, such as cellular, wireless local loop and satellite communications. A strategic focus on wireless communications will provide a sustainable foundation for the continued growth of the telecommunications sector and the successful introduction of new products and services in an environment of facilities-based competition. In addition, it is a policy which can help public and private sector managers identifying economic and technological trends, and adapt political and economic institutions to facilitate development through participation, modernization, and the reinvention of public policy.

By choosing the word “strategic,” we are emphasizing the fact that corporate and public management has to make strategic choices in order to make such a policy successful. Strategic choices about particular technologies, for example, are critical to the success of liberalization. In the telecommunications sector, as we will discuss, there are a range of possible technologies and services that can be emphasized in the first stages of liberalization. Traditionally, liberalization has focused on the high-cost technologies, such as value-added networks, leaving the public network monopolized. That choice can now be inverted; liberalization can start with low cost wireless technology that would have an immediate impact on the establishment of competitive markets.

Strategic choices have to be made about the structure of the governing institutions. Should regulatory regimes concentrate on constraining large, in some cases, monopolistic providers, or should they take proactive steps to diversify the marketplace? In most cases, regulatory agencies have acted as watchdogs, reacting to marketplace changes instead of anticipating them. A more proactive stance is possible, and certainly needed during this period of change. But which areas and technologies are appropriate choices for investment and liberalization?

Corporate managers have strategic choices to make. Traditionally, corporate managers have used established services as a base for determining the cost and structure of future services, but, for the provision of infrastructure, such an assessment is difficult, if not impossible. There are no established services that would allow us to conduct a traditional customer-needs focused marketing study to

define products and services. So the questions are evident, even though the answers are less so: What is the size and scale appropriate to the provision of certain services? And what kinds of service architectures will allow a company to maintain a sustainable investment policy in an environment of facilities-based competition?

Providing a framework to answer these questions requires a assessment of technologies, combined with an examination of the social consequences of these technologies as they relate to their potential as profitable products and services. The grounding in the social sciences which strategic liberalization offers provides a further dimension for analysis which is not included in the traditional perspectives of telecommunications policy makers in the public and private sector.

In addition, the policy of strategic liberalization defined in this thesis attempts to bring a common character to the choices that are being made by corporate and public managers. Both corporate and public managers hope to establish institutions that are microeconomically and micropolitically sustainable and have the ability to compete for the provision of services. By describing the opportunities for decentralized modernization and enhanced participation, and pointing to specific occurrences in the four countries that we will be examining, our goal is to help define as a global community how the quality of and access to infrastructure services can be improved.

The second, third and fourth chapter further outline the dimensions of strategic liberalization, and what it means for the telecommunications sector. Specifically, we will look to the possibilities for wireless communications to provide the foundation for further competition in the telecommunications marketplace, thereby providing an opportunity for public and corporate policy makers to use wireless access as a cornerstone for future competitive planning.

Chapter two focuses on the role of telecommunications in development, tying improvements and reduced costs in service to the overall needs of development that this chapter has outlined. By reviewing the literature on telecommunications and development and drawing new conclusions about the changed technological, political and economic environment, we will highlight the importance of telecommunications in enhanced political and economic participation and social modernization.

Chapter three focuses on wireless communications, discussing the altered cost structure and policy environment of wireless access. By reviewing the level of existing competition for wireless communications services, and discussing the opportunities for the cultivation of future competition,

our goal is to recognize the strategic potential of wireless access as a driving force for telecommunications development.

Chapter four describes the case studies that will further define the opportunities for strategic liberalization. In the chapter, we will outline some of the analytic tools which will allow us to draw comparative conclusions about development of wireless access in the United States, the United Kingdom, Russia, and Brazil. The rest of the thesis is taken up with a discussion of each of the case studies, with a final chapter drawing conclusions from each of the case studies about the possibilities for future policy.

As we begin to outline the parameters of such a strategy, we should remember the proposition which motivates our discussion: The old ways of doing development are no longer viable in the changed political and economic environment. Political and economic participation is not what it once was. Modernization now means something very different. unless we breathe new life into these terms and thoughts, they will become irrelevant, leaving people who might benefit from such ideas marginalized. Strategic liberalization represents a new and critical opportunity to regain the initiative as we continue to search for a better future for the citizens of the world.

Chapter 2

Telecommunications and Development

The best definition of “telecommunications” comes straight from its roots. It is communications “through” a medium. The word communications, defined as “a process by which information is exchanged between individuals through a common set of symbols, signs or behavior,” comes from the word “community.”¹ The whole idea of telecommunications is closely tied to how communities work, which is why so much has been written about the impact of new technologies on political and social organization.²

Telecommunications is the critical technology of the information age. In a world that increasingly depends on the integration of information and the automation of control systems that coordinate the activities of so many machines, the technologies that connect us define the way we work, live and learn. For that reason, the telecommunications revolution has become a global phenomenon. Talk of establishing a Global Information Infrastructure is a dominant theme in the literature, and many speak of the potential value of a world wired for information.

The social implications of the telecommunications revolution are far-reaching. In the first chapter, we alluded to the relationships drawn between social and technological change. For the study of telecommunications development, this relationship remains a central concern. There is a real connection between the kind of technology that is used to communicate and the kind of society that exists with the technology. As technology changes, what a person can do changes, and how people relate to each other also changes. Development is concerned with what a person can or cannot do, to re-echo the words of Amartya Sen, and changes in telecommunications technology clearly change what a person can or cannot do.

A number of questions immediately arise: Does the expansion of the telecommunications network help a community to achieve the goals of development? What kinds of policies, aid packages, regulatory stances and corporate management decisions would most appropriately tie telecommunications development to national development? What policies focus investment on the

¹ Webster's Ninth New Collegiate Dictionary, p. 266.

² Jeffrey Abramson et. al., The Electronic Commonwealth (New York : Basic Books, c1988).

expanded opportunities for modernization and participation associated with new telecommunications technologies? And, most importantly for our purposes: Are there specific kinds of technology and technological organization in the telecommunications industry that contributes to the development process?

To answer these questions, we spend the next chapter examining the history of the institutions engaged in the delivery of telecommunications products and services. By outlining the changes and issues in the telecommunications sector, we will work to identify the criterion by which competitively sustainable institutions for the telecommunications sector can be identified.

Our first step is to describe the origin and early progress of telecommunications services throughout the world, discussing some of the common technological, economic and political factors that have shaped the provision of services. We will then examine the impact of these institutions on the development process, examining some of the causal models that connect increased telecommunications investment to national development. Finally, we will identify new technologies and kinds of competition that are most likely to contribute to the goals of national development. By the end of the chapter, we will be prepared to focus our attention on the role of wireless communications services as a critical opportunity for implementing a policy of strategic liberalization.

1. The Legacy of Government Involvement in the Telecommunications Industry

The companies and government ministries that provide telecommunications services today offer customers the opportunity to communicate through certain kinds of technology. The technologies are diverse: Telephones, televisions, satellites, computers, electronic mail networks, personal digital assistants, just to name a few, and more are being introduced every day. The content and nature of communication is limited only by human thought and ingenuity. From basic conversation to the collaborators on the Internet, all different kinds of content will be circulating on the networks of the future.

But much of that is hype. Fortunately, we can ask Ithiel de Sola Pool to describe, in simple language, what is going on when we speak of a communications system.

Viewed physically, a communications system consists of 1) a series of nodes, or terminals, each of which is an input device, or an output device, or both; 2) a transmission medium among the nodes; 3) sometimes a switching device that determines which nodes are connected to which; and 4) sometimes a storage device for holding messages and forwarding them later on. It can be a one-way communication system -- like broadcasting -- in which one node talks and the rest listen; or it can be a two-way communication system like the telephone.³

At the fundamental level, telecommunications is the art of connecting people through a medium. How that happens is the critical issue in discussing the differences between kinds of communications.

The traditional telecommunications company has played the role of “transmitter,” carrying signals from one place to another. There are two means for transmitting communications that have been developed: through wires, which allow for the transmission and reception of information at the fixed points along the wire, and through wireless, which uses the electromagnetic spectrum to carry information from one place to another.

In that regard, we can characterize the service provided by these institutions as *access to communications*. By stringing a copper wire to a person’s telephone, or handing a person a cellular phone, or by connecting a person’s television or a satellite or cable television access wire, the company offers a person access to a certain kind of communications.⁴

How access is provided, the quality and cost of access, and the nature of access are all bound up in the economic and social developments of the last two hundred years. This brief history of telecommunications explains some of the dynamics that have shaped the kinds of telecommunications services that are available throughout the world today.

³ Ithiel de Sola Pool, *Technology Without Boundaries* (Cambridge, Mass.: Harvard University Press, 1990), p. 19.

⁴ For George Calhoun, we are entering the age of “access” in telecommunications development, where the critical fact of institutional transformation will be focused on linking customers directly to telecommunications and information services.

1.1 Early Developments in the Telecommunications Industry

Telecommunications does not start with Alexander Graham Bell. As a practical man of science, Bell's work depended on a range of scientific innovations in physics, chemistry, and other physical sciences through the course of the two centuries preceding his invention of the telephone. The development of the telegraph was closely tied to innovations and experiments in the transmission and production of electricity, for example.

But to understand the place of the telephone and other telecommunications technologies, we need to go back further than Bell's invention. For centuries, governing authorities had established systems of communication to link the often far-flung territories they controlled.⁵ Most of the efficient systems relied on the visual transmission of signals from one station to another.⁶ With the expansion of electrical and transportation systems during the wake of the industrial revolution, a new control structure emerged for the coordination of these activities.⁷ At the core of this information infrastructure was the manipulation of electric current in the form of the telegraph.

The first experiments in telegraphy were undertaken in the mid 18th century, but the problems of controlling and harnessing electricity was not resolved until the experiments of Michael Faraday in the early 19th century. A variety of devices were created to code and send messages through electric pulses, transmitted in one place and received in a second.⁸

It was left to an American to make the experimental breakthroughs a commercial success. By taking a simplified version of the two-wire telegraph, standardizing the dot-and-dash codes, Samuel Morse established a commonality that could bring far-flung points together. On January 1st, 1845, Morse's

⁵ Many have argued that a community is defined by the structure of the communications system. Karl Deutsch argues that the border of a community is at the space where a differentiation between inward and outward communication becomes significant. (from The Nerves of Government). Benedict Anderson's concept of an "imagined community" echoes the same central idea: Through the development of the mass media, national consciousness in the Americans was able to take root. (from Imagined Communities)

⁶ Semaphore code, for example, played an important role in the coordination of government activities during the tumult that followed the French revolution. T. K. Derry and Trevor I. Williams, A Short History of Technology, (New York: Dover Publications, 1960), p. 622

⁷ James Beniger, The Control Revolution

⁸ Howard Frederick, Global Communications & International Relations (Belmont, CA: Wadsworth Publishing Company, 1993). p. 34

machine successfully sent the message “what God hath wrought” from Baltimore to Washington. A year after his success, 1,445 kilometers of telegraph lines were active in the United States.⁹

By 1862, the world’s telegraph system covered approximately 150,000 miles, and telegraphy was established as a critical technology of coordination for the industrial age.¹⁰ By that time, Cyrus W. Field had succeeded in linking the Americas and the European continent with undersea cables, allowing for a message transmission from President James Buchanan in the United States to Queen Victoria of England.¹¹

The basic technology of telegraphy was transformed into a control structure in a time of increasing industrialization throughout the developed world. Business and commerce began to rely on the possibility of two-way electronic communication to direct and guide strategic decisions and coordination. Automatic switching and signals for the railway system were installed and completed from the 1860’s to the 1880’s, completing the “leveling of times and places” that such technology made possible.¹²

The telegraph was so well established that, when Alexander Graham Bell applied for a patent on his working model of the telephone on February 14, 1876, few would have predicted it would first challenge and then replace telegraphy as the dominant form of two-way communication throughout the world¹³ -- Especially considering the fact that the idea of transmitting voice through a wire by means of producing variable resistance in the microphone and constant resistance through the amplitude modulation of an electric current in the wire was not new. Concurrent with Bell’s invention and commercial licensing of his patents, similar devices were registered in Britain, France and Germany.

⁹ Ibid, p. 34

¹⁰ Derry and Williams, A Short History of Technology, 687-689

¹¹ James Jerpersen and Jane Fitz-Randolph, Mercury’s Web: The Story of Telecommunications (New York: Athaneum, 1981), p. 15.

¹² Beniger, The Control Revolution, p. 318. Interesting to point out that the technology of the telephone and telegraph were both born during a period of centralizing forces; production, information and control were dragged from the peripheries to corporate and political institutions.

¹³ It is widely agreed that the first person to actually create the engineering specifications for a usable telephone was Elisha Gray, not Alexander Graham Bell. But Bell arrived at the patent offices just before Gray, and won the rights to the invention, even though the prototype he patented did not actually work.

Stretching a wire from one place to another and using that wire to transmit information allowed for a limited sense of communication. There were two options: Either the wire started in one place and stopped in another, in which case only one person could communicate with no more than one other person, or one wire could connect to many people, in which case only one person could “communicate” and everyone else would have to wait to communicate with everyone else.

For that reason, the initial applications of the telephone were for what would be called today, “broadcasting.”¹⁴ Much like cable television today (though certainly not like the cable television of the future), a central source that sounds through the wired network to all the receivers who subscribed to the service. In fact, daily weather reports and concert symphonies were the order of the day in many continental telephone systems before the turn of the century, complete with daily schedules and regular broadcast formats.

The critical invention required to transform the telecommunications industry at this stage of development was the switch. Before switching, the telephone network did not have the ability to route messages and conversations from place to place so as to ensure that each person with a telephone could call any other person with a telephone. With switching, connections could be made between points and two-way conversations could ensue.

The first switches were human operated, and the development of an electromechanical switch did not occur until early into the next century. Even then, the telephone systems of the developed world relied on human operators and switching until the 1930’s and 1940’s.

Following the expiration of Bell’s patent in the United States, a period of competition ensued that dramatically increased the level of penetration of telephony.¹⁵ The Bell System, guided by Theodore Vail and backed by the financing of J. P. Morgan, did battle with a number of local telephone providers. Meanwhile, the European powers had decided that telegraphy and telephony posed a direct threat to their monopoly of all postage services. As such, many of the countries began to bring all telephony services under the rubric of their Ministries of Posts, thus creating the Post, Telegraph

¹⁴ Ithiel de Sola Pool ed., *The Social Impact of the Telephone* (Cambridge, Mass.: MIT Press, 1977).

¹⁵ Milton Mueller, “Universal Service in Telephone History; A Reconstruction,” from *Telecommunications Policy*, July 1993, pp. 352-369.

and Telephone administrations that have dominated the provision of such services in Europe for the course of the 20th century.¹⁶

Throughout what is commonly known today as the developing world, reasonable levels of telegraph and telephone penetration were achieved. Telegraph and telephone service was inaugurated in many Latin American countries soon after its introduction in the United States and Europe. Colonial administrations extended the new communications technology in the continuing expanse of imperialistic power towards the end of the 18th century.

During this expansion of wired telecommunications, Guilermo Marconi was experimenting with a completely different way to send messages and voice from one point to another. Following on the experiments of the physicists that set the foundation for Einstein's theory of relativity, Marconi developed a system for "wireless telegraphy." The early development of wireless was marked by the politics of the age; the first applications that became profitable for the Marconi company was the ship to shore service that the British, Italian and German navies prized so heavily during the years leading up to the First World War. Marconi's services were not allowed to directly compete in Great Britain with the telegraph and telephone services administered by the British Ministry of communications. As such, many of the applications that have become so significant today, such as mobile telephony, were delayed for another time and another age.

1.2 The Age of the Public Utility

With the final reforms of the communications sector in the early 1930's in the United States, a standard organization for the provision of telecommunications services had been established worldwide. Centralized organizations, grounded in government ministries or what became known as "public utilities," defined the character of telephone service. That fact is clear in the history books. Why it happened is still a source of significant debate.

The traditional view is best expressed in the work of Alfred Chandler, an economist and organizational theorist that many draw upon for his particular analysis of the telecommunications

¹⁶ Eli Noam, Telecommunications in Europe (New York : Oxford University Press, 1992).

industry in the United States.¹⁷ His view relies upon a definition of economies of scale that is used to justify the existence of public utilities; when the average cost of producing another unit of output falls with each unit of output, an external economy of scale exists. Other producers in the marketplace would cause economic waste inasmuch as a single company could produce the output at a lower average cost than the average cost of two or more companies.¹⁸

But Chandler's argument relies on more than just a traditional description of scale economies and their effect on production. He also argues that a certain kind of organization was required to support the provision of telecommunications services worldwide. Chandler's view is that:

The speed and volume of messages made possible by the new electric technology forced the building of a carefully defined administrative organization, operated by salaried managers, to coordinate their flow and to maintain and expand transmitting facilities. The first enterprise to create a national organization to handle through traffic obtained an almost unassailable position.¹⁹

The combination of organization and technology produced a natural economy of scale. Monopoly organization for the telecommunications sector was natural and therefore enshrined in the public policy of the age.

Others see it differently. Milton Muller argues that competition was the real stimulus of telephone penetration in the United States.²⁰ Through a process he calls "access competition," telephone service was extended to rural and small-town America by small and medium sized companies hungry for a share of the market for local telephony. The small companies were able to develop and

¹⁷ Albert Chandler, Scale and Scope; The Dynamics of Industrial Capitalism (Cambridge, MA: Harvard University Press, 1990).

¹⁸ In many ways, the founder of this theory was Alfred Marshall, who first articulated the idea of economies of scale in the last 1800's.

¹⁹ Albert Chandler, Scope and Scale, p. 202.

²⁰ Milton Mueller, "Universal Service in Telephone History." *Telecommunications Policy*, July, 1993. Much of the discussion about competition in the early development of telecommunications infrastructures in the United States presented in this thesis draws from Mueller's writings, but one of his most significant sources is David Gabel. See, in particular, "The Early Competitive Era in Telephone Communications, 1893-1920," *The Journal of Regulatory Economics* (September, 1994); and, David Gabel and D. Mark Kennet, "Economies of Scope in the Local Telephone Exchange Market," *The Journal of Regulatory Economics* (1994).

maintain the kind of system they did because the economies of scale in the telecommunications industry come more from switching than from actual transmission. “The small-scale telephone switchboards needed by small towns and rural areas were easy to manufacture and inexpensive to operate,” Mueller argues, creating the conditions for competition and increased penetration.²¹

Mueller’s argument brings into question the view that increasing penetration of telephone services nationally was only possible through a monopolized, in many cases publicly owned, telephone company. Andrew Davies, employing a methodology founded in political economy, sees the influence of American financiers and centralized politics in Europe as being more the determining factor than the kinds of technological and organizational dynamics described by Chandler.²²

The Structure of the Public Utility

This is not the place to rehearse those debates and bring them to a conclusion. But it is fair to say that the creation of the public utilities of this century were a political decision. There were other options for the development of infrastructure services, such as telecommunications, but these paths were not taken. Regulatory agencies and ministries were constructed to closely monitor the establishment of service, along with the cost and quality of that service.

The nature and structure of public utilities settled in the first quarter of the 20th century. In the United States, that meant a compact between a private company, American Telephone and Telegraph, and the government. Embodied in the Kingsbury Commitment of 1913 and the subsequent Communications Act of 1934, AT&T was given the exclusive right to provide telephone service throughout the country. The Bell System provided that service through a group of Bell Operating Companies, which integrated their service with the long lines department and the equipment producing division of AT&T, Western Electric. As part of that public compact, though, the Bell System had to offer service in conjunction with a number of smaller companies that had developed during the period of competition from the late 1880’s to the early part of the next century.

Overseeing the provision of services in the United States was the Federal Communications Commission, established as part of the 1934 Communications Act. Along with its oversight of

²¹ Ibid, p. 357. Also, Milton L. Mueller, “The Switchboard Problem: Scale Signaling and Organization in Manual Telephone Switching, 1878-1898,” *Technology and Culture*, Volume 30, July 1989, pp. 534-560.

²² Andrew Davies, *Telecommunications and Politics* (New York: St. Martin’s Press, 1994)

broadcast and radio spectrum, the FCC was and is responsible for ensuring that the character and quality of service in the telecommunications industry is in accordance with federal law. State utility commissions, which had become an important part of state regulation of utility activities by the turn of the century, took on the responsibility of overseeing the provision of services in their respective jurisdictions.²³

In Europe, there was no need for such a compact inasmuch as the government had taken early control of the provision of services. Additionally, the complications of a federal system did not exist in the unitary states of Europe at the turn of the century. The establishment of Post, Telephone and Telegraph (PTT) administrations created the European version of the public utility. The government ministries were mostly self-regulating, with the management of the telecommunications systems being the responsibility of politically appointed managers.

This structure was, in great part, a kind of entente between the government and a variety of private investors wishing to offer infrastructure services. The entente fixed the structure of these institutions for more than 60 years, with very little structural change. The stability provided an opportunity to increase penetration of services, and the regulations put in place for defining the activity of these institutions reflected this opportunity.

Rules and Regulations Guiding Utility Institutions

In this stage of telecommunications development, service offerings of for all of the companies around the world looked pretty much the same: The public, switched telephone network brought you telephone service. The network was "public" because the goal of the service was everyone should be able to gain access to the service. Switched, inasmuch as it was an integrated network that linked all subscribers together through the technology of the switch. Even though the numbers were different and the kinds of dial tones or rings were also different, telephones, from a functional point of view, were telephones. You spoke through on one end, and on the other end, the person heard your voice.

²³ See Paul E. Teske, After Divestiture: The Political Economy of State Regulation (Albany: The State University of New York)

The guiding principle for the public utility was the common law concept of common carriage, imported to the United States and much of the Western world from the British legal tradition.²⁴ The concept of common carriage evolved with regard to what we would today call infrastructure services, such as transportation and communications. Because of the nature of the service and its importance to commercial and business transactions, a common carrier owes a duty of non-discrimination; the “common carrier was required to serve, upon reasonable demand, any and all who sought out their services.”²⁵

The common carrier system has largely defined the character of regulation as it relates to the provision of telecommunications services in the developed world. As Eli Noam points out:

The common carrier system has served telecommunications participants well: it has permitted society to entrust its vital highways of information to for-profit companies, without the specter of unreasonable discrimination and censorship by government or private monopolies; it was an important element in establishing a free flow of information, neutral as to content; it reduced administrative costs and the burden of liability of a carrier, since it needed not, at least in theory, inquire as to a user’s background and intended use; and it protected the telephone industry from various pressure groups who would prevent it from offering service to their targets of protest or competition.²⁶

Under such protection, the telecommunications industry was able to flourish in countries with sufficient capital to develop extensive telecommunications networks. The combination of standardized, undifferentiated telephone service and a common carrier network became the defining points for the concept of “universal service.” First defined more as a public relations term by AT&T at the turn of the century,²⁷ universal service quickly became a fixture of American policy. In the 1934 Communications Act, the goal of universal accessibility was set into law and remains a firm goal of communications law to this day.

²⁴ Eli Noam, “Beyond Liberalization II: The Impending Doom of Common Carriage,” from *Telecommunications Policy*, Vol. 18, 1994.

²⁵ *Ibid*, p. 437. See also *Western Union Telegraph v. Call Publishing Co.* 181 US 92, 98 (1901). The case set the standard of common carriage for telegraphy, and set the stage for similar regulations and expectations to be applied to the telephone industry in the United States.

²⁶ *Ibid*, p. 437.

²⁷ American Telephone & Telegraph Company, *Annual Report*, 1907, pp. 17-18.

The problem was: What kinds of institutional activity could best support that goal? In the United States, a number of subsidized companies sprung up to fill in the gaps where the Bell System companies could not economically recoup their investment.²⁸ Where the companies were publicly held, more often than not a direct subsidy was given to those individuals who were unable to purchase telephone service or lived in geographically isolated regions.

In the developed world, universal service has largely been realized through the public utility system and PTT administrations. Penetration rates of 93%-95% in some countries indicate that the telephone has become a pervasive instrument of our society, connecting millions of people each day through a service that has become regular, reliable and thought of as essential.

Perhaps most significantly, universal service was achieved largely at the expense of some of the large, corporate institutions that had an intensive need for communications services. Local telephony was basically subsidized by long-distance service, which was priced well above cost in almost all of the developing countries. The reasons were mostly political; lower rates for local consumers and "essential services," such as information, police and fire services, were very popular with citizens, and thus a boon to elected officials.

But as penetration rates increased in the developed world under the aegis of public utility and PTT management, the telephone did not fare as well in poorer countries through the world. Many of the states that formed during the period of decolonization choose the dominant style for the administration of their telephone administrations; government ministries cropped up throughout Africa and the former Asian colonies as telecommunications service providers. Telecommunications providers in Latin America, many of which were independent even into the 1960's and 1970's, were nationalized for the purposes of achieving higher rates of performance. Nevertheless, in the developing world, telephone penetrations most often are below the level of 10 per 100 people. Considering the lack of resources and the traditional difficulties that these telephone administrations have faced, universal service seems to be an impossible task.

²⁸ Two of the largest telephone companies in the world, Sprint and GTE, were born of this attempt at realizing universal service. By using these two companies (or, more properly in the case of Sprint, the ancestor of the company) to provide subsidized service to rural communities, the government fostered the penetration of telephony and strove to meet the goal of universal service.

1.3 The Tragedy of the Public Network: The Breakdown of the Public Utility Model

Whether or not a natural monopoly ever did exist, or whether it was mostly a theoretical construction used to justify a political decision, the public network did thrive from its establishment at the beginning of the century into the 1960's and 1970's in the developed world. Then, decreases in prices and new technological opportunities began to change the public network.

The first changes were seen among the intensive users of telecommunications services, most particularly large corporations. In the words of Marcel Roulet, then chairman of France Telecom:

We in the business community have seen a new type of corporation emerging. We call this the global enterprise, and it is marked not merely by its capability to sell goods or services on an international scale, but its ability to coordinate the activities of international operating entities into a smoothly-functioning unit, regardless of distance or differences in time, language, monetary structures or culture.

Of course, the global enterprise may only be built, operated and maintained through the use of a global enterprise network. This is no secret, and in fact the corporate strategies of many of the world's largest corporations have for the past few years been focused on creating the most effective enterprise networks that will allow them to achieve their strategic aims, anywhere on the globe.²⁹

The impact on global communications has been revolutionary. For corporations, making a call half way around the world needed to be almost as easy as making a call down the street. Global communications networks catalyzed this development, facilitating the transformation of the telecommunications providers and the customers they served through the deployment of new infrastructure capacity.

The results were apparent in the statistics. Usage skyrocketed. Calling minutes, both for long distance and international calls have increased dramatically since the early 1970's. Not only have

²⁹ "The Corporate Evolution Wrought by Global Networking," comments by Marcel Roulet at the Business Week Conference on Global Telecommunications. May 7, 1991.

businesses increased their usage of telecommunications services,³⁰ but so have common citizens who have benefited from lower prices and the opportunity to reach out to this new global community.³¹

But this transformation involved much more than basic telephony. The advent of computers and information processing systems brought a new need for a distributed control system; mainframes and centralized information servers needed to be accessed from a multiplicity of points. Some of those points were very far away from the main computer, a world away as the case may be.

By the 1950's and 1960's, engineers began to speak of electronic data interchange (EDI). EDI is a catch all term for the exchange of information through a telecommunications network. The first steps in this direction were taken tentatively, mostly by global corporate managers who realized that access to information meant better business opportunities. But such electronic communications services were seen as having a limited impact. The famous story of Thomas Watson at IBM deserves to be retold; Watson did not think the market for mainframe computers would be larger than 10-15 machines worldwide.

But times have dramatically changed since that prediction was made. The price of computer power has been decreasing dramatically over the past few decades; one dollar's worth of quality adjusted computing power in 1970 cost \$73.60 in 1950 and only 5 cents in 1984.³² The result has been an explosion of personal computers and a diversified market for software products.

Developments in telecommunications technology represent the next great phase for the development of information products and services. Moving data from one place to another became cheaper and easier because of new communication technology.³³ As transmission systems moved from analog to digital with the advent of the computer, precision and clarity in transmission improved. Circuit and packet switching improved the capacity of the telecommunications network, allowing for its use to be

³⁰ Gregory C. Staple and Mark Mullins, Global Telecommunications Traffic Flows and Market Structures: A Quantative Review (London: International Institute of Communications, 1991).

³¹ Telegeography 1992, Gregory C. Staple, editor. (London: International Institute of Communications, 1992)

³² Bruce Egan, "Investing in the Telecommunications Infrastructure," from the Annual Report of the Institute for Information Studies, The Aspen Institute Conference, p. 26.

³³ Costs continue to get cheaper all the time. See George Gilder, *Forbes ASAP*, November 1994. Gilder argues that the cost of transmission within a telecommunications network, as measured in the cost of bandwidth capacity in the network, will soon be lower than the cost of increased transmission speeds within a single personal computer.

distributed over the entire network rather than simply opening and closing single connections.³⁴ Microwave, satellite and fiber optics developed and began to improve the opportunities to construct and operate corporate communication networks.³⁵ Instead of thinking of computers as individual machines standing on individual desktops, companies are beginning to think of the telecommunications network as a large computer infrastructure, able to provide distributing computing solutions to seamlessly connect users.

The combination of technological opportunities changed the nature of corporate communications systems, but, more significant for our purposes, it altered the way businesses related to the public and private telephone administrations that had provided them with their telephones. It should be made clear: Setting up such a global network is not an easy task. A myriad of local restrictions affect the kind of technology that can be used and the nature of interconnection between the public and private networks.³⁶

But there were companies that saw the opportunity to make it easier for them. Major corporations began to buy their own equipment from a wide range of equipment providers, and then demand the ability to interconnect that equipment with the public network in each country. By creating their own data networks, corporations were able to completely bypass the local and national telecommunications networks and provide themselves with a higher quality of communications services at lower prices.³⁷

By the early 1980's, the technological facts were clear. Regulators throughout the world attempted to catch up with the de facto change in the industries by relying on new kinds of service classifications.

³⁴ The idea of a distributed network is essential to the improvement of network capacity. A distributed network can send portions of data communication along different routes within the network and reassemble them at the receiving point. By distributing the use of the network, capacity is increased and reliability is also increased. For more information, see David Wright, Broadband: Business Services, Technologies and Strategic Impact (Norwood, MA: Artech House, 1993).

³⁵ Jeffrey A. Hart, "The Politics of Global Competition in the Telecommunications Industry." *The Information Society*, Volume 5, pp. 169-201. 1988.

³⁶ "Global Managing," *Communications Week*. October 15, 1990

³⁷ A prime example of companies that profited on this technological revolution is EDS. Bought by General Motors to manage their international data network, EDS continues to grow today in a marketplace that has begun to become cluttered with companies that operate data and communications networks for major corporations.

The idea of “value-added networks” (VANs) emerged as a catch-all concept to describe all kinds of communications that extended the use of traditional telecommunications technology to purposes beyond basic telephony.³⁸ Competition in value added networks became a driving force in the United States, while various PTTs in Europe established value added and public data networks with varying degrees of success.

With the increasing diversification of telecommunications products and services, national and international communications standards setting bodies came under increasing pressure from the corporations who wanted to buy services and the companies that wished to provide them.³⁹ In the United States and Europe, the response was to propose an open systems regulatory framework, embodied in the Open Network Architecture (ONA) proposal articulated by the Federal Communications Commission and the Open Network Provision (ONP) advocated by the European Union in the late 1980’s. In many ways, these regulatory responses were an attempt to accommodate new technologies within the context of existing institutions. But the incredible diversity of possible transmission techniques and equipment types, mixed with the phenomenal increase in micro technology and computer power, has made complete standardization of all products and services almost impossible.

In the developing countries, many analysts became more concerned that the high levels of telecommunications investment on the part of the multi-national corporations further isolated them from the citizens of the countries in which they operated. Dependency theorists certainly did raise a valid issue: much of the global telecommunications and information flow originated in the developed world.⁴⁰ Although multinational corporations did bring in important investment dollars, their ability

³⁸ Eli Noam, “International Communications in Transition,” from Changing the Rules: Technological Change, International Competition and Regulation in Communications, Robert Crandall and Kenneth Flamm, eds. (Washington, DC: The Brookings Institution, 1989). Noam’s definition of VAN’s reflects the ambiguity of the term. “Value added services are merely a functional category and not a regulatory term,” which Noam sees as a necessary transition step from plain old telephone service to the diversity of new products and services that the industry wishes to make available. (p. 273)

³⁹ Gerd Wallenstein, Setting Global Telecommunications Standards (Norwood, MA: Artech House, 1990)

⁴⁰ There are a range of hotly disputed facts and figures that have been used to illustrate this point. In the early 1980’s, with the MacBride commission report to the International Telecommunications Union acting as the catalyst, an extended debate about the effect of this trend reached a climax, although the issue has been left largely unresolved. At the center of the argument about cross border information flows was the “free flow of information” model espoused by the United States and many other western countries and the belief that developing countries needed to practice a form of communications protectionism in order to prevent the

to isolate their networks from the public telecommunications network meant that their investment did not need to contribute to the telecommunications development of the host country.

The result has been a “mixture of old and new structures in international telecommunications,” with increased traffic flows between developed countries and between developed and developing countries according to various geographical patterns.⁴¹ Instead of the unified, established public networks that dominated the first 100 years of electronic communication, a network of networks has developed, some connected, some disconnected, but all dramatically altering our ability to communicate.

These factors have led to the decline of the public network, encapsulated nicely in Eli Noam’s phrase used at the beginning of this section. The tragedy of the public network is that all users who have no other place to go are forced onto what is perceived as the lowest standard denominator, the public switched telephone network. High capacity users whose contributions could fuel the refitting of the network with new technologies have opted out in favor of building their own.

Such can also be said about the global information infrastructure, which was linked together by the established coordination of international agencies such as the International Telecommunications Union. As the postal unions before it, the ITU was able to assist in the establishment of a clearing house for international calls, ensuring interconnection and global communications through the public networks. As individual networks are threatened with decline, the fragile set of reciprocal arrangements that have undergirded the established system of global interconnection is also threatened.⁴²

erosion of their national culture. The later argument was most commonly associated with the dependency school of development theory. The geopolitical change of the past decade has largely changed the terms of the debate, although the analysis buttressing the countervailing points of view are certainly relevant to the discussion of telecommunications and development. See, in particular, Ithiel de Sola Pool, Technologies of Freedom and Technologies Without Boundaries for the arguments for the free flow of information model. The arguments for cultural protectionism are well expressed in Cees Hamelink, Cultural Autonomy in Global Communications : Planning Aational Information Policy (New York : Longman, c1983)

⁴¹ Aharon Kellerman, “International Telecommunications Around the World; A Flow Analysis,” from *Telecommunications Policy*. December, 1990, p. 474-475.

⁴² See, in particular, the descriptive articles from Telegeography 1992, (Washington, DC: International Institute of Communication, 1992)

1.4 New Realities: Changes in the Institutions of the Telecommunications Sector

The public network as constructed by the public utilities and PTT administrations throughout the world is no longer viable. Regulators and industry participants are well aware of that fact, and structural changes within the industry reflect the technological and economic facts.

Taking a brief glance at how telecommunications corporate revenue has changed in the past decade tells a great part of the story. In 1980, Public Telecommunications Operators (PTOs) received 53% of their revenue from call charges, which are plain old telephone services. By 1991, with revenues up by over 100 billion dollars in that period, the percentage of revenue from call charges had dropped to 45%.⁴³

What portions of revenue increased during that period? The International Telecommunications Union characterizes it as "other services," which increased from 10% of revenue to 27% over the course of the same period.⁴⁴ From calling cards to diversified data management products, telephone operators do much more now than simply hook up your telephone. At the same time, the market for telecommunications equipment has boomed from a \$20 billion industry in 1984 to a \$50 billion industry in 1991.⁴⁵

Other changes in how telecommunications companies provide services can be seen in these lists of public telecommunications operators from the 1994 World Telecommunication Development Report:

⁴³ World Telecommunications Development Report 1994 (Geneva: International Telecommunications Union, 1994), p. 17.

⁴⁴ Ibid, p. 17.

⁴⁵ Ibid, p. 23

25 Largest Telecommunications Operators in the World

Rank	Operator	Country	Total revenue (\$US millions)	% Change in revenue (1992-1992)
1	NTT	Japan	51354	1.7
2	AT&T	United States	39580	2.0
3	DBP Telekom	Germany	34550	0.1
4	BT	United Kingdom	23379	-0.7
5	France Telecom	France	23164	5.9
6	SIP	Italy	17492	10.8
7	BellSouth	United States	15202	5.2
8	NYNEX	United States	13155	-0.6
9	GTE	United States	12644	0.6
10	Bell Atlantic	United States	12093	2.5
11	Telefonica	Spain	11279	14.5
12	Ameritech	United States	11153	3.1
13	MCI	United States	10562	11.3
14	US West	United States	10281	-2.8
15	SBC Corporation	United States	10015	7.3
16	Pacific Telesis	United States	9935	0.4
17	Sprint	United States	9230	5.1
18	Telstra	Australia	8992	28.3
19	Bell Canada	Canada	6505	1.7
20	TELMEX	Mexico	6185	25.8
21	PTT Telecom	Switzerland	6012	14.3
22	Korea Telecom	Korea (Rep. of)	5985	13.4
23	PTT Netherlands	Netherlands	5964	8.0
24	Telebras	Brazil	5900	25.7
25	Telia AB	Sweden	5363	0.5

Changes in Business Conditions for the 25 Largest Telecommunications Operators

Operator	Total mainlines (000s)	% change in mainlines	Total employees (000s)	% change in total employees	Ownership
NTT	57300	2.7	242.3	-6.0	PP
AT&T	n.a.	n.a.	77.9	-0.5	FP
DBP Telekom	35421	5.6	231	0.9	SOE
BT	26084	2.9	170.7	-18.9	FP
FranceTelecom	30100	3.4	155.3	-0.5	SOE
SIP	23709	2.8	87.5	-0.1	PP
BellSouth	18677	3.4	97.1	1.1	FP
NYNEX	15699	1.9	70.9	-1.8	FP
GTE	16819	3.6	81.1	-4.7	FP
Bell Atlantic	18181	2.4	71.4	-7.2	FP
Telefonica	13792	4.0	74.4	-1.4	PP
Ameritech	17001	2.5	71.3	-3.6	FP
MCI	n.a.	n.a.	31	11.2	FP
US West	13345	3.2	63.7	-3.2	FP
SBC Corp	12803	3.3	59.5	-2.8	FP
Pacific Telesis	14551	2.0	61.3	-1.4	FP
Sprint	n.a.	n.a.	43.4	0.5	FP
Telstra	8257	2.6	70.8	-12.7	SOE
Bell Canada	9229	2.3	52.9	-3.2	FP
TELMEX	6546	12.1	48.9	-1.1	PP
PTT Telecom	4185	2.6	19.5	0.8	SOE
Korea Telecom	15593	7.0	59.1	2.1	SOE
Netherlands	7395	3.1	34.9	1.4	SOE
Telebras	9900	8.1	89.6	0.6	SOE
Telia AB	5919	1.0	34.1	-12.7	SOE

From the 1994 World Telecommunications Development Report, p. 20. Shows major domestic units rather than ultimate owners to reduce double-counting. Key: FP = Fully Private; PP = Partially Private; SOE = State Owned Enterprise; GD = Government department. Sources for information: ITU/BDT Telecommunication Indicator Database.

Most significantly apparent in the above table are the increases in both revenue and number of lines installed in developing countries. Penetration rates being as high as they are in the developed world, changes in the number of main lines are all relatively small. But countries such as China are experiencing rapid growth in the number of lines installed, showing the strategic emphasis that is being placed on the telecommunications sector throughout the developing world.

The revenue base for many of the large providers has stabilized over the past few years. The largest increases in revenue on the tables come, again, from developing countries. The big providers in the US, UK and Japan have seen their revenue streams flatten; some, such as BT in the United Kingdom and NYNEX, one of the Regional Bell Operating Companies in the US, actually posted declines.

One element of the table is consistent throughout: downsizing in the telecommunications industry. Almost all of the companies listed in the table have dramatically reduced the number of employees in the past few years, with BT taking the lead during the 1991-1992 period by reducing staff by 18.9%.

Changes in business conditions are paralleled by the fast-paced evolution of telecommunications technologies. The hallmark of those changes have been the transition from analog transmission systems to digital forms of electronic exchange.⁴⁶ Any kind of communication can be reduced to digital code, which is basically a string of 1s and 0s that acts as a common language in computer systems. The digital revolution has brought all kinds of communication together, fusing voice, video and sound into what is now commonly being called "multimedia" communications.

Digital communication allows for increased speed, decreased price, higher degrees of accuracy and more capacity on the communications networks. As we have already discussed, the first stage of the transition facilitated the evolution of electronic data interchange. But that has only been the beginning.

The hardware of telecommunications is changing dramatically. The traditional telephone networks were based on copper wiring and waveform transmission; the infrastructure has remained largely unchanged since the Bell System and the PTT's began to create telephone networks in their respective countries. The capacity of those networks has also not changed much since that time.

⁴⁶ Neuman, The Future of the Mass Audience

The capacity of a telecommunications channel, which is the amount of information carried, is gauged in terms of bits per second (bps), or “bandwidth.” The larger the bandwidth, the greater the capacity of the communications channel, the greater the number of bits per second, and, to the thinking of most technologists, the better the network.⁴⁷ The average modem or fax machine today works at about 9,600 bits per second. That is also the bandwidth for an average phone line. To have an interactive, full motion video conversation between two people at two different points of the network, you need a throughput of about 45,000,000 bits per second (shorthand is 45 mpbs).

Needless to say, the common phone line is a far cry from the two-way video conferences that AT&T always throws into its commercials. New transmission technologies make such conjectures seem much more than a marketing ploy, though. Fiber optic technology has radically changed the capacity of the telecommunications network, with transmission speeds of up to 100 gigabits per second now possible through the development of Asynchronous Transfer Mode (ATM).⁴⁸ Fiber optic technology is presently seen as the foundation for high-speed communication and interchange across the networks of the future.⁴⁹

For the most part, fiber optics have been consigned to what is called in the industry trunk and backhaul operations, carrying large chunks of transmissions from one place to another. There is talk of bringing fiber optic technology directly into the home, but the digital revolution has also provided a range of new techniques for the compression of data. By making the size of transmissions smaller, compression allows telecommunications providers to use existing infrastructure, such as copper or what is called coaxial cables, more efficiently.

⁴⁷ As improved technology is deployed, the issue will likely not be the need for more bandwidth; the channels will be big enough for any kind of transmission. The question will be one of differentiated usage of that bandwidth, an issue which will be of critical concern to our discussions in the next chapter.

⁴⁸ A quick comment on definitions and terminology. The telecommunications industry is perhaps one of the most complicated sectors when it comes to terminology. In an attempt to avoid running afoul of the real debates in the realm of engineering and network operations, I have tried to keep the use of terminology to a minimum. I have appended to this thesis a complete list of telecommunications acronyms.

⁴⁹ See Henry Geller, “Fiber Optics: An Opportunity for a New Policy,” (Washington DC; The Annenberg Washington Program, 1991). For most analysts, the question has not been “why fiber optics,” but, rather, “how much fiber optic technology, where, and who should pay?”

Whether through compression techniques or the deployment of fiber optic technology, it is clear that the bandwidth used for transmission is becoming more and more plentiful. When we combine that development with the explosions in the computer industry, it becomes clear that the telecommunications business is in a period of fantastic transition.

But if revenues are not increasing, as the above tables indicated, the industry transition is less an expansion than a transformation at this stage. The kinds of products and services that are conceived of for this new capacity and functionality have yet to be deployed or priced. In most cases, they are more a matter of conjecture than fact. For that reason, a wide spread of assessments exist about the future revenues on the "information superhighway." At the same time, a great amount of cynicism exists about the potential contribution that many of the existing companies will play in constructing and profiting from new technological breakthroughs. In November of 1994, a number of Bell Atlantic employees were sent home from their jobs because they decided to wear to work a shirt that depicted Bell Atlantic employees as "road kill on the information superhighway."⁵⁰

1.5 Opening the Future: Privatization and Regulatory Change

Part of the frustration among employees, management and the technological visionaries driving the transformation process comes from the lack of regulatory change in many countries. In the United States and other countries throughout the world, bypass has driven network operators and regulators to open the market formally to certain kinds of competition. In the United States, the divestiture of AT&T opened the market for competition in two important areas: customer premises equipment and long-distance services. In Japan, both local and international service competition started as NTT was restructured to face the new economic realities.⁵¹ Great Britain opened its local exchange to a second competitor, and allowed for a range of value added networks that could provide specialized voice and data services.⁵²

⁵⁰ *The Philadelphia Inquirer*, December 1, 1994.

⁵¹ The creation of type-I and type-II carriers in the late 1980's allowed for the commencement of operations of a number of competitors to Nippon Telephone and Telegraph (NTT) by the early 1990's. 1992 Communications in Japan. (Tokyo, Japan: White paper published by the Ministry of Posts and Telecommunications, 1992) See also Simon Glynn, "Japan's success in telecommunications regulation," *Telecommunications Policy*, January/February, 1992.

⁵² David Gillick, "Telecommunications Policy in the UK," *Telecommunications Policy*, February, 1991.

Developing countries have followed the lead of these three, liberalizing and privatizing their networks to various degrees. In countries where privatization has not occurred, there is a tension between those who do not want to make a huge public policy blunder and others who feel that a continued lack of action is the biggest blunder of all. The countries in the following list have privatized their telecommunications providers in the past decade and a half.

List of Major Privatizations in Telecommunications Operators 1981-1993

Country	Company	% sold	date	\$US mil.	% private	Results/Notes
Argentina	Telefónica Argentina	69	1990	482	100	Private sale to COINTEL consortium, consisting of Telefónica de España, Citicorp, and Technit (60%); 10 percent to employees and 30% to the public.
Argentina	Telecom Argentina	60	1990	462	100	Private sale to consortium, composed of STET, France Telecom, JP Morgan and a group of Argentine investors (60%); 10% to employees and 30% to public
Canada	Teleglobe	100	1987	369	100	
Chile	Compañía de Teléfonos de Chile (CTC)	50	1988	N/A	100	Original private sale to Bond Corporation; later acquired by Telefónica de España. Remaining shares held by public.
Chile	Empresa Nacional de Telecomunicaciones (ENTEL)	100	1988	N/A	100	Sold to Telefonica de España, Chase Manhattan (10%), and the remainder held by employees, pension funds, and smaller private investors.
Hungary	Hungarian Telecom. Company (MATAV)	30	1993	875	30	Private sale to the Magyarcom Consortium (composed of Deutches Bundespost Telekom and Ameritech)

Japan	NTT	13	1986	1385 0	35	Shares hold in three tranches through domestic public offerings. The second and third offerings were held in 1987 and 1988. The total net value of the sale was almost US \$70.5 billion
Republic of Korea	Korea Telecom	2	1993	200	2	Shares were sold to domestic non-institutional investors
Latvia	Lattelkom	49	1993	N/A	49	Private sale to Cable & Wireless of the UK and Telekom Finland
Malaysia	Telekom Malaysia Berhad	24	1990-	2350	25	Shares sold through a domestic public offering on Kuala Lumpur Stock Exchange
Mexico	Teléfonos de México (TELMEX)	20	1990	1757	98	Private sale to consortium composed of Grupo Carso, Southwestern Bell, and France Télécom. Subsequent public tranches sold in 1990, 1991, and 1992
New Zealand	Telecom Corporation of New Zealand Ltd.	100	1990	2500	200	Private sale to Ameritech and Bell Atlantic. In 1994, they reduced their holdings to 50%
Puerto Rico	Telefonica Larga Distancia de Puerto Rico	80	1992	142		Private sale to Telefónica de España
Singapore	Singapore Telecom	11	1993	2500	11	Shares sold on the Singapore Stock Exchange
United Kingdom	Cable & Wireless	49	1981	452	100	Shares sold by tender in two tranches. Second tranche sold in 1983. Net value of total sale amounted to US\$ 868 million

United Kingdom	British Telecommunications (BT)	51	1984	5187	100	Shares sold by tender in three tranches. Second and third offerings held in 1991 and 1993. Net value of total sale amounted to US\$ 22.8 billion
Venezuela	Compañía de Teléfonos de Venezuela (CANTV)	40	1991	1900	40	Private sale to Venworld consortium (GTE, AT&T, Telefónica de España, and two Venezuelan partners)

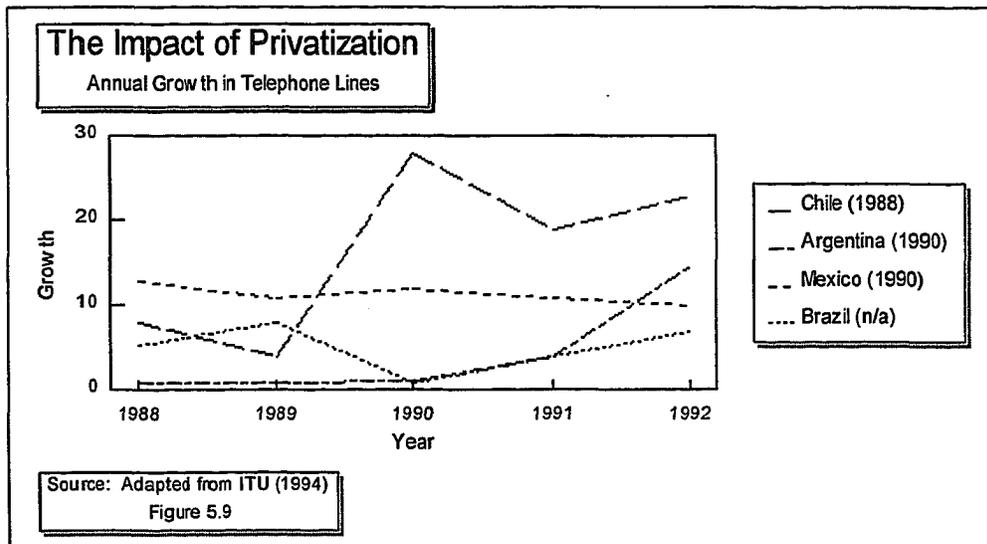
Source: International Telecommunications Union, from the 1994 World Telecommunications Development Report, p. 56.

Note: Prior to privatization, a small percentage of shares of CTC and TELMEX were held by the public.

The above table shows the wide range of countries and companies that have chosen privatization as the best option for improving their future place in the telecommunications sector. These changes have not only been significant to the telecommunications sector, but to the global economy also. NTT's sale was worth more than \$70 billion, and, as the largest company in the world, its privatization was much more than a symbolic act on the part of the Japanese government.

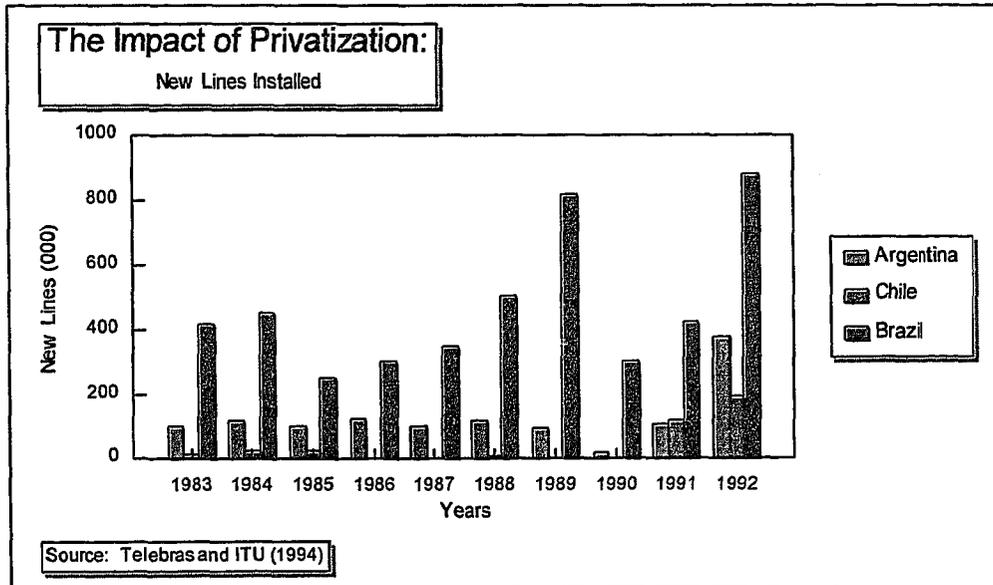
For developing countries, the traditional route to privatization has been to combine larger telecommunications companies and financial institutions with local interests into investment consortia. The developed world's telecommunications companies have taken large positions as an investment in the huge potential growth of the telecommunications industry in each of these countries. In the mean time, the governments of each of the countries have placed much of the responsibility for improving the management and operation of these newly privatized telecommunications companies on the experienced telecommunications providers.

These concrete policy decisions have radically altered the ownership structures in the telecommunications industry. As we pointed out in the previous chapter, the shift in ownership structures brings with it a shift in ostensive goals; managers must be responsive to shareholders and return shareholder value. Some of those shifts are revealed in the investment patterns throughout each of the developed countries. The following charts indicates that privatization has had a dramatic effect on investment in the telecommunications networks of a number of countries.



The above chart compares four Latin American countries and the investment in telephone lines from 1988 to 1992. Three of those countries, Chile, Argentina and Mexico completed the privatization of their telecommunications networks by the end of the 1980's. Brasil has yet to privatize Telebras, their state-run telecommunications provider.

The chart indicates that increases in investment occurred subsequent to two of the three privatizations indicated on the chart. Significant increases in Chile and Argentina are evident; the Mexican experience seems contrary to the experience of the other two countries. Brasil has seen its investment in telephone lines stagnate during the course of that period.



The above chart presents, in absolute terms, the number of new lines installed in three countries from 1983 through to 1992. Again, the numbers offer a comparison of the investment patterns of two privatized networks, Chile and Argentina, with the Brazilian case. Until the mid to late 1980's, all three experience relatively constant rates of line installation. Proportionately, the Argentine and Chilean telephone companies begin to install a much greater number of lines in 1990, 1991 and 1992 than in the past; the Brazilian investment pattern remains erratic.

The press for new investment after privatization has largely been driven by the shareholders and government regulators, both of which hope that an expansion of the network's capacity will lead to an increase in traffic and revenues. Privatization, in other words, has brought in an influx of foreign currency like none that the developing world has ever seen, and privatization of telecommunications networks have been at the forefront of these developments.

Nevertheless, as we discussed in the earlier chapters, privatization does not necessarily change business practices. Business practices are connected to regulations, and the regulatory environment which defines the provision of services in these countries has not changed dramatically since privatization. As we will see, the levels of competition are restricted by political and economic decisions that run contrary to the principles of liberalization. Energies have been released over the past three to five years that will now need to be directed, especially as the flow of money to the developing world slows dramatically in reaction to recent currency problems worldwide.

1.5 Interim Conclusions

To complete our cursory overview of the telecommunications sector worldwide, it is worthwhile to summarize the discussion. If there is any one word that would sum it up, it is diversity. The global result of these technological and economic changes is a hodgepodge of public and private networks and a daunting diversity of public regulations and technical standards.

The deeper forces that are driving the revolution in telecommunications are attached to broader economic trends; we face a technological revolution that is driving the networks of the future to further and further decentralization, yet we come from an age where the political economy of our media and the mass psychology of nation states and national information leave strong centers that continue to attract social forces.⁵³

What we have seen in the history of the telecommunications sector to date is a set of political decisions that have determined the provision of service. It was a political decision to establish the public utility model for telecommunications development and it was a political decision to attempt to sustain it in the face of the change we have described. There is an opportunity to make political

⁵³ W. Russell Neuman, The Future of the Mass Audience

decisions today that will determine the future economic and technological course; the hard technological determinism that many have stated will guide the future of the industry does not stand in light of the possible pasts and futures that lie before us.

The old arrangement will not do; public management and monopoly arrangements are no longer tenable in the new technological environment. Nevertheless, the necessities of transitions and the realities of bureaucratic interests force us to recognize a critical reality: public and private management will have to coexist for a while. During that period of difficult coexistence, institutions will transform themselves to reflect the new technological and social opportunities. Until then, the telecommunications sector is in desperate need of ways to bridge the public and corporate management of resources.

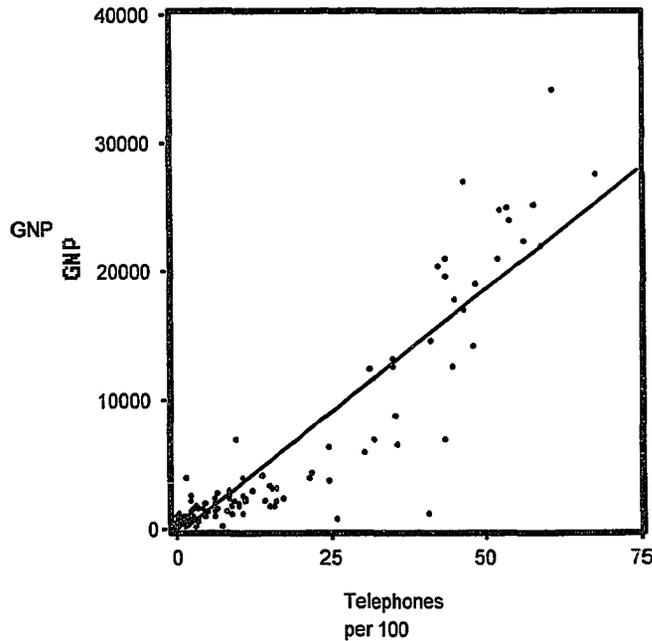
We need to examine the possible grounds upon which political decisions can be made and the kinds of information that can bridge the vision of the public policy maker and the energy of the corporate manager. That is where development theory in general, and the issues of telecommunications development in particular, are critical elements of the debate. The next section provides further background into the literature of telecommunications policy, specifically relating that literature to the problems of social and economic development.

2. Linking Telecommunications to Development

Were the telecommunications sector less significant to the needs of national and community development, this quandary might not be as difficult to unravel. In applying the needs of development to the telecommunications sector, what we reveal is a significant relationship that can not be ignored by policy makers or corporate strategists. Both have a vested interest in the goals of development we have already discussed. Research reveals that the telecommunications sector makes a particularly important contribution to national and community development. As we begin to understand the forces that have shaped the telecommunications sector, it is equally as informative to step back and understand how telecommunications has shaped the political and economic communities it has been constructed to serve.

2.1 Correlations

Correlations between traditional measures of national development and the quality of telecommunications services are clear and often repeated. The most significant correlation, which shows a relationship between income per capita and penetration of telecommunications services, is depicted in the following regression analysis:



LS // Dependent Variable is GNP
 SMPL range: 1 - 135
 Number of observations: 135

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-648.44650	315.27628	-2.0567564	0.040
PER	382.93332	13.877103	27.594616	0.000
R-squared	0.851307	Mean of dependent	4671.036	
Adjusted R-squared	0.850189	S.D. of dependent	7488.987	
S.E. of regression	2898.640	Sum of squared resid	1.12E+09	
Durbin-Watson stat	2.222881	F-statistic	761.4628	
Log likelihood	-1266.769			

The data used for this regression analysis come from the 1994 World Telecommunications Development Report, published by the International Telecommunications Union. On the vertical axis of the regression analysis is the Gross National Product per capita of 135 countries throughout the world. The lowest in the sample are below \$200 per capita, and the highest are over \$20,000 per capita on the horizontal axis. As the statistical analysis shows, there is a close correlation between the penetration of telephones in any given country and the per capita income of that country.

This relationship has been shown many times in research, and the most recent numbers from the World Bank and the International Telecommunications Union show no real change. Generally speaking, the higher income per capita is, the greater the penetration of telephones in the country.⁵⁴

It is possible to layer regression analysis over regression analysis; there are definitely correlations between increased penetration of telecommunications services and decreases in infant mortality, higher levels of education, penetration of mass media, and other traditional measures of development. This shows us only that the road to development is somehow paved with phones. What it does not show is a causal link between investment in telecommunications and the achievement of development goals, such as modernization or increased social participation.⁵⁵

2.2 Causal Relationships

Such causal relationships are often asserted. Ithiel de Sola Pool's book on the social uses of the telephone, written in 1977, holds many such claims. Perhaps the most famous is that the two-way communication of the telephone is a participatory technology, while the passive, unidirectional information flow of the television does not allow for participation.⁵⁶ It is likely that we could plot a regression analysis to show the relationship between participatory democracy and telephone penetration as well, but that would still lack for a causal relationship.

The most significant relationship between telecommunications and development has been drawn through productivity. Telecommunications makes labor and capital more productive; productivity

⁵⁴ Raul Katz, The Information Society: an International Perspective (New York : Praeger, 1988)

⁵⁵ Paul Strassmann, The Business Value of Computers (McKinnon & Kidd Publishers). See also Erik Brynjolfsson and Lorin Hitt, "Information Systems Spending Production (Working Paper WP3579 1/93, The Sloan School of Business, The Massachusetts Institute of Technology)

⁵⁶ Ithiel de Sola Pool, Social Uses of the Telephone

spurs economic growth and development. Telecommunications therefore promotes economic and social development. This sounds logical enough, but finding the data and analysis to definitively show such a relationship is a difficult enterprise at best. Perhaps the most detailed, methodologically rigorous expression of this relationship comes from Francis Cronin of DRI/McGraw Hill.

One of his most substantial works on this subject was the Pennsylvania Telecommunications Infrastructure Study. Cronin's research was funded, in part, by a consortium of Pennsylvania telephone companies and was conducted in conjunction with Deloitte and Touche.⁵⁷ The final report, issued in March of 1993, and Cronin's subsequent publications will guide our discussion of the relationship between telecommunications, productivity, and economic growth.⁵⁸

The key to economic growth in the United States has been total-factor productivity, and this becomes the starting point for the analysis. From the period of 1889-1988, total-factor productivity increased by 1.6% a year, accounting for over 50% of the total increase in GNP for that period of time.⁵⁹

When Cronin disaggregates total-factor productivity gains, he reveals certain sectors have contributed to the improvements in productivity while others have done less. Telecommunications has outpaced the economy in total productivity growth, "implying not only that it has contributed its share of total output more efficiently, but that it has contributed to overall productivity growth. Conversely, without advances in telecommunications production, the U.S. economy would have experienced greater declines during the 1970's and a slower recovery in the 1980's."⁶⁰

In analyzing the increases and decreases in factor productivity within other industries, he discovers that the use of telecommunications as a production input has increased markedly from the period of

⁵⁷ Francis J. Cronin, et. al. Pennsylvania Telecommunications Infrastructure Study, prepared for the Pennsylvania Public Utilities Commission. It is important to point out that there is a politics behind the study; the Pennsylvania PUC was very interested in determining how much new incentive regulation could affect the economic future of the Commonwealth. That is not to say that the results have somehow been clouded by the politics; many have begun to point to the study as the best work in this area to date.

⁵⁸ In particular, see "Telecommunications Infrastructure Investment and Economic Development," from *Telecommunications Policy*, August 1993, pp. 415-430, and "Telecommunications and Growth; The Contribution of Telecommunications Infrastructure Investment to Aggregate and Sectorial Productivity," from *Telecommunications Policy*, December 1993, pp. 677-690.

⁵⁹ John W. Kendrick, "U.S. Productivity in Perspective," *Business Economics*, October 1991, p. 7.

⁶⁰ Pennsylvania Telecommunications Infrastructure Study, p. XIII-4

1965-1987.⁶¹ Key services critical to the modern economic structure, such as finance and insurance, have seen their use of telecommunications services increase by over 2.9% a year. In total, through a direct increase in the productivity of the telecommunications sector and its contributions to the increased productivity of other sectors, the research indicates that telecommunications has been responsible for 15% to 35% of the total economy-wide productivity gains.⁶²

What this research does is give a more direct linkage between economic development and telecommunications investment through increases in total factor productivity. Even so, "we must recognize that telecommunications is only one of several inputs necessary for economic development," and, although Cronin's study does suggest a strongly positive relationship between economic growth and telecommunications investment, it focuses on one state in a highly developed country.⁶³

The causal links do not suggest specific courses of policy beyond what should be clearly evident: telecommunications is tied to development and investment in telecommunications has contributed to economic growth in the United States, and we need to pay attention to the telecommunications sector if we are to shape the development of a community. But there are other issues that need to be brought into the equation when it comes to constructing a policy that connects improvements in the telecommunications sector to new opportunities for development.

2.3 Making the Linkage: Diffusion of Telecommunications Technology

Specific factors influence the introduction of telecommunications technology, and it is important to examine those factors so as to complete our understanding of the relationship between development and telecommunications investment.⁶⁴ In order to facilitate our more detailed discussion of these issues as the thesis progresses, two generic charts are presented as an illustration of the economic and social issues underlying the problem of technological diffusion.

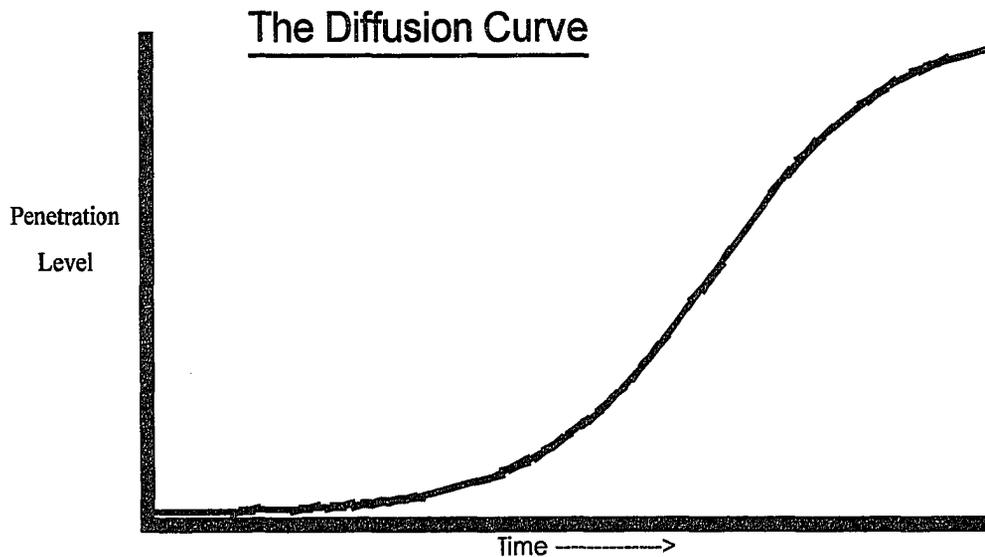
⁶¹ "Telecommunications and Growth," p. 682.

⁶² "Telecommunications and Growth," p. 688

⁶³ Ruby Roy Dholakia and Bari Harlam, "Telecommunications and Economic Development," from *Telecommunications Policy*, 1990: Volume 18 #6, p. 470.

⁶⁴ The analysis in this section comes largely from the work of W. Russell Neuman, Lee W. McKnight, Jose Robert Ferro and Antonio Jose J. Botelho for Telebras, from the paper "Brazilian Telecommunications in Transition: A New Strategy for Competitiveness."

The traditional mathematics of a diffusion curve is represented in the following chart:

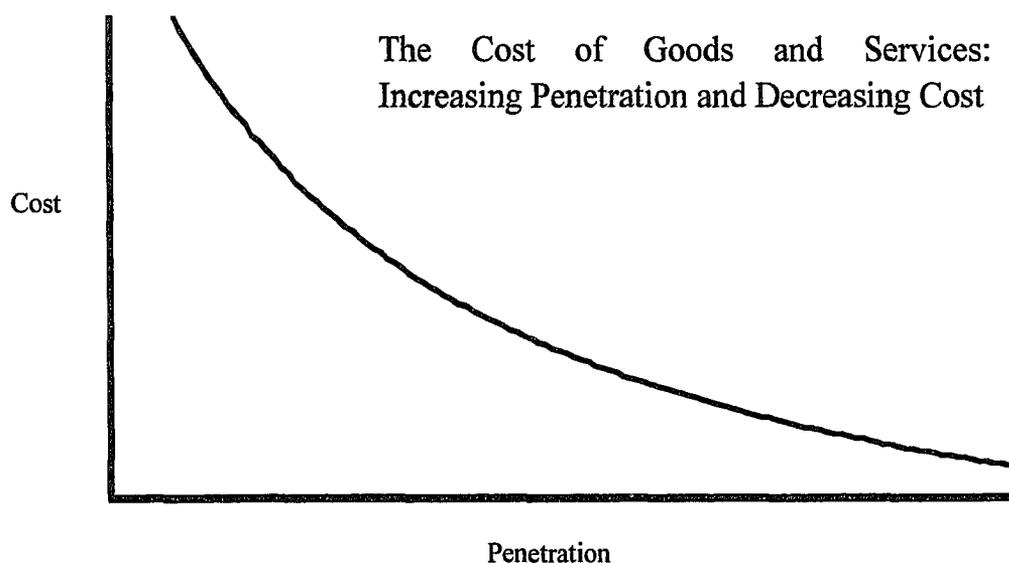


The vertical axis represents the number of individuals in the society that have adopted the technology or practice in question. The horizontal axis represents the elapsed time from the introduction of the technology or practice to its final diffusion level.

The pattern represented in the chart indicates that the penetration of a given technology or technique occurs unevenly over a period of time. When a new technology is introduced, few adopt it. Soon, it picks up momentum, and levels of penetration increase substantially during a shorter period of time. Finally, as the technology or practice reaches a saturation point, the rate of penetration decreases.

A variety of factors influence the diffusion of technology at each stage along this curve. The introduction of a technology can fail if it does not meet a perceived social or political need. After the introduction of a technology, certain structures would have to exist to facilitate the diffusion of the technology, such as its adoption by leadership groups or its utility relative to other kinds of goods and services available. Finally, the transformation of the social or economic organization must be such as to sustain the continuing use of the technology.

Perhaps the most important issue when it comes to the diffusion of a technology is the price of that technology. The next generic chart shows a traditional demand function as it relates to the setting of prices for a particular good or service.



For this chart, the penetration of the good or service is depicted on the horizontal axis, while the price of that good or service is depicted on the vertical axis. For telecommunications services, as is the case for almost any product made available in a market economy, there is a price at which no person would purchase the good or service. There is also a price at which every person would choose to purchase the service. Between those two points, there is an appropriate demand function that charts the quantity demanded at any given price.

For telecommunications services, we can speak of similar relationships: If I were to give you a cellular phone for free, to use as much as you want for free with, as it were, no strings attached, you would probably take it. If I asked you to pay upwards of a million dollars for it, you would likely decline. In between those two points, there are different price levels you might accept depending on the utility you saw in having a cellular phone.

This is basic microeconomics, but it sets the stage for an important element of the discussion. In the first chapter, we argued that development through competition will have to rely on a number of

microeconomically sustainable institutions that will drive the penetration of infrastructure services. What we see above is the fact that technologies as they diffuse through a society will likely require a certain amount of time to pick up momentum. Also, if telecommunications technology is a critical contributor to the economic growth and productivity of a community, the penetration of technology needs to be a critical concern. But penetration is not viable if the cost is not right.

More than just cost comes into play as technology is introduced and begins to diffuse through an economy. New technology often meets institutional constraints that are expressed in business practices or existing government regulation. An informed strategy to facilitate the introduction and diffusion of technology has to take into account more than just price. For that reason, telecommunications development needs to be informed by issues of political economy along with the cost benefit of corporate policy.

What are some of the other problems that are encountered as we move along the diffusion curve? Corporate and regulatory institutions will face a variety of challenges and constraints, and the companies responsible for driving the introduction of new technologies and services will entertain a range of possibilities. Before we define what strategic liberalization means for the telecommunications industry during this period of transformation, we need to take a closer look at the constraints which companies face during changes in marketplace conditions.

3 Institutional Constraints and Market Competition in Telecommunications Development: A Historical Perspective

The 1994 World Telecommunications Development Report lists six telecommunications development constraints.⁶⁵

1. Lack of investment
2. Foreign exchange scarcity
3. Investment inefficiencies
4. Organizational limitations

⁶⁵ 1994 World Telecommunications Development Report, p. 79

5. Inadequate private-sector involvement
6. Insufficient regional Co-operation

For developing countries, each of these problems are certainly significant. Developing countries spent less than 20% of the almost \$120 billion invested in telecommunications worldwide. Sometimes operating profits from telecommunications providers in developing countries are no reinvested into the network but are siphoned off to subsidize government programs. In other cases, there is a lack of money, pure and simple. A lack of foreign exchange restricts the opportunity to import telecommunications equipment in order to keep a network functioning. The costs of running a network and installing a line are much higher in developing countries, in some cases the average cost of installing a line is over \$20,000 per person (as compared to the often quoted figure of \$1,500 in the US). Human resources are limited, there is no private sector to speak of, and the potential for using regional resources is never explored much less exploited.

Each of these issues is construed by the writers of the World Development Report as being more applicable to the developing world than the developed world. But, in many ways, each of these pitfalls is applicable to telecommunications planning in the developed world as well; without appropriate levels of investment and organizational capacity, the telecommunications sector will not flourish and the goals of economic and political development will be affected.

The traditional answer to meeting these pitfalls are a combination of better planning and multilateral assistance. On the management side of the equation, the high performer countries have been able to ensure that profits generated from the telecommunications provider have been reinvested into the operations of the network and that a consistent ownership and regulatory environment has been maintained.

The main agencies for international telecommunications assistance are the International Telecommunications Union and the United Nations Development Program, which have provided a range of targeted programs to enhance the telecommunications sector. The World Bank and European Bank for Reconstruction and Development (EBRD) have committed an increasingly greater percentage of their resources for loans to the telecommunications sector; the restructuring loans and

assistance with privatization efforts worldwide have contributed greatly to the recent explosion of activity in the telecommunications sector.⁶⁶

Regional cooperation is also seen as a critical element of telecommunications development worldwide. A number of regional economic and political associations have begun to take an active interest in the development of the telecommunications sector within their region. Some of the main intergovernmental telecommunications organizations include the Asia-Pacific Telecommunity, the Pan-African Telecommunications Union, the Conference of European Postal and Telecommunications Administrations and the Inter-American Telecommunications Commission.

Consistent with all of these approaches has been a reliance on large-scale organizations to push the development of the telecommunications sector in each country. Either through a multilateral agency or through a public utility like telecommunications provider, it has been assumed that telecommunications development depends on centralized institutions and forces. That raises an interesting question: Is there a more appropriate institution or kind of institution for the telecommunications industry that does not rely on scale and scope to sustain itself? To understand that question, we have to look for other models of telecommunications development that are rooted in competition.

3.1 Overcoming Marketplace Constraints Through Competition in Telecommunications

This brings us back to the earlier discussion of the structure of telecommunications providers in the modern age. If the determination to establish the public utility structure for telecommunications services was, in part, a political decision, and if alternatives to that kind of technological and corporate organization are available, we should look to compare alternative institutions for the provision of services.

⁶⁶ 1994 World Telecommunications Development Report, p. 91. See also Figure 5.17.

Milton Mueller's argument comes into full relief. Access competition, which is his description of the early push for telephone penetration in the United States, stands out as an interesting alternative for telecommunications development.

The historical facts about access competition have important policy implications... If the standard historical assumption about regulated monopoly's role in the creation of universal service is true, then developing countries should stay with regulated monopolies to develop their infrastructure before experimenting with competition... If, on the other hand, access competition played a critical role in the developmental stages of the US infrastructure and this experience accounts for the tremendous US lead in the extension of telecommunications service, then a very different policy conclusion can be drawn. Conditions in developing countries, which have low penetration and a stagnant monopoly, often closely correspond to the conditions in the USA prior to independent competition. A policy of open entry and systems competition could have similar effects, although of course there are many differences in conditions.⁶⁷

Neither the technology nor the history are the same today. Nevertheless, it might be possible to sustain access competition using a different set of technologies and corporate institutions, thus unlocking the energies of the telecommunications sector.

We return to the theme voiced in the first chapter: How can new competitive institutions be established and sustained? There is a microeconomic and micropolitical level of analysis embedded in this question, both of which require explanation and definition.

As we have already discussed, increasing penetration for telecommunications services depends on reducing the cost of the service. Reducing the cost of the service requires reducing the costs of one or more of the inputs of that service, thus shifting the demand curve downward and driving higher rates of usage. At the same time, institutions must be constructed so that they can competitively coexist on a level playing field. That is the sticky issue in telecommunications services today. The fixed costs of providing telecommunications services have been extraordinarily high, both from the standpoint of human resources and technological applications.

⁶⁷ Mueller, "Universal Service in Telephone History," p. 369

Creating competition requires us to rethink the whole range of cost inputs so as to understand how costs might be lowered through the selective application of new technological applications. That becomes the critical microeconomic criterion that will spur telecommunications development through competition.

The politics are even more problematic. Regulatory bodies can be described as both reactors to and shapers of technological and organizational processes. In examining the taxonomy of regulatory agencies throughout the world, we see that they have been more reactive than proactive when it comes to the application of new technology.⁶⁸ The political decisions since the turn of the century have largely been made by default, with monopoly interests dominant in virtually every country throughout the world.

The political community should not protect new institutions and technologies as they enter onto the scene for reasons of competitive advantage; rather, regulatory institutions can choose to foster competition through identifying the opportunities for new entrants in a competitive marketplace. By assessing technologies, and suggesting kinds of technological and organizational institutions appropriate to competition, the policy community and regulatory institutions can perform a vital public service: They can point the direction to a competitive marketplace and can help to lead corporate institutions in a variety of appropriate directions.

The results will be an accelerated pace of development in the telecommunications sector. As the U.S. Department of Commerce's report, *Telecommunications 2000*, describes:

Competition builds markets; it does not erode them. The more competitive a given geographic, product, or national market, the faster it seems to grow. Competition thus seems key to sector development.⁶⁹

The accelerated rate of development for telecommunications will impact on the development process as a whole, enhancing the opportunities for participation and modernization.

⁶⁸ It is important to recognize that a consensus exists among the telecommunications policy community that a more proactive role is required of international and national regulatory institutions. See Tyler, et. al.

⁶⁹ NTIA telecommunications 2000, p. 11

Our goal is therefore to identify specific technological and organizational characteristics appropriate to sustainable competition in the telecommunications industry. As a starting point, we should look to existing forms of competition in the telecommunications industry and focus on one particular example: competition for wireless access to communications services.

3.2 A Taxonomy of Competition in the Telecommunications Industry

Certain portions of the telecommunications sector are considered competitive. Present descriptions, though, are largely mired in the politics of deregulation. This is especially true in the United States, where virtually every corporate institution has a hired academic or two that can effectively argue that the market the company dominates is competitive while other markets the company wishes to enter is not competitive.

Three specific markets are considered competitive in today's telecommunications sector. How competitive each market is provides an opportunity for much debate, but the structure of all three is generally based upon the establishment of at least the facade of competition, if not the reality.

The first kind of competition has already been discussed in some detail: Specialized data and voice networks for corporate users. As the interface between the telecommunications and computer industries, data networking is cluttered with all kinds of network providers, hardware producers, consultants and software makers. Clearly, a great deal of competition exists for this kind of telecommunications service.

The second kind of competition most often discussed is competition for long-distance services. The development of competition in this sector depended on a certain kind of technology: point-to-point microwave transmission, which became commercially viable in the mid to late 1960's. Among the first companies to use this technology was Microwave Communications Inc., which later shortened its name to MCI.

MCI began to compete with the long lines division of the then monopoly provider in the United States, AT&T. After years of political maneuvering, Judge Harold Greene declared that long-distance services could sustain competition if the "local bottleneck" could be separated from the

long-distance network. AT&T, under an agreement put together by the company and the Justice Department, agreed to divest itself of the local exchange in order to compete for long-distance service and equipment contracts. The resulting arrangement left the Regional Bell Operating Companies as regulated monopolies responsible for the local exchange, while MCI was granted the access to the existing wireline telephone system to compete for long-distance services.

Soon after they achieved that goal, MCI stopped using its microwave towers.⁷⁰ The battle for market share in long distance would not be fought in the United States with microwaves, but rather with fiber optic technology. The huge capacity of fiber optics allowed long-distance carriers to roll-out vast networks that connected local service area with local service area.

Peter Huber has argued that the resulting introduction of fiber in the long-distance services has resulted in a noncompetitive situation. His argument is based on the huge overcapacity in the network and the fact that shares in long-distance services in the United States have stabilized in the past few years. Prices have certainly been pushed down and usage is up, but that does not mean a competitive situation currently exists.⁷¹

Similar kinds of competitive markets have evolved under the aegis of evolving regulatory liberalization in a number of developed countries. During the 1980's, the British Department of Trade and Industry helped to bring into existence a competitive duopoly for wireline services; BT faces stiff competition in long-distance and business networks from Cable & Wireless' subsidiaries throughout the country. The market still largely belongs to BT, even though new competition might change that fact dramatically in the years to come.

NTT of Japan faces a similar challenge. The Japanese government has chosen to license a number of service carriers to provide for competition in local, long-distance and international services. Slowly but surely, NTT has had to face additional entrants into the market for a wide range of telecommunications services, in particular long-distance.

⁷⁰ Peter Huber et. al., The Geodesic Network II

⁷¹ Huber openly admits that he is in the employ of the Regional Bell Operating Companies, and he does have a vested financial interest in making the argument that competition does not exist in long-distance but rather in local services. That argument would then justify the entry of the local providers into long-distance service in the US.

The model of long-distance competition and local monopolies has been replicated in a number of developed and developing countries throughout the world. As part of Mexico's liberalization scheme, long-distance markets will be opened to competition in the next few years while local telephony will remain under the monopoly control of TELMEX until the year 2037.

It is important to point out that, at the foundation of the initial competitive markets for communications services, the access technology was wireless. It presented certain advantages for establishing a low cost network that allowed MCI to argue that they should be allowed into the market. Wireless required less network maintenance, since operators did not have to worry about all of the wires in the network. The control organization for a point to point network was easier to manage than a distributed wireline network, although complexities in switching were certainly just as complex, if not more.

So why the transition to fiber? Because of the high capacities of fiber optics, and the ability to transmit digital information instead of analog waveforms, the quality of service could be improved. But the result has been a non-competitive situation, according to Peter Huber. He argues that the incredible overcapacity in the long-distance networks in the United States has made a farce of competition; AT&T could easily cut its prices, make a profit, and run the competition out of business.⁷²

If that is true, then why has it not happened? First, the regulators in the US will not let them. And, second, if they did, the antitrust division would be knocking at the door and filing a flurry of legal briefs, calling for another divestiture in order to support a competitive marketplace.

We can also add another layer to Huber's argument. If the best opportunities for telecommunications development are based upon extended penetration and access, long-distance competition can not help. Long-distance, as defined in the US regulatory model, connects local loop to local loop, not person to person. Is that the kind of competition that will bring to people the new services and access that could generate the concurrent effects of economic growth and increased productivity? Probably not.

⁷² Huber calls it "Candice-coated competition," echoing Candice Bergen's role as spokesperson for long-distance provider, Sprint.

The present market for long distance may be competitive, but the true price and service differentiation that would be required of a competitive market has not emerged. That is in great part because differentiated service offerings have yet to emerge; phones are still phones, no matter what the future vision of the telecommunications networks may be. Until there is a sense of differentiated service based on price, content and access, the long-distance market can not stand as a model for widespread competition in the telecommunications industry.

Wireless technology has also been at the foundation for a third kind of competition in the telecommunications marketplace globally: Wireless access. In the United States, the most prevalent form of wireless access has gone under the name of cellular telephony, with mobile phones targeted mostly to high-end customers. In a number of countries throughout the world, multiple providers have been licensed to provide competing services in a given geography. In most cases, that geography has been national, but, in the United States, a variety of large and smaller companies have developed to provide service in a wide range of service areas.

It is important to point out that the character of competition for wireless access in the US and throughout the world has been far from vigorous. A wealth of studies exist to test the character and quality of competition in existing markets in the United States, with most of them echoing a common theme: the amount of real competition is, at present, minimal.⁷³ Nevertheless, the market for wireless telephony has sustained a number of providers, brought new entrants into the telecommunications sector, and transformed the possibility for local and long-distance competition.

More importantly, wireless access is the only kind of competition that has reached directly into the local market, reaching a broad base of consumers and corporate users. On that basis alone, George Calhoun is right in saying that the advent of broad based opportunities for wireless access means “the end of the natural monopoly.” He writes:

The introduction of radio technologies into the long-distance segment of the telecommunications market in the 1950’s led directly to the breakup of the monopoly for long-distance services. Freed from the cost constraints of wireline plant in the long-distance application, operators found that they could effectively

⁷³ For a particularly complicated econometric analysis of this issue, please see L. Keta Ruiz, “Pricing Strategies and Regulation Effects in the U.S. Cellular Telecommunications Duopolies,” from the 1994 Telecommunications Policy Research Conference.

compete, and tolerate competition, without destroying either themselves or the market. It took the regulatory structures some time to catch up; however, competition was eventually embraced, and today we have AT&T arguing that it has come to the point where they should no longer be saddled with the assumption that they are the dominant carrier.

Wireless access will work the same transformation in the local exchange market. Make no mistake about it, we are witnessing the beginning of the end of the natural monopoly. In the twenty-first century access environment, there will be no reason why there cannot be as much competition in telephony as there is in, say, the airline business or the trucking business.⁷⁴

The examples of the airline or trucking business are worth commenting on to introduce a further competitive issue which needs to be addressed. An airline or a trucking company owns the facilities it uses to provide services. Both kinds of companies use commonly accessed infrastructure; multiple trucking companies use the same publicly owned and maintained road, and multiple airlines use municipally owned airports. So part of the competitive environment is based on the ability of each company to maintain efficient and profitable facilities, but the other part involves ensuring access to the commonly available infrastructures.

By analogy, the competition in the telecommunications industry which Calhoun describes would involve some commonly accessed infrastructure, and some that is owned by the company providing the services. Yet that constrains the kind of competition possible, keeping it a step away from a market where each company owns the facilities required to deliver products to customers. The more commonly accessed infrastructure, the more opportunities for market inefficiencies and political disputes that have less to do with the quality and cost of services and more to do with the political muscle of the institutions vying for access.

In a marketplace with a history of placing regulatory and political needs over customer interests and concerns, this can be a recipe for disaster. For that reason, Calhoun's hope for a market as competitive as the airline industry or the trucking industry is not going far enough. Facilities-based competition should be a long term goal, turning the information products marketplace into an environment which resembles the competition between Coke and Pepsi, instead of Delta and United.

⁷⁴ Calhoun, Wireless Access and the Local Telephone Network, p. 121.

This is where wireless access has a particularly critical role to play, as we will discuss in detail during the next chapter.

Leaving aside the argument of whether or not the market for wireless communications is presently competitive, wireless communications has been the foundation for what little direct, facilities-based competition presently exists in the telecommunications industry. If we are looking for a mechanism to hasten the penetration of competition and new services in the local exchange, then we need to look to wireless access for some possible answers.

4. Conclusions: Sustainable Institutions and Effective Competition

If we are to recreate access competition in this modern era, we need to find a platform for competition that would be appropriate to the market that we consider most critical to the improvement of service worldwide: Local access to communications services. The platform has to be sustainable and provide for facilities-based competition between a variety of service providers. It would also have to be amenable to the needs of national development that we have already outlined in the opening discussion.

Considering the role that wireless technology has played in the development of competition in the provision of telecommunications services worldwide, it is likely that it can be used as a technological foundation to support further competition. We have come to a tentative conclusion about the best possible “strategic” choice for “strategic liberalization.”

Which brings us back to the possibility of using competition to fuel economic and political development through the telecommunications sector. If the traditional institutions within the telecommunications sector can only go so far in exploiting the new opportunities for development opened by social and economic change, we need to look to other kinds of technologies and organizations.

For the telecommunications sector, strategic liberalization means wireless communications. Wireless access is the critical development of the past twenty years of telecommunications development that can open up the local market to competition, and push levels of penetration higher. The only way to

construct a global information infrastructure based on competition is to strategically invest in wireless communications and use it as a catalyst for the establishment of competing service platforms.

We now reach the heart of the argument. Having outlined the history of the telecommunications sector, established the link between telecommunications and development, identified the critical issues for telecommunications development, and outlined the existing kinds of competition in the telecommunications sector, we now have a solid base upon which to test the following assumption: It is possible, and desirable, to employ wireless technology as the basis for competitively sustainable corporate institutions. More than that, it is essential to the future development of the global information marketplace. The next chapter shows why the technologies of wireless access will be critical to the next age of telecommunications development worldwide.

Chapter 3

Wireless Communications: A Foundation for Competition and Development

Wireless access is generically defined as the use of radio to provide access to the telephone (telecommunications) network.¹ The main enabler is the electromagnetic spectrum, which can be used to carry encoded information from point to point and sustain a conversation between two people, or two computers for that matter.

There are a variety of models for delivering wireless access services that exist in the telecommunications industry worldwide. Thus far, we have not differentiated between these models. Some of these models are appropriate to the goals of development we have outlined; the model for service should provide access to as many people as possible in a fashion that can aid in economic and political development.

So the key question of this chapter is to identify a service model and institutional structure for wireless access which is consonant with the goals of development. In order to do that, we will begin with a discussion of the technologies and policies which underlie the provision of wireless access services throughout the world. We will then focus on the specific kinds of service models, including an examination of the political and regulatory implications of the models we present. In the process, we will define the characteristics of an institution that can sustain itself and provide the foundation for access competition through wireless services, thereby offering us a practical grounding for the policy of strategic liberalization we have begun to articulate.

1. The Evolution of Wireless Access Services

When we began our discussion of the history of telecommunications, we defined the service provided by telecommunications operators as “access to communications services.” These providers can offer

¹ Calhoun, Wireless Access and the Local Telephone Network, (Boston: Artech House, 1992) p. 121.

access by two means: stringing a copper or fiber optic wire from one point to another, or by using the electromagnetic spectrum to connect one point to another.

As an idea, wireless access is not new. We briefly mentioned that one of Marconi's first applications of his wireless communications system was wireless telegraphy. Two way, wireless communications has been around for more than a century, so we are not dealing with a conceptual novelty per se. It is the application of the technology that is new, and the application of the technology is emeshed in new innovations and regulatory changes over the past 100 years.

Wireless access, though, is only part of a whole; the networks of the future will include both wireless and wireline access. And many networks will be able to compete using only wireless access as the foundation for their network infrastructure. Until recently, it was inconceivable to think that the entire public switched telecommunications network could be replaced in any country. The fixed costs of wires made such a conception look more like folly than practical policy. But, as we will show in this chapter, it is now possible to do just that. An entirely new communications network can be built in any country, even the United States, with wireless access as a critical component of the service provision. Without wireless access, we would be left with the present network: fixed wires and fixed locations, with little financial and service flexibility.

In order to understand the possible futures and the viability of each of these metaphors, it is necessary to move into a more detailed discussion of the technologies of wireless communications. As soon as we begin discussing technologies, the acronyms shoot by faster and more often than bullets at the OK Corral. Unfortunately, the author will need to try the reader's patience a little as we turn to the technology and physics of wireless access.

1.1 The Technological Foundations of Wireless Communications

Wireless communications are carried on waves of electromagnetic energy from one place to another, and the way in which electromagnetic spectrum behaves largely defines the technologies that are used for wireless communications. Without getting too deep into the physics of it all, it is important that we review some of the scientific characteristics of wireless access before we discuss the specific enabling technologies that have been used to construct wireless communications systems.

In our earlier discussion of the development of the telephone, we noted the intimate connection between the development of electrical power and the advent of the telecommunications industry. In fact, the two industries are practical applications of the same set of equations, first developed by James Maxwell in 1861. His work to describe the forces of electricity and magnetism forms the basis of wireless communications today.

Maxwell identified the basic properties of how electrons move from one place to another by describing the motions of electromagnetic fields. Electromagnetic fields react to each other and, in the same way that magnets operate, repel and attract each other. The oscillation of electromagnetic fields sends out energy in the form of waves; as the fields move and shift, information can be sent along with them from one point to another.²

Electromagnetic waves come in many shapes and guises, most noticeably to us as visible light. But there are a range of longer and shorter wavelengths than the wavelength of visible light, all of which carry energy and some of which have been brought to bear on a range of scientific and commercial concerns. From x-rays in the medical industry to radio waves in broadcasting and television, the electromagnetic spectrum is now being used by human ingenuity to carry information from one place to another.³

Different kinds of wireless access services are offered in different parts of the electromagnetic spectrum. AM, FM radio and broadcast television use the longest radio waves, up to about 110 MHz. Cellular services are offered in the 800 MHz band worldwide, Personal Communications Services (PCS) in the space between 1.8 GHz and 2 GHz. The microwave range has usually be used for point to point wireless communications. Wireless cable services are proposed for the range around 28 GHz.⁴

² Maxwell's predictions in this regard engendered the crisis in classical mechanics that eventually led to Einstein's theory of general relativity. Without getting too far into these issues, Einstein's theory of relativity showed that electromagnetic radiation, such as light, travels both as a wave and as a particle simultaneously.

³ The science of wireless access is presently under scrutiny after reports that cellular phones may cause cancer. Extended exposure to certain parts of the electromagnetic spectrum can certainly be harmful, such as X-rays and other forms of radiation. The ongoing debate on Electromagnetic Forces (EMF) has impacted on the market for wireless access and some consumers wait for more conclusive scientific evidence.

⁴ Different kinds of waves have different modulation patterns and modulation frequencies. The "hz" designation is a measurement of the number of modulations per second, with MHz an abbreviation for

But there is nothing inherent about why these communications services are offered in the portion of the electromagnetic spectrum designated for their use. The designations are much more political than they are scientific, and are determined in great part by the fact that radio waves can interfere with each other if the use of different parts of the spectrum are not managed properly.⁵ For that reason, different parts of the spectrum have been assigned for different tasks. But, when it comes to transmitting information, bandwidth is bandwidth.

The political decisions that have determined the use of the electromagnetic spectrum were made at a number of different stages of telecommunications development and were based on honest scientific assessments of the day. But, as is always the case, old regulations are built from old science, and, even though the scientific understanding has changed, the regulatory definitions have not. Much of the public policy spawned by the technical and scientific assumptions of various periods in the past century remain with us today.

The most notable of these assumptions is the belief that the electromagnetic spectrum is a scarce resource that, like any scarce resource that can be used for public gain, must be closely regulated by government. The "traditionalist" view on this subject is that the electromagnetic spectrum is "a finite resource that has value in and of itself" and believe that it is the responsibility of the Federal Communications Commission and like regulatory bodies throughout the world "to divide and allocate spectrum."⁶ The "innovationists" on this issue are "focused around the concept that spectrum is highly flexible because technology has evolved so greatly that with a bit of extra thought it may be possible to allow a plethora of uses shared amongst many players."⁷

The truth, as Terrence McGarty and Muriel Medard point out, is someplace between the two extremes. Technological innovations have made the electromagnetic spectrum seem a lot more

"megahertz" and GHz an abbreviation for "gigahertz." The above three services used as examples are ordered from the longest waves to the shortest waves.

⁵ The coordination of a variety of countries throughout the world have allowed for some global standardization in the use of the electromagnetic spectrum. The implications of global standardization in spectrum management for wireless access services is discussed later in this chapter.

⁶ Terrence P. McGarty and Muriel Medard, "Wireless Architectural Alternatives: Current Economic Valuations Versus Broadband Options: The Gilder Conjectures," presented at the 22nd Annual Telecommunications Policy Research Conference, October 1994.

⁷ Ibid, p. 2.

flexible than it looked, say, 20, years ago. Whereas, before, a certain slice of the spectrum was required for a broadcast television station, the same slice can now support five or six television stations, and a few paging companies to boot.

These technical developments which allow us to harness the spectrum more efficiently open new opportunities for public policy and corporate managers. Resources that have been allocated to existing institutions, such as broadcast television, radio, and satellite can now be employed for different purposes. The institutions with access to those resources will need to transform themselves in order to reap those benefits, and strategic liberalization needs to point to the kinds of institutional change that would be most appropriate in realizing these new benefits.

So how much information can a wireless system carry? That depends on who you talk to and what technique they are advocating. At this point of conjecture, the clean lines of science are blurred the individual agendas of corporate, public policy, and, yes, even academic advocates. Generally speaking, wireless access has less of a bandwidth capacity than does a wireline communications systems. There are also greater concerns about security, since it is easier to “hack” a wireless communications system than a wireline system (just ask the British royal family.) Even so, there is nothing that is presently done on wireline transmission that will not be possible on wireless systems, given the proper technological application and regulatory flexibility in defining the services to be offered.

But constructing networks to meet the goals of strategic liberalization requires more than just a throughput analysis. We need to bring together capacity, regulation, microeconomics and strategic planning. With the physics of the project behind us, we turn to the nuts and bolts of implementing wireless access systems.

1.2 The Components of a Wireless Communications System

When a person taps into the electromagnetic spectrum and makes a call from a wireless phone, there is a lot of different technology involved in ensuring that the call gets through. As wireless systems move from just phone calls and broadcast television to all kinds of data, voice and image transmission, the software and hardware for the systems will just become more complicated. The

easiest way to understand wireless telephony without getting an degree in electrical engineering is to break a wireless telephone system down into its constituent parts and define the function of each.⁸

For the person making the call, the starting point is the wireless phone.⁹ The wireless phone has a number of components, which can be classified into three parts: the transmitter, the receiver, and the memory and control portion of the communicator.¹⁰ The concept of the receiver and transmitter are easy enough to anyone who played with a crystal radio set when they were young. The communicator is tuned to a specific frequency (or frequency range), picks up transmissions that occur in that range, and transmits back on that range.¹¹ The memory and control portions link together power sources (batteries) to the computer chips that allow for the modulation of the information to be transmitted and the demodulation of the information received.

Of course, there also has to be a device on the other end that receives and transmits the information in a way that the wireless communicator can handle. That is known as a mobile telephone switch (MTSO). The MTSO is connected with a transmission and reception site known more commonly called a "cell." The parlance comes from a description of the territory that such as device can cover, which, on an engineer's diagram looks like a six sided "cell." That term then became the basis for the common description, "cell"ular telephony. As it is known today, cellular telephony is a kind of wireless access facilitated by the interoperation of a number of transmitting and receiving cells, which connect individual phones to the telephone network.

The use of cells, MTSOs and individual communicators presents a fundamentally different paradigm for network construction than the traditional wireline telecommunications system. An investment in wireline technology is extremely capital intensive. Not only is it necessary to connect each of the individual points on the network with a dedicated line that can stretch from 20 to 100 meters in length, but it is also necessary to put into place a trunking system that can carry all of the traffic from

⁸ For a more detailed discussion of the constituent parts of a wireless telecommunications network, please see D.M. Balston and R.C.V. Macario, eds, Cellular Radio Systems (Norwood, MA: Artech House, 1992), p. 1-42.

⁹ It might be more appropriate to use the term "wireless personal communicator," since that is what the marketing departments in the telecommunications industry appear to be gearing up to call them.

¹⁰ Balston and Macario, p. 6.

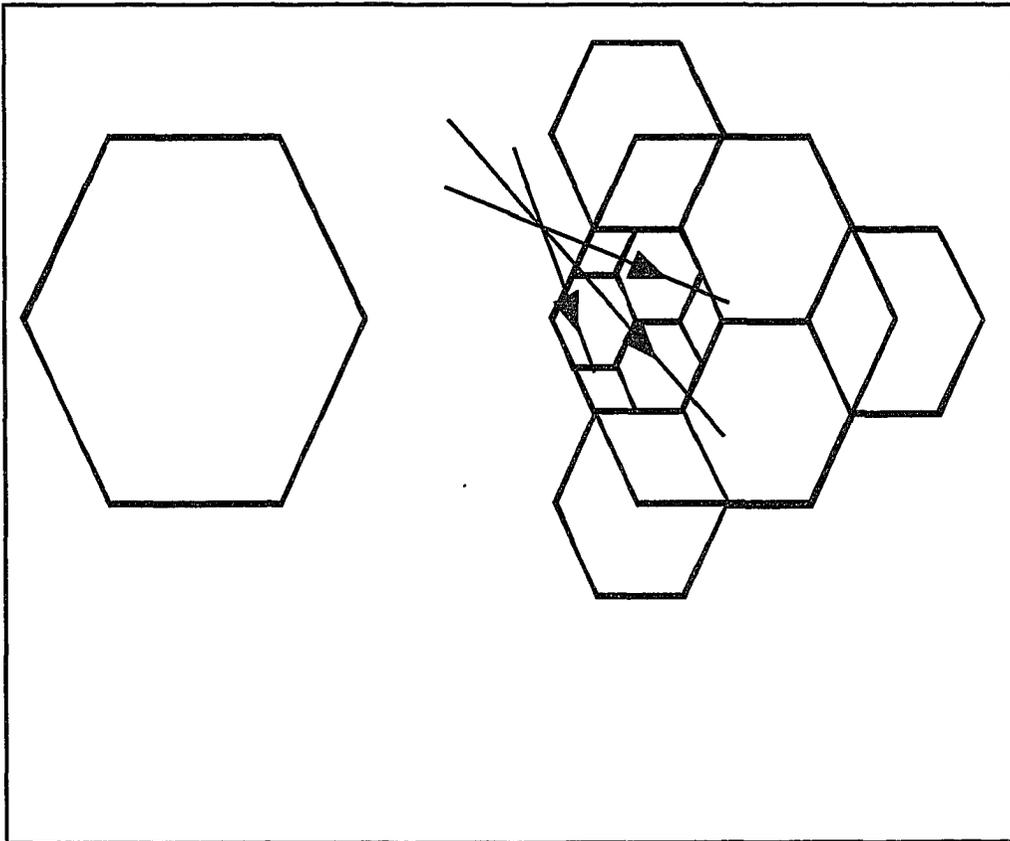
¹¹ This is a vast oversimplification, especially considering new innovations in what is called spread-spectrum technology. George Gilder claims that the advent of spread spectrum technology will completely remove the need for the assignment of frequencies of the electromagnetic spectrum. See Forbes ASAP, June 1994.

each of the individual subscribers. Calculating demand becomes a very precise science, and a very important one as well. Overbuilding causes financial loss that can not be recovered, and underbuilding can seriously hamper the ability of the network to provide quality service and expand to handle new traffic and subscribers.

Wireless technology is built on a scalable architecture that can be expanded and contracted much more easily to meet shifts in the demand for telecommunications services. For example, if a new subscriber base emerges in a different portion of a city or region that is serviced by wireless access, it is not necessary to rebuild the system and wire the new territory. All that is necessary is the establishment of a new cell site that can support the new subscribers.

As demand increases in highly populated urban areas with a higher demand for telecommunications services, it is possible to use a technique known as cell division (or cell splitting) to increase the capacity of the network. Instead of using only one cell to manage the subscriber base in a given territory, the area is divided up among six cells, which, in combination, increase the capacity of the network in that area by six. For a wireline network, the only option would be to rebuild the trunk lines and construct new drops from the trunk line to the homes. The following graphic depicts the impact of cell splitting and highlights its value as a strategy to meet emerging demand.

Scalability of investment in wireless local loop systems



Source: Shawn O'Donnell, from "Towards an Open Communications Environment; A White Paper on the Future of Russian Telecommunications."

Needless to say, the mobile telephone switch is a much more complicated device than a single wireless communicator. The MTSO has to handle a number of different users at the same time, much as a server on a computer network that has to facilitate the interoperation of a number of terminals. As cells are split, the configuration of the network that serves the network, namely the switches that connect various cell sites together, needs to be altered to meet the demands of more subscribers.

Now comes the difficult part. Creating a receiver and a transmitter is, comparatively speaking, not half as difficult as creating the link between the two items. In fact, the link between the cell site and the transmitter determines much of the engineering specifications for hardware components. The

space in between the transmitter and MTSO is filled with electromagnetic waves. A number of different ways to ride those waves have been developed, some of which deserve explanation.

Transmission: Analog Systems

The initial mechanism for the transmission of information across the electromagnetic spectrum were analog wave forms. Analog transmission techniques are based on encoding waveforms with varying levels of intensity. The levels of intensity are decoded at the reception point and translated into speech and/or data.

The first analog systems to be made commercially available for two-way cellular communications were developed in Europe.¹² NMT 450 was first brought into service in 1981, jointly developed and rolled out by the public telecommunications administrations of Denmark, Finland, Norway and Sweden. (Not surprisingly, the NMT designation stands for “Nordic Mobile Telephone” and the 450 is a reference to the portion of the spectrum for which it was developed, 450 mhz). NMT 900, which operates at the higher frequency of 900 mhz, was made available in 1986.

The NMT system uses a specific mobile telephone exchange (MTX) to connect the mobile subscriber to the telephone network. A base station supervises the use of frequencies; reception and transmission occurs at the rate of 1200 bits per second. When a call is placed to the mobile subscriber, the call is routed to a designated home MTX or a pre-designated MTX where the subscriber is “visiting.” When a mobile subscriber is “in motion,” the system has to “hand off” the subscribers signal as the communicator is moved out of the range of one base station and into the range of another. In industry parlance, NMT uses a “hard hand-off,” meaning that one and one only base station/cell connects the subscriber to the network at one time. The subscriber has to “leap” from cell to cell as the communicator moves. Most of the countries that have adopted NMT for their analog wireless access services are European countries.¹³

¹² See D. Weston, “NMT: The Nordic Solution,” from Cellular Radio Systems, p. 73.

¹³ The countries that have adopted NMT include: Andorra, Byloerussia, Croatia, Estonia, France, Indonesia, Luxembourg, the Netherlands, Poland, Saudi Arabia, Sweden, Tunisia, Austria, China, Cyprus, Faroes, Hungary, Latvia, Malaysia, Norway, Romania, Slovenia, Switzerland, Turkey, Belgium, Czechoslovakia, Denmark, Finland, Ireland, Lithuania, Morocco, Oman, Russia, Spain, Thailand, and Uzbekistan. *Ibid*, p. 111.

The American standard for analog transmission is AMPS, which stands for Advanced Mobile Telephone Service.¹⁴ Constructed by Bell Labs and tested in the 1970's, AMPS became the standard configuration for cellular systems in the United States. After the licensing of cellular carriers in the early 1980's, AMPS uses the bands reserved for cellular service in the United States, which stretch from about 820 mhz to 900 mhz. A mobile switching center (MSC) coordinates the interface between the public telephone network and the mobile subscriber; the MSC has more responsibilities in the AMPS system than in MTX in the NMT system inasmuch as the billing and statistical information associated with running the network is centered in the individual MSCs. The MSC is responsible for the "hand-off" function as well, signaling the next MSC as the hand-off is about to happen. A narrowband version of AMPS, known as NAMPS, uses smaller channels for transmission and reception, which increases the capacity of traditional AMPS services. Most of the countries in North American have adopted AMPS as their standard for analog wireless services.

When cellular service was rolled out in Great Britain in 1985 (three years after in the United States), the two providers, Vodafone and Cellnet, determined that a modified version of AMPS would be appropriate for analog wireless transmissions.¹⁵ The British had to modify AMPS in order to meet the European specifications of frequency allocation; although the portions of the electromagnetic spectrum assigned to wireless services in the early 1980's were similar in Europe and in the US, they were, nonetheless, different and required different air interfaces.¹⁶ It was also necessary to abide by other European technical standards that were not taken into account in the development of AMPS. Although Japan started offering analog transmission wireless access services through their own system (known as MCS-L1/2), providers other than Nippon Telephone and Telegraph (NTT) used variations of TACS to construct their networks.

Transmission: Digital Techniques

These are the analog systems that have been the backbone of wireless services over the past 15 years. But, in the same fashion that digital transmission is fast overtaking analog transmission for wireline systems, new digital standards for wireless transmission have begun to be promoted by different

¹⁴ See B. J. Menich, "Analog Cellular Radio in the United States," from Cellular Radio Systems, p. 47.

¹⁵ See E. W. Beddoes and J.R. Easteal, "TACS: The UK Approach," from Cellular Radio Systems

¹⁶ The European frequency allocation was from 862 to 960 mhz.

interests across the globe. Instead of encoding waveforms with different levels of intensity to transmit information, the manipulation of frequencies is used to transmit the on and off, 1 and 0 of digital code. The effect is increased capacity, enhanced quality, and better connections. The three most notable techniques for digital transmission are: Time Division Multiple Access (TDMA), Group Standard Mobile (GSM), and Code Division Multiple Access (CDMA).

Before describing each of these separately, we should point out that each of these “flavors” of digital transmission have only begun their service in the industrialized world. The penetration of digital transmission systems, at the time of this writing, are less than 5% of the total service area in the United States. For that reason, the equipment manufacturers that have banked their fortunes on one or another version have very strong opinions on which is better. In order to focus on the institutions behind the techniques, rather than the techniques themselves, we will try to confine ourselves to the descriptive.

TDMA is a digital transmission technique based on a relatively old innovation. During World War Two, engineers learned how to isolate individual frequency channels and control those channels sufficiently to intersperse multiple transmissions simultaneously in a single channel. By dividing the channel up into time blocks (usually no more than a few milliseconds in length), and assigning each time unit to a different receiver (while transmitting in all of the time blocs), capacity could be increased.¹⁷ Because human speech also contains a lot of pauses and brief moments of silence, time division takes advantage of the open spaces to intersperse other information into the transmission.

George Calhoun has likened the innovation to bringing a number of people into a room and asking them to carry on simultaneous conversations with individuals on different sides of the room by choosing a specific time slot and speaking one word at a time. If people could speak as fast as computers and shoot bits to one another, the process actually might become rather fast and efficient.

To make the process commercially viable, though, requires a great deal of computer control and power. How does the communicator know which time slot is the right time slot? Or which frequency channel is the right frequency channel? By establishing a “control channel,” TDMA maintains a link that is separated from the communications transmission to try to handle that portion of the equation.

¹⁷ See F. Lindell and K. Raith, “Introduction of Digital Cellular Systems in North America,” from Cellular Radio Systems.

Obviously enough, the MTSO also needs to be able to determine which conversation is which before establishing the link with the telecommunications network.

North American equipment producers have established common standards for the cellular bands and for communication on other portions of the spectrum. The initial goal of these manufacturers is to convince the cellular carriers presently using analog systems that they should make the switch to digital immediately. Some carriers have been quick to align themselves with specific manufacturers, while others have remained on the sidelines to assess the relative success of the various systems and offerings.

Groupe Speciale Mobile (GSM) is a digital transmission technique that employs a form of time division multiple access.¹⁸ GSM was established as a pan-European system for digital transmission, and the establishment of the GSM technique was spearheaded by the European Telecommunications Standards Institute (ETSI).¹⁹

By employing a non-governmental organization to codify GSM standards, the European equipment producers involved in the project signed onto a philosophy that knowledge of the system should be in the public domain.²⁰ The benefits of such a commitment will include cross-country roaming, where a subscriber can travel to any portion of Europe and still use the same wireless communicator to gain access to the telecommunications network.

GSM has been largely adopted by the European PTTs and competitive service providers.²¹ Versions of GSM for other frequencies have also been developed, most noticeably the DSC-1800 version of GSM that will be used for the offering of wireless access in the 1.8 - 2 ghz range. Many have signed onto consortia efforts to link the North American and European TDMA systems.

¹⁸ For more information on the operation of GSM networks, see Siegmund Redl, Matthias Weber and Malcolm W. Oliphant, Introduction to GSM, (Norwood, MA: Artech House, 1995)

¹⁹ The ETSI was jointly established by the European Conference on Posts and Telecommunications and the European Community to codify standards for the telecommunications industry.

²⁰ D. M. Balston, "The Pan-European System: GSM," Cellular Radio Systems, p. 155

²¹ As of the end of 1992, telecommunication operators in Australia, Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom had committed themselves to the GSM wireless system.

The other prevalent alternative to TDMA and GSM is Code Division Multiple Access (CDMA). CDMA's answer to the problem of bringing a lot of people into a room and holding simultaneous conversations is very different than TDMA: instead of controlling everyone's conversation to a different time slot, CDMA assigns different languages to each conversation. By coding the transmissions, the communicator can pick the appropriate transmission out of the air and translate it for the user.

CDMA does not use specific channels on set frequencies, as TDMA does. Transmissions can occur over a range of frequencies, thus allowing CDMA equipment to spread through the spectrum and avoid interference in clogged parts of the assigned spectrum. The advocates of CDMA, most notably Qualcomm, fervently believe that CDMA represents a better alternative for a number of reasons.²²

There are other digital transmission techniques that are presently being developed, such as Space Division Multiple Access (SDMA) and variations on the Frequency Division Multiple Access (FDMA) that lies at the root of TDMA innovations. More interestingly, some claim that spread spectrum techniques will eventually replace the need for specific license assignments. The ability of transmission systems to use codes instead of frequencies would allow for the use of the entire spectrum, with interference conflicts being resolved through coordination of conflict avoidance technologies.²³

Our discussion of these established technologies point our search in a number of directions. What should be clear at this point is that enabling technologies are as much products of science and engineering as they are products of political needs and systems. Understanding how the political realm impacts on the provision of wireless access services is our next important step in determining how a policy of strategic liberalization might be implemented.

²² Qualcomm claims that CDMA can handle more information, transmit information clearer, and provide a "soft handoff" which allows for two or three MSCs to "hold" a transmission until the handoff is complete.

²³ George Gilber, "From Wires to Wireless," *Forbes ASAP*

1.3 The Role of Political Institutions in Telecommunications Technology: Frequency Allocation and Spectrum Management

Political institutions shape technology through laws, regulations and other forms of market intervention. For the telecommunications industry, that influence has been pervasive throughout the period of PTT and public utility management. It is fair to say that the marketing function in each telecommunications company throughout the world has been subsumed under what is traditionally called external or public affairs: no service can be offered to the public without being named, classified, categorized, and regulated by the government.

That is true for access providers, content providers and equipment manufacturers. As we discussed in the previous chapter, the standards setting bodies of the telecommunications industry have certainly been hard at work establishing the accepted techniques for providing telecommunications services. There is good reason for this concern on the part of political institutions: how standards are set affect the competitiveness of individual companies and the viability of entire markets for services. That, in turn, means jobs and opportunities for constituencies to which the politicians are answerable.

For wireless access, there is one critical area of government intervention which is more critical than all others: frequency management. Governmental institutions throughout the world have taken on the responsibility of assigning frequencies, and giving those frequencies to companies and institutions is a very political decision. One might argue that it is from this fundamental issue that all regulation in wireless access is derived; the spectrum is a finite resource, and such a resource requires a fair arbiter to manage it.

In order to understand better and characterize the nature of political involvement in the market for wireless access services, we need to understand the traditional assumptions that lie behind frequency management. We can then connect each of those factors to broader regulatory trends. As a starting point in the discussion, we turn to a Joint Technical Advisory Council expert report from the Institute of Electronics Engineers and Electronic Industries Associations published more than 30 years ago.²⁴ Using this older source will illustrate an important point about existing regulatory definitions for

²⁴ Joint Technical Advisory Council (JTAC) of the Institute of Electrical and Electronics Engineers and the Electronics Industries Association, *Radio Spectrum Utilization: A Program for the Administration of the Radio Spectrum*

wireless services: They have hardly changed in more than 25 years throughout much of the world. The paper states that there are five dimensions to that specific problem:

1) *This resource is used, not consumed; it is being wasted when it is not being used*

Spectrum does not disappear after use, which makes it a different kind of resource than oil, gas, or other natural resources. The legal regime that developed for property rights in the West, therefore, need some modification if they are to be applied to the management of the spectrum.

The concept of licenses has emerged over the past century to provide opportunities to use this resource. Unlike licenses to mine or harvest on a particular piece of land, the chief concern of regulators is not the depletion of the resources but rather the efficient and proper use of those resources. In most cases, because of the political nature of information and information transmission, governments have chosen to keep wireless licenses and whole swaths of the spectrum for their use.

The distribution of those licenses is an issue of much contention. As a public resource that many could try to use, the choice of who gets to use it (especially if the amount of spectrum is thought to be a constraint) is a wholly political decision.

2) *This resource has dimensions of space, time and frequency, and all three are interrelated*

Transmissions have a range, and then dissipate after passing beyond that range. For that reason, the same portion of the electromagnetic spectrum can be used at different locations. The problem is, of course, to ensure that no two places are using the same spectrum.

On the national level, regulatory agencies or the national telecommunications provider works to ensure that this does not occur, either by providing national licenses for a specific frequency or

drawing specific boundaries for the use of those frequencies.²⁵ The more difficult problem is on the international level where “coexistence requires coordination and control.”²⁶

The International Telecommunications Union (ITU) has recently completed a restructuring that places the management of frequency assignments into its radio and wireless sections. But the ITU, through the World Administrative Radio Conference (WARC), can only suggest assignments for spectrum use; there is no binding enforcement mechanism in place to allow the ITU to constrain the national regulatory bodies from making these decisions.

3) *It is an international resource, available to all*

Unlike oil or gas deposits, the electromagnetic spectrum is everywhere on the planet. This is especially significant for developing countries, many of whom have only recently begun to recognize the fact that this resource can be used effectively to improve telecommunications services.

The ITU has begun to construe its mandate more and more along the lines of an international development agency, focusing on improving the telecommunications capacities of many developing countries.²⁷ Although those countries may not have access to wires and fiber optic cables, they do have the spectrum to use.

4) *This resource is wasted when its parameters are not correctly applied to a task*

Basically, there are some things that should be done with the spectrum and other things that can be done more easily using other communications techniques. But, again, this is a political decision that rests mostly with national telecommunications administrations (PTTs) or independent regulatory bodies. By assigning portions of the spectrum to specific uses (and technologies), it has been the regulators, not the markets, that have made these designations. This adds a dimension of constraint on corporate planning, which, for the companies in the telecommunications industry, is dependent

²⁵ The only country to do the latter is the United States, which used two frequency blocs to assign hundreds of licences to provide cellular services nationwide.

²⁶ David M. Leive, International Telecommunications and International Law: The Regulation of the Radio Spectrum, (Dobbs Ferry, NY: Oceana Publications, 1970)

²⁷ Most recently, the ITU has proposed establishing an institution named WorldTel, which would provide financing for telecommunications projects in developing countries throughout the world.

more on the whims of politicians than the ability of a marketing department to identify and package a truly useful service.

5) *The resource is subject to pollution*

Magnetic fields are not as nicely laid out in real life as they are on paper. Transmissions tend to bleed into other frequencies, and licensees who use the spectrum for different purposes often find their transmissions getting in each other's way. There are mechanisms for reducing the pollution of the spectrum, and sharing that information improves the ability of the spectrum to be used. International agencies also try to facilitate pollution control by identifying difficulties and suggesting remedies.

The Implications for Licensing and Service Provision

These five issues define frequency management policies generally applied to wireless access throughout the world. The issues, and the means by which political institutions attempt to address these issues, are expressed in how providers of wireless access services are licensed.

Licensing has different degrees of specificity, depending on the goals of the regulators. The one element that is consistent in all countries is the identification of a specific area of the spectrum for the service to be provided and a specific geography or constituency for the provider to serve. Sometimes, it goes much further than that. The government often also specifies the size of channels and subchannels for transmission and sometimes even mandates the kind of hardware (and the manufacturer of the hardware) that has to be used to build the network.

Having defined the dimensions of the license itself, the next most evident question is: Who should receive the license, and under what conditions? For cellular systems throughout the world, most countries permitted the incumbent wireline carrier to develop, own and operate the first wireless franchise in the country. The exception to the rule was the United States, which decided to create a lottery for the licensing of cellular operators.²⁸ All kinds of people applied for cellular licenses, and many of them had no intention of actually using the license to construct a network. The early

²⁸ The FCC created a duopoly in each service area, giving one licence to the incumbent wireline operator and providing for a "non-wireline" licence that would be given away in the lottery. A more detailed discussion of the development of the American cellular market appears in chapter five of this thesis.

consolidation of licenses in the most important metropolitan areas would seem to indicate that the lottery was not successful in creating a broadly diverse range of operators.

The other main option for the distribution of licenses for wireless access would be a lottery, an auction where competitive bids could be tendered. The history of the auction model for the telecommunications industry is a fascinating, and has been detailed comprehensively by Thomas Hazlett of the University of California. Hazlett's research uncovers the fact that an auction strategy was first advocated by proponents of market socialism, not by the free market, anti-regulatory policy thinkers with whom the position is most closely associated today.²⁹ Even so, the idea was advocated by thinkers like Ithiel de Sola Pool and a variety of others as the debacle of lottery assignments became apparent in the 1980's cellular experience in the United States.

As the FCC developed licensing procedures for Personal Communications Services (PCS) in the early 1990's, the idea of an auction was strongly advocated by many in and around the Commission. Eventually, the FCC rolled out a broad policy for auctioning off almost anything in the electromagnetic spectrum that it could find, and this development is detailed in the fifth chapter of this thesis. In addition, the idea has taken wing and is now under consideration in a variety of

²⁹ Hazlett attributes the idea of applying auctions to the allocation of spectrum to Leo Herzel, not Ronald Coase as some have suggested. The association with market socialism comes from Coase, as Hazlett points out in his article by drawing on some of Coase's commentary on the subject:

It is sometimes said that I introduced the idea of using prices to allocate the spectrum. But this is untrue. The first time this was proposed, at any rate in print, was by a student author, Leo Herzel, in an article in the University of Chicago Law Review in 1951. When I first read this article I thought, and it was quite natural to think this, that Leo Herzel had been influenced by Aaron Director and Milton Friedman. But this is also untrue. While he was an undergraduate, Herzel had become very interested in the debate over whether a rational, efficient system for allocating resources would be possible under socialism. As a result, he read Abba Lerner's The Economics of Control soon after it was published in 1944. This debate, particularly Lerner's detailed proposal for market socialism in The Economics of Control was the inspiration behind his views.

Hazlett points out that auctioning is, in its purest form, rent seeking behavior by governments who assert access over the resource of the electromagnetic spectrum. See Thomas W. Hazlett, "Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?" Presented at the Telecommunications Policy Research Conference, September 1995.

developing and developed countries.³⁰ Not only would this provide a source of government revenue, but it would ensure that the individuals and companies bidding would have a vested interest in making their investment pay. The disadvantage, as some have pointed out, is that only the companies with deep pockets will be able to bid unless the regulators “put aside” additional licenses for other potential market competitors.³¹

Licensing is just the tip of the iceberg when it comes to the influence that regulators exert over the market for wireless access, but it is not difficult to draw the implications and common patterns from the licensing strategy alone. Protecting a market can be achieved by limiting the number of licenses. Creating a market for a specific kind of standard requires identifying that standard as part of the license.

Needless to say, these are all barriers to competition inasmuch as they signify a barrier to entry that can not be overcome without the government. If we are to achieve competition through strategic liberalization, the barriers to entry must be decreased. It will be necessary for licensing to be redefined to meet the policy objectives we have already outlined.

1.4 The Role of Standards and Standard Organizations and Wireless Access

The interplay of technical standards, be they open or proprietary, and the licensing process becomes a critical factor in reducing the barriers to entry. There are two countervailing pressures that regulators are forced to address: in order to make a service possible, it is necessary to find some sort of technological common denominator to ensure interconnection and, where possible, universal service. At the same time, defining standards through political means is not the best way to ensure continuing technological innovation; the pressures for innovation in the market push technical advances faster than a politician’s exhortation.³²

³⁰ According to Peter Cramton, Professor of Economics at the University of Maryland, the countries where such a policy is under consideration include Poland and Hungary as of the end of 1995.

³¹ This idea has caused a great deal of continuing debate in the US. The FCC initially set aside licenses for minority and women-owned companies that could develop a franchise, and for the companies that “pioneered” the process of PCS wireless access. For more information, see Paul Schultz, “PCS: The Quest for 2 GHz Spectrum”, TR 1992 Report Series, No. 8. (Telecommunications Reports: 1992)

³² See, in particular, the collected essays presented in Technology and the Wealth of Nations.

Corporate managers experience the same sort of tension, expressed in the paradox described by Gerd Wallenstein:

On one hand, technology-driven innovations need much interaction with targeted users before products can be standardized. On the other hand, few potential users are prepared to invest in experimental systems that may prove incompatible with network standards a few years hence. Straddling this paradox are darling entrepreneurs who engineer first applications to characteristics suitable for a few, large scale users.³³

“Standardization is innovation’s key to the market,” he states elsewhere in the book.³⁴ That being the case, corporate managers need to determine how to integrate solutions with other market players while positioning the equipment or services they provide in a fashion that might be to their advantage.

To resolve this paradox, the industry has chosen to allow technical committees to develop standards for every piece of the telecommunications puzzle. But it is more than a matter of science. Since technologies open markets, which, in turn lead to jobs and economic prosperity, political leaders have some very unscientific interests to bring to bear to the discussion. The alphabet soup of industry and governmental organizations include many that have been established to represent the national or regional economic interests. The European Telecommunications Standards Institution (ETSI) is funded, in part, by the European Union, which is certainly interested in sustaining the competitive capacity of the PTTs and competitive telecommunications providers in the Union. The Electronics Industry Association (EIA) and Telecommunications Industry Association (TIA) in the United States may derive less of their funding from governmental sources, but their work is clearly connected to the innovations of North American equipment producers. Perhaps the only truly international standards body is called, appropriately enough, the International Standards Organization (ISO).³⁵

³³ Ibid, p. 53.

³⁴ Gerd Wallenstein, Setting Global Telecommunications Standards (Norwood, MA: Artech House, 1989), p. 53.

³⁵ Just because these bodies establish standard technical solutions to telecommunications problems does not mean that they will become widely accepted. Quite the contrary. As international bodies with no power to enforce their decisions, quite often their solutions are deemed by the marketplace to be incorrect. The most evident example is the immense success of TCP/IP as the internetworking standard of the internet, which was developed separately from the ISO’s mechanism for data transmission and networking.

Which is where the politics comes in. The typical rationalization is that if there is a national, or regional standard, and the local companies use the standard, there is an assured market for the services. That assured market will then support the expansion of the companies into other markets, where the same solutions can be imposed. In such a fashion, developing nations have often been forced to follow the telecommunications technology lead.³⁶

Wireless communications is no exception. The industry battles for the standardization of CDMA, TDMA and GSM have been well documented in the telecommunications trade press. All three have been codified by the North American standards bodies and now that the specifications have been written down, the struggle becomes to sell transmission techniques to the service providers that will need to purchase the equipment. But that competitive ground is essentially constrained by the standard-setting function, which, in turn, is based upon the political arrangements codified in government regulations.

In other words, the technologies are adopted and implemented by specific institutions attempting to achieve certain goals, many of which are not consistent with the goals of development we have been referring to throughout this discussion. It is widely agreed that the attempt by certain companies and countries to establish proprietary and protected standards restricts the diffusion of advanced technology, contravening the opportunities which would become apparent with the advent of improved access.

Institutions therefore need to be oriented to the need for systems integration, either through political activity or the pressures of the market. Integration will make business opportunities possible and reduce the competition-dampening effects of licensing policies. The problem for political institutions though, has less to do with the technology and more to do with the nature of the institution. What kinds of service models promote technological integration as part of a broader effort to increase access and interoperability of network components? And how can the energies of the market be directed through the definition of appropriate service models which provide the impetus for national development?

³⁶ As we shall see in our case study discussions, Brazil is a notable exception to this rule.

2. Technologies, Markets and Politics: Defining Service Models for Wireless Access

We have set the groundwork for the discussion of the various service models by breaking out the different technical, economic and political elements of how wireless access is provided. By combining the three, we can begin to outline the various service models that exist and have been suggested for the evolution of these services. As our starting point, we will take George Calhoun's description of four alternative service models for wireless access:³⁷

1. Wireless access as the extension of the telephone network
2. Wireless access as an outgrowth of cellular radio
3. Wireless access as PCN (Personal Communications Networks)
4. Wireless as private access services

Each of these models represent a specific combination of technology and institutional behavior. There are ownership implications, in so far as many of the systems for wireless access around the world are owned and operated by governments. In addition, there is a great deal of industry "hype" surrounding some of these models, most particularly the Personal Communications Services/Personal Communications Networks (PCS/PCN) model.

As we discuss each of these models separately, we will use this opportunity to introduce the established definitions for wireless services, most notably paging, cellular, direct broadcast satellite and the like by fitting them into the individual models for the provision of services. Although the industry differentiates each of these services as having qualitative differences, it is important to remember again that the same information can be carried by all different portions of the electromagnetic spectrum. In other words, any of these services, which are often offered on different portions of the electromagnetic spectrum, can be transformed to perform the same function as any of the other services. A paging company that only transmits 50 character messages today can be transmitting multimedia products tomorrow.

³⁷ This taxonomy is taken from George Calhoun, Wireless Access and the Local Telephone Network, section 5.2 (starting on page 135). The fourth alternative is suggested more as an ownership distinction than as a service model in Calhoun's work; to illustrate certain issues, I will expand on that division further and develop it into a full model for the provision of wireless access.

We begin by examining each of these models separately. Although none of these models fits neatly into the policy of strategic liberalization, we will be able to take pieces from each and understand what a model of strategic liberalization might look like. We can move from there into the specific innovations in corporate and public policy that would make strategic liberalization more viable as a service model for wireless access.

2.1 Wireless access as the extension of the telephone network

Wireless services have long been seen by many as an ancillary service to traditional wireline telephony. Calhoun's first model is a reflection of that perspective, and also the reality that gave birth to the first commercial applications of wireless access in this country.

Because of the geographical dispersion of homes and residences in the United States, wireless access has been used to provide exchange services to remote areas. The main reason has been cost. The fixed and marginal cost of the wire required to link a remote area is much higher than the fixed and marginal costs of wireless services. Most monopolies with mandated service provisions have used wireless access as a mechanism for meeting the regulatory requirements in regard to rural access. The usage of wireless access for these purposes is virtually nonexistent in many of the developed countries throughout the world because the dispersion pattern of the population is not as great.

There might be other reasons as well, many of them having to do with the standards of service set by the various jurisdictions. In the United States, a number of state regulatory battles have been fought over the quality of service and tariffing procedures for wireless access.³⁸ This is because the politics of providing telephony is closely linked with the politics of politics, and that a variety of options

³⁸ For a discussion on some of those issues, including the inclusion of electric power into the tariffing decisions at the state level, see R. M. Pepper, "Through the Looking Glass: Integrated Broadband Networks, Regulatory Policy and Institutional Change," *Federal Communications Commission OPP Working Paper Series*, No. 24., November 1988.

might be considered more preferable to the regulators than to the company responsible for providing the services.³⁹

If we expand the definition of dialtone to include television programming, then another kind of wireless access can be included into this model. Cable television started as a hybrid form of wireless access supported by coaxial cable that brought programming to geographical areas which could not access the broadcast towers. Recently, the a number of companies in the United States have begun to develop a service for providing wireless cable, which employs no coaxial cable but functions as a cable television access service.⁴⁰

Throughout the developing world, the possibilities for wireless access as an extension of the telephone network has been the focal point for pushing levels of penetration higher. In fact, most of the work on applying wireless access to the needs of developing countries has focused on this kind of model until very recently.⁴¹ Examples include the Indonesian Satellite Project, funded by the United States Agency for International Development in the 1970's and a wide range of UNDP programs which have been focused to meet the needs of particular countries. IMMARSAT, the international treaty organization which owns and operates a number of satellites worldwide, is focused more on extending the telecommunications network of developing countries through the provision of long-distance and international services. Those extensions of the network, though, do not add additional subscribers to the network by providing direct access to the telecommunications network.

Certainly, satellite based access services for remote villages, or point to point wireless systems that connect rural exchanges to urban centers have their place in development thinking. But they have not bridged the gap in providing telecommunications services, as the statistics presented in the first chapter clearly indicate. As Heather Hudson has pointed out recently, "even where countries have invested in long-distance links through leasing satellite capacity, the "last mile" problem remains."⁴²

³⁹ One alternative to providing wireless access services to rural areas is to provide party line services, which link a number of subscribers onto a single access line. See Calhoun, p. 141.

⁴⁰ Dean McWhorter Johnson and Bradford K. Macomber, "Laying a Sound Business Foundation," *Private Cable & Wireless Cable*, p. 16.

⁴¹ See, in particular, Heather Hudson, When Telephones Reach the Village: The Role of Telecommunications in Rural Development (Norwood, N.J.: Ablex Pub. Corp., c1984).

⁴² Heather Hudson, "Access to Telecommunications in the Developing World: Ten Years After the Maitland Report," presented to the 22nd Annual Telecommunications Policy Research Conference, August, 1994. p. 1.

People are not becoming subscribers to telecommunications services, for reasons of price, technological penetration, government regulation, and corporate strategy.

For the developing and developed world, this kind of model does not go far enough. There are a number of reasons for this deficiency. First and foremost, as Calhoun explains, “what we may call the wireline derived view of wireless access tends to be cautious and pragmatic.”⁴³ Established institutions and organizations are the focus of these efforts, and no attempt is made to create countervailing institutions that might provide access through competitive means.

Second, this model is not oriented to the possibility of replacing the existing infrastructure with wireless access services, thereby providing competitive alternatives for services in markets that can sustain competition. Integrated service providers will have to do more than simply add microwave links to the end of their networks; they will have to get into the local loops, pushing penetration levels higher.

This is certainly not to imply that such activity is a failure or has little merit. Quite the opposite is the case; thousands of rural communities now have access to services that would have been impossible to dream of decades ago. It is that focus on increasing the penetration of services which needs to be brought into our model of strategic liberalization. In linking competition and development through the strategy of strategic liberalization, we need to look to more dynamic models which foster the development of new institutions for the provision of wireless access services.

⁴³ Calhoun, p. 143.

Recent Developments in Wireless Access Through Mobile Satellite

Satellite technology has long been viewed as an appropriate technological remedy for linking remote regions into the telecommunications network.⁴⁴ Many development programs have used as the basis of their efforts satellite technology to push levels of penetration in rural areas higher than would be possible with traditional landline technology. The driving force behind many of these technological arrangements has been consortia of governments and international organizations, most notably INTELSAT, which helps developing countries share satellite capacity so as to expand their reach for broadcasting and telecommunications services.

New technology has pushed the cost of satellite communications even lower, dramatically altering how satellite technology is used by telecommunications companies. Very Small Aperture Terminals (VSAT) less than a meter in diameter are now being employed by companies and regions as diverse as Brazil⁴⁵ and Wal-Mart in the United States. In fact, there is a project underway as of the writing of this paper to link 130 remote villages to key cities in Guatemala by using VSAT antennas for the price of \$12 million.⁴⁶ Direct Broadcast Satellite (DBS), although not a two-way communications medium at the present time, has boomed throughout Asia and will begin to compete directly for cable television revenues in the United States over the course of the next few years.

Investments in satellite technology have become an important part of the investment strategy of a number of telecommunications companies. A wide range of industrial and commercial consortia are presently working to construct global satellite networks using a variety of hardware, transmission, and orbital techniques. The table on the following page provides a list of some of those companies and the extent of their planned investment.

⁴⁴ See, in particular, Heather E. Hudson, Communications Satellites: Their Development and Impact (New York: Free Press, 1990).

⁴⁵ World Telecommunications Development Report, box 5.5 A number of banks have begun to use VSAT terminals to link together their respective financial networks.

⁴⁶ World Telecommunications Development Report, box 5.5.

Active and Proposed Satellite Ventures

Iridium	Globalstar	Elipso	Spaceway	Teledesic	Aries	Orbcomm
Motorola	Loral, Qualcomm	Westinghouse, Harris Corp. Fairchild	Hughes Aerospace	William Gates and Craig McCaw	Constellation Communications	Orbital Sciences
\$4 billion	\$1.8 billion	\$410 million	\$3.2 billion	\$9 billion	\$294 million	\$170 million
1998	1998	1997	2000	2001		1995
66	48	14	9	840-900	48	26
Global	Global	10 key countries and rural markets	Global	Global	Areas underserved by cellular	Global

2.2 Wireless access as an outgrowth of cellular radio

The goals of a cellular telephone network traditionally have been different than for the public telephone network, a fact which is reflected in the business plans, government regulations and equipment produced for the purpose. Cellular telephony, in its first 10 years of development, has concentrated almost exclusively on mobile applications and high-end, business applications. Those facts form the basis of this second model, wireless access as an outgrowth of cellular radio.

Applying this model in the developed and developing world has created a very narrow business focus, and companies have been covering high fixed costs with junk bonds and a variety of leveraging schemes.⁴⁷ The focus of the financial management of these companies has been to amortize these high fixed costs out over an extended period of time, making it difficult to begin

⁴⁷ For stories concerning the development of McCaw and its relationship with a number of bond traders in the 1980's, see the *Seattle Sun Times* and *Seattle Post-Intelligencer's* reports of April 4-8, 1994, entitled "Money from Thin Air," on the development of McCaw Cellular communications.

competing with wireline phone services on cost.⁴⁸ Even if cheaper services using the cellular model could be made available, many in the industry argue that it would be illogical to “make a \$30 service available when the \$70 services are selling so well.”⁴⁹

The marketing image that has been developed echoes the industry’s financial need to maintain high costs by emphasizing the element of the network that produces the largest marginal cost of operation: mobility. A good example appears in the 1992 Annual Report from McCaw Cellular:

This brave new world, unfettered by a phone cord, has unleashed a tidal wave of applications that is changing the way we live, work, play and relate to one another...

It means that a busy executive can travel anywhere -- by car, plane, boat or any other mode -- and conduct business without wasting a minute. A journalist can file a story by paperless fax from a delayed flight and still meet a deadline. An injured hiker can call for help -- from a remote location. A deaf or hard of hearing individual can perform in a capacity previously not open to him. A citizen’s group can report drug deals and other crimes -- as they happen -- and take back their neighborhood. The possibilities are endless. The human potential -- limitless.⁵⁰

The amazing growth of McCaw and other cellular companies show that people will pay for the mobility. But the strategies have not been constructed for extensive market penetration. Although there are amazing projections for the growth of wireless services, which we will examine more in depth as we discuss the market implications in the next section of this chapter, there are a number of examples of how wireless access has failed to meet expectations.

The penetration of wireless access services has been retarded by the excessive reliance on the cellular service model. First, and perhaps most importantly for our purposes, the cellular model has not produced a truly competitive market that is based on price and quality differentiation. Neither real data analysis nor conjectured game theories have established that the duopolistic markets in the United States produce real competition on the basis of price. The only market in the world with more than two companies serving a given geography is the United Kingdom, which now has four separate

⁴⁸ See the analysis from Donaldson, Lufkin & Jenrette Securities, 1993 Cellular Communications Industry Report, p. 1-5.

⁴⁹ *Ibid*, p. 2.

⁵⁰ Imagine No Limits, McCaw Cellular Annual Report, 1992. p. 4.

wireless carriers. The extent of competition in that market will be the focus of our sixth chapter, but it is enough to say now that the policy and corporate communities agree that competition on the basis of price is still constrained by a number of technical and economic factors.⁵¹

The regulators in the United States have attempted to open up the space to allow competition to evolve, and many other countries have also made room for competition within the context of the cellular/wireless access model.⁵² The sticking point has been licensing which, as we have described in the earlier sections of the discussion, is a process wholly tied to regulations and politics. If regulations and politics can not move to create a competitive environment, then there is good reason why costs do not go down and services remain at costs that would prevent them from competing directly with traditional wireline services.

This model of wireless access as cellular telephony has not been helpful in the developing world as well. The cost structures considered profitable in the developed world have been passed down to the developing world, in large part because the developing world's cellular systems are owned and operated by the large telecommunications companies of the United States, Japan and Europe. As such, services have been largely marketed to the wealthy consumers instead of the large mass of people who do not have access to telecommunications services at all. So, for example, in Nigeria at

⁵¹ See, in particular, the proceedings of Docket 91-34 of the Federal Communications Commission on the bundling of customer premises equipment (CPE) and wireless services. Peter Huber points out in The Geodesic Network II (section 4.6, footnote 30) that the Department of Justice's criterion for a workably competitive market (based on the Herfindahl-Hirshman Index's assessment of market concentration).

⁵² As Peter Huber, et. al, write in The Geodesic Network II:

The [Federal Communications Commission's] procompetitive policies have made it unnecessary to regulate [many] aspects of radio services. The rates, revenues, and profits of radio service providers are subject to no federal regulation, and most states do not regulate cellular or paging providers at all. Most states that do regulate such services do so only to a very limited extent, requiring such things as informational tariffs, and typically imposing no price regulation at all at the retail level. The competitive policies licensed upstream, in allocating licenses and overseeing equal interconnection with the landline network, make additional regulation unnecessary.

See, in particular, *In re Revision of the Uniform System of Accounts and Financial Reporting Requirements for Class A & Class B Telephone Companies*, 60 Rad. Reg. 2d (P&) 1111 (FCC 1986).

the end of 1993, there were only 7,000 cellular subscribers, and, in Ghana, there were less than 3,000.⁵³ As the World Telecommunications Development Report has described it:

Mobile phones are often perceived to be a luxury purchase rather than an element of basic service. Certainly, if one looks at the distribution of subscribers worldwide, they are concentrated in the developed countries. The 24 industrialized nations of the OCED currently account for more than 90 percent of the installed base for mobile phones, compared with just 70 percent of the installed base of telephone main lines. Furthermore, even within these countries, the main users of mobile phones are to be found among the business community rather than the residential users. So, at face value, mobile communications have little to offer developing countries and even less to help the rural poor.⁵⁴

If the growth of cellular services is truly to reach the levels of penetration that some predict, the service will have to evolve. In the developed world, the idea that an individual (or, to match the penetration rates, 22% of the market) wants to have to deal with three phones (home, work and mobile) seems an absurdity. To make money in the developing world, the idea that less than one-tenth of 1% of a population can provide a sufficient revenue stream is even more unlikely. The cellular model, with its constrained competition and emphasis on mobility, is not a good starting point for strategic liberalization; it does not provide a path that would make wireless services a broadly based access mechanism.

⁵³ See *Africa Technology Forum*, Volume 6, No. 2. 1993. See also *Africa Communications*, January/February 1994, p. 9.

⁵⁴ World Telecommunications Development Report, p. 37-38.

Cellular

In 1980, the Federal Communications Commission established rulemaking procedures for cellular operators, establishing the first North American regulatory regime for the provision of wireless access through what would become cellular telephony.⁵⁵ A few years earlier, the Nordic countries first rolled out their systems, using a different portion of the electromagnetic spectrum but focusing on a similar market niche: Mobile consumers of telecommunications services that could pay for the additional expense.

The regulations in the United States were markedly different than in Europe and Japan, in great part because of the geographies that were chosen for the provision of the service. In order to spur development in the new industry sector, the FCC decided in 1981 to divide the licenses for these services into 305 Metropolitan Statistical Areas (MSAs) and granted two licenses for each region.⁵⁶ In addition, the FCC required that each licensee build the wireless network so as to ensure that 75% of each MSA was covered in 5 years.⁵⁷

In order to bring in as many new participants as possible, the FCC mandated that one license in each territory would go to the wireline carrier (initially thought to be AT&T, but, as divestiture proceeded, the wireless assets were turned over to the Regional Bell Operating Companies) and the other would go to a non-wireline carrier determined by lottery. The number of carriers consolidated quickly as licenses were purchased in order to achieve economies of scale. By the mid-1990's, a vast majority of the "pops" served throughout the country were customers of the top 13 cellular companies.⁵⁸

⁵⁵ *An Inquiry Into the Use of Bands 825-845 and 870-890 mhz for Cellular Communications Systems*, 86 FCC 2d, 476, 478 and 482-483 (1981).

⁵⁶ *An Inquiry Into the Use of Bands 825-845 and 870-890 mhz for Cellular Communications Systems*, 86 FCC 2d, 482-483 (1981).

⁵⁷ *The Cellular Telephone Atlas*, p. 2.

⁵⁸ The cellular industry commonly uses "pops" to describe the number of individuals that can be served by a particular cellular licence. Short for "population," the term often assumes that a particular licence can and does in fact serve every single person in a region, which certainly does not correspond to the business reality of building a market for an emerging service.

In Europe, most of the cellular systems licensed by the governments operated on a national level, and quite often there was no competition between multiple carriers until very recently. The exception to this has been Great Britain, which licensed a duopoly for its cellular systems in the early 1980's and has licensed two additional carriers for Personal Communications Networks (PCN) since that time. Few developing countries have more than one or two providers nationally, but that will likely change over the course of the next few years as countries begin to offer PCS/PCN licenses.

Total Population Served by Cellular Carriers in the United Kingdom 1995

Operator	System	Launch Date	Subscribers	Subscribers	Yearly growth
			1/2/95	1/2/94	
Cellnet	TACS-900	1/85	1,587,000	932,551	70.18%
Cellnet	GSM	1/94	23,000	n/a	n/a
Vodafone	TACS-900	1/85	1,554,000	1,076,412	44.37%
Vodafone	GSM	7/92	133,000	13,141	912.10%

From "Financial Times, Mobile Communications," February 23, 1995. (Copyright 1995 Pearson Professional Ltd.)

Total Population Served by Cellular Carriers in the United States 1993

Rank	Company	Total "pops" (000)
1.	McCaw Cellular*	42,508
2.	BellSouth	38,978
3.	Bell Atlantic	35,075
4.	SBC Corporation**	32,988
5.	GTE Mobilnet	29,617
6.	GTE Mobilenet/Contel	24,788
7.	LIN/McCaw Cellular	24,739
8.	PacTel Cellular***	21,649
9.	Ameritech	21,583
10.	U.S. Cellular	21,322

* McCaw Cellular was purchased by AT&T in 1994, a transaction that was completed by the beginning of 1995.

** SBC Corporation is the holding company for the Southwestern Bell Operating Companies.

*** In 1994, PacTel transferred all of its wireless holdings to Air Touch Communications, which was subsequently spun off from the company into a separate company.

2.3 Wireless Access as PCN/PCS (Personal Communications Networks/Personal Communications Services)

When the acronyms PCS and PCN were coined, many in the telecommunications policy community latched onto the concept as a new model for the provision of wireless access services. As Calhoun put it in his 1992 book:

The third view of wireless access services is frankly revolutionary. (If this means that it is also at times rather overblown, so be it.) Radio is welcomed in its full potential as a technology of the next millennium, the communications medium of the future, the realization of science fiction dreams from *Dick Tracy* to *Star Trek*. Radio is not to be shackled to antiquated service ideas rooted in the saurian swamp of wireline telephony -- on the contrary, the PCN revolutionaries rhapsodize about radio communications as a great technological imperative that will redefine our expectations about what communications services should do for us. Just as the airlines killed the railroads, so will personal, portable communications networks reduce the wireline network to a vestigial remnant, a backup systems at best, a pastime for antiquarians.⁵⁹

Calhoun's dramatic assertion has been echoed by many since he outlined his vision of the future of PCS and PCN. Some of what has been said has turned out to be mostly hype, other parts of that vision still resonate.

But this ideal as expressed by Calhoun differs greatly from the business reality that has apparently settled in after the completion of the 1995 auctions for Personal Communications Services in the United States. As a form of wireless access, PCS has become a rather empty regulatory definition than anything else. As Craig McCaw put it in an interview in the *Wall Street Journal*:

"Basically," he says, PCS is "cellular at a different frequency. Adding more spectrum will drive prices down, add capacity and increase competition." That, in

⁵⁹ Calhoun, 1992. p. 147.

turn, will bring untethered communications to a larger number of consumers. "It's a natural evolution" from cellular.⁶⁰

According to one observer, it is a regulatory definition driven by technology, "not the regulators or even the advocates of PCS."⁶¹ The development of digital transmission techniques (TDMA, CDMA and GSM) and the ability of commercial equipment producers to develop hardware and software that could use higher bands of the electromagnetic spectrum has been the origin of pressure on regulators throughout the world to open up new portions of the spectrum to new competitors.

PCS services will be offered on a different portion of the electromagnetic spectrum than traditional cellular services; cellular services were started in the 800 mhz band in the US and the 900 mhz band in Europe, while PCS/PCN services will be developed in the 1.8-2.2 ghz range. That higher bandwidth means that transmissions will have a shorter range, but that it will take less power to make and receive transmissions. The result is that headsets can be smaller and cheaper, and coverage can be more selective to meet the needs of the particular market niche. When first outlined, the belief was that PCS services would lower costs for wireless access in general, provoking competition within the established market for wireless access.

During the ascendancy of the idealized versions of PCS in the early 1990's, a variety of other benefits were ascribed to the PCS/PCN model. Competition was the most critical and most often emphasized element of this model. As W. Russell Neuman put it in 1992, PCS has two "hidden harvests," the first of which is the ability of a person to determine which calls to accept through intelligent network services, the second of which is the possibility of breaking up the local loop of wireline exchanges through new forms of wireless access.⁶² In 1992, Clifford A. Bean, Director of Arthur D. Little, Inc.'s Mobile Telecommunications Consulting Practice, said that "PCS is the first market-driven telecommunications offering in more than 100 years."⁶³ If the second harvest which Neuman spoke

⁶⁰ "Craig O. McCaw Has the Giants Confused With His Bids," *The Wall Street Journal*, February 23, 1995.

⁶¹ Henry M. Rivera and Claudia B. Koepfel, "Loose Ends: A Tale of Three FCC Proceedings," from PCS: The Quest for 2 GHz Spectrum, TR 1992 Report Series No. 8 (Washington, DC: Telecommunications Reports, 1992), p. 1.

⁶² As quoted in PCS: The Quest for 2 GHz Spectrum, TR Report Series No. 8 (Washington, DC: Telecommunications Reports, 1992), p. 19.

⁶³ *Ibid*, p. 19.

of was to become a reality, wireless access carriers would position themselves in the market for local telephony and telecommunications services as a direct competitor to wireline services.

But the model proposed less than two years ago has evolved dramatically as licensing and commercialization of PCS services became a reality in the United States and in the United Kingdom. Many now feel that the emerging players in the market for PCS services look too suspiciously familiar to the cellular players of old, and that fact will stifle competition.⁶⁴ We are back to the question posed in the discussion of the cellular service model: Why develop or charge for a \$30 service if a \$70 dollar service is still selling like hotcakes? The possibility in the United States that concerns the advocates of competition in the market for wireless services is that the “new” participants will develop an oligopic position that will ensure no competition on price and no direct attempt to undermine the existing predominance of the wireline network.

But even if PCS does not represent the true advent of full-fledged competition and a complete break from the model of wireless access as cellular radio, PCS does not necessarily have to turn into cellular at 1800 mhz. The United Kingdom has given us an important example of how competition on the basis of price might begin, though, indicating that the competitive possibilities of the PCS model have not yet been exhausted. As we noted in the first chapter, a multiplicity of companies in the marketplace does not necessarily lead to competition on the basis of price, and a limited number of companies in the marketplace does not mean that an oligopoly will necessarily arise. The four provider marketplace in the UK offers new insight into how PCS might lead to competition in the telecommunications industry, not only with the providers of cellular service, but also with the traditional wireline carriers that have dominated the market for the past century. Because the PCS/PCN model has not yet been worked out in practice, we can still take the relevant elements of the ideal and understand how wireless access services in general might emulate the ideal.

⁶⁴ Personal conversation with Terrence McGarty.

Personal Communications Services (PCS)

Lightweight, easily portable headsets with digital, consumer-oriented transmission systems developed to deliver a wide range of communications services. The construction of PCS is seen as the catalyst for single number service, calling party pays, expanded wireless functionality through network intelligence, decreased transmission costs, and decreased consumer prices. It is also often described as the realization of "anytime, anywhere" consumer communication.

PCS did not begin as PCS, nor did it begin in the United States. In January of 1989, the Department of Trade and Industry in Great Britain published a report entitled "Phones on the Move." It identified the possibility of developing Personal Communications Networks (PCN) on spectrum unavailable to commercial users at that time. By focusing on personal, rather than vehicular applications, the goal was to combine emerging spectrum and digital technology with newly developed intelligent networks.⁶⁵

It came across the Atlantic more as a phrase than as an original idea. Many in the US had already been looking to new emerging technologies and the possibility of acquiring new bandwidth. On June 14, 1990, the Federal Communications Commission opened a general docket for "Personal Communications Services" issues (90-314), and began to discuss how PCS might be developed in the US.⁶⁶ The most important questions seemed to be questions similar to those asked of cellular years before: What spectrum should it be assigned, and what technologies should it use?

⁶⁵ *Phones on the Move*, Department of Trade and Industry (London: OfTel, March 1989). A representative quote from the document dealing with this issue appears on page 6:

Personal Communications Networks can be positioned to address a variety of packets with only relatively minor shifts of emphasis and design. One determining characteristic will be whether Personal Communications Networks feature "handover" or not. "Handover" is a feature of cellular radio systems and enables a user to make an uninterrupted telephone call whilst passing from the coverage area of one radio base station to another. For purely personal communication applications, handover is unlikely to be needed. This would permit the simplification of the network and potentially lower infrastructure cost.

⁶⁶ See the Notice of Proposed Rulemaking, *In the Matter of Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services*, FCC 93-454, released October 8, 1993.

This debate took place in a broader global context. The World Administrative Radio Conference (WARC) of 1992, which was sponsored by the International Telecommunications Union, allocated spectrum between 1850-2025 mhz and 2110-2200 mhz for "future public land mobile telecommunications systems." The hope was that member nations would employ similar bandwidth throughout the world so that international standards for wireless communications would be more easily developed.

The FCC took their cue from the WARC conference and began to consider the possibility of assigning similar bandwidth to "emerging technologies," such as PCS. There was a great deal of pessimism about the potential of speedy spectrum allocation by the FCC. The Cellular industry lobbied for 15 years before final definitions were given to the regulations that now govern its operation. Many believed that government would be unable to move forward on PCS.

Then politics intervened. The newly arrived Clinton administration's search for government revenues led them to the doors of the FCC. It was decided that spectrum would be auctioned so that the money could be used to reduce the deficit. Timetables were included in the 1993 Budget Reconciliation Act to insure that those revenues would be applied to the present fiscal year, and the timetables were much tighter than anyone imagined possible. Instead of waiting 15 years, the industry had less than 15 months to prepare for a spectrum auction.

The results are being determined in the United States as this paper is being written. In Great Britain, a PCN operator has been licensed and additional licenses will be granted so as to spur nationwide competition. Other European countries will soon follow, indicating that this new section of the electromagnetic spectrum will likely soon be filled with a new kind of wireless access services.

2.4 Wireless as private access services

Although Calhoun does not discuss private wireless access services as a type of service model, elements of this market segment are applicable to our discussion of competitive liberalization and our attempt to identify some of the technological and service components that would be relevant to such a policy. Private dispatch services, traditionally known as Specialized Mobile Radio (SMR), are mostly used by mobile transportation companies, while paging is a service based on one-way messaging.

Both of these services have identified a specific kind of functionality that wireless access provides, constructed hardware and software offerings that exploit that functionality, and rolled out those services to a narrow niche in the market. Although there is certainly competition within these narrowly defined markets, the broader market for wireless access in general has quickly become the target for the companies that provide these service, simply because the portions of the electromagnetic spectrum that they presently use can and will be transformed into a more broadly functional kind of wireless access.

Paging

Developed as a one-way specialty service for professional groups, paging has evolved into a two way messaging service which does not yet include voice and extensive data capabilities. In the process, growth in the paging industry has mirrored the phenomenal growth of the cellular industry worldwide. In the United States, the number of pagers grew from about 1 million in the late 1970's to 2.2 million in 1983 and to about 10 million in 1991.⁶⁷ The total market for paging services grew from \$1.14 billion to \$2.82 billion in the United States alone.⁶⁸ Part of that growth has been fueled by increases in the capacity of paging networks, which has increased fivefold since 1981.⁶⁹

⁶⁷ "U.S. Paging Market Forecast to Grow by One-Third in Four Years," *Financial Times Limited*, April 11, 1991.

⁶⁸ Huber, et. al, 4.16.

⁶⁹ *Ibid*, 4.16.

Enhanced specialized mobile radio (ESMR)

As defined by Peter Huber in The Geodesic Network II, SMR is “a private dispatch service that interconnects with the public network. It has experienced rapid growth in recent years, and with the relaxation of various restrictions for interconnection, could become more of a competitor to cellular in the future.”⁷⁰ The “E” in front of the “SMR stands for “enhanced,” which is a shorthand for making such networks digital and expanding their functionality so that they can provide cellular type services in the coming years.

SMR has its roots in an American definition, but SMR systems are becoming more prevalent throughout the developing and developed world. Most of the ESMR carriers in the marketplace today consist of fleet dispatch companies that provide hardware and space in the electromagnetic spectrum for cab companies, trucking companies and other mobile transportation services. Perhaps the most interesting story of the ESMR transformation from a dispatch service to a recognized competitor to wireless services is Nextel, formerly known as Fleet Call. The company, over the past two years, has attempted to project itself as the most likely competitor to cellular services.⁷¹

⁷⁰ Ibid, p. 4.15.

⁷¹ Coopers & Lybrand Info-Comm Conference, Washington DC, November 23, 1993.

With the wide diversity of companies providing these kinds of products, the private service model tells us that a number of small companies that focus on niche products for specific kinds of wireless access may be able to develop a sustainable revenue stream and leverage that revenue stream to expand operations and grow into a real competitor to the larger wireless access providers. The important question then becomes, what is the appropriate niche for such a provider?

2.5 A Taxonomy of Wireless Service Models

Throughout our discussion of service models, we have sprinkled in references to different kinds of wireless access, relying on established service definitions. As has already been noted, those definitions are driven more by regulators and equipment salesmen than by marketing or engineering departments. Nevertheless, to synthesize the disparate elements, the following table presents a summary of the various service models we have discussed.

A Taxonomy of Wireless Service Models

Type of Wireless Access Service	Examples	Public vs. Private Ownership	Level of Competition
Wireless Extension of Public Network	Rural telephony via satellite or microwave	Public (usually part of the public switched telephone network)	Low/Non-existent
Cellular Telephony	High mobility applications (public telephone access for automobiles)	Public and Private	Low to Moderate
Personal Communications Services/Networks (PCS/PCN)	Pedestrian applications	Private	Moderate
Private Wireless Access	Wireless LANs or private paging services	Private	Moderate

The irony of this taxonomy is that wireless access services are much more homogenous than the purveyors of each individual service would like to state publicly. As has been mentioned before, bandwidth is bandwidth; the services provided in one portion of the electromagnetic spectrum can be provided in a different portion of it as well. So the distinctions reflected in the above table are more by the designs of regulators and marketing departments than by real differences in the capacities of different parts of the electromagnetic spectrum.

The market is beginning to recognize that fact as the established models and service definitions begin to bleed into one another. Cellular providers will soon be marketing “personal communications,” and paging companies will likely soon be providing voice messaging. Satellites will be delivering multimedia communications, some of it one way, some of it two way; fleet dispatch companies will soon be offering additional data services to residential users; the list of possibilities goes on and on.

In light of this impending convergence and because the market for wireless access is consolidating rapidly as regulatory distinctions become less and less meaningful, we need to fuse together the models we have discussed to develop a generic understanding of what wireless access can do. Characterizing the future allows us to draw a clear distinction between the vision of strategic liberalization and the models that have been brought into reality by the existing government and public policy institutions.

2.6 The Future of Wireless Access

What we have seen in our discussion of service models and technological configurations is that there is no established model which reflects the goals of the strategic liberalization policy. There are fragments in some real world facts and conjectured examples, but there is no one real expression of how wireless access can be used to stimulate competition in the telecommunications market in the way we have outlined.

Considering the central importance of competition in our model, it is logical that we draw heavily from what may be called the ideal of PCS and PCN. In our earlier discussions, we identified pushing down costs as a critical element of competition. The “idealized” PCS/PCN model points to an important portion of those cost components: hardware and transmission costs. If PCS services do push down the cost of hardware and software, then it is likely that, over the long term, companies will be able to push down the prices of the services offered to their customers.

But although the hardware and software costs of constructing a network are critical, there is more than just the fixed costs and marginal costs of operating that network. The cellular model has informed us that most wireless access providers have been forced to amortize the investment over an extended period of time, which, in turn, negates some of the immediate impact of new, cheaper

technology. Reductions in cost, in the end, will have to be reflected in the very structure of the institution for providing wireless access.

The examples of the wireless access as an extension of the telephone network and the private wireless access providers inform us that providers do not have to start with a broadly available service in order to grow and thrive. Finally, the idea of auctioning bandwidth, a policy that has been incorporated into the PCS model we have discussed, allows for an adequate valuation of the worth of the spectrum. This appears to be the best mechanism to ensure that investments flow to the most productive portions of the network.

But none of these models, working in isolation, will be able to promote political and economic development without a cheap and widely accessible form of access. People will need to be able to get into the layers of the network and use their connection to make the kind of social and economic contribution essential to the development process. The best form of access to achieve those goals is wireless access, but the institutions and technological configurations which presently provide wireless access are not equipped for contributing to the goals of development.

Over the next two sections, we will outline how new innovations can be combined with the workable elements of each model that we have just identified. We will begin with the microeconomics and business practices of wireless access providers, then move on to the regulatory environment and the public policy that can reinforce favorable market developments. This elaboration of the strategic liberalization model will then set the ground for the identification of and examination of the case study examples that follow.

3. The Marketplace for Wireless Access: Creating New Economic Institutions

We begin with a discussion of the industry and business innovations that new technology and policy insights make available for the future of wireless access. The importance of these developments can not be overstated; in the end, it is costs and institutional structure that will push or retard the penetration of new technologies, and the costs and business culture that lie behind the provision of wireless access needs to be scrutinized if we are to come to a complete understanding of the new opportunities in the marketplace.

To provide some context, it is worth reviewing some of the projections for growth in the market for wireless access. 11,000 new subscribers sign up for cellular service each day in the United States, and it is projected that there will be a total of 145 million cellular customers in American by the year 2003. The 30% a year growth rate posted by the wireless industry greatly outstrips the 3-5% growth of the nation's wireline companies. The growth of wireless is not confined to the United States; 9 out of 10 people in Sweden, for example, will be cellular consumers by the year 2000. Over the next few years, phenomenal growth is predicted, with projections stretching from 18% (which would be about 50.7 million customers)⁷² to as high as 25% by the year 2000.⁷³ Among rural carriers, it is estimated that cellular companies have achieved penetration rates of more than 1% in the United States, and penetration rates had increased past 4% by the end of 1992.⁷⁴ These penetration rates do not include the growth of other forms of wireless access, such as Personal Communications Services (PCS), which would presumably also succeed in establishing a customer base that would make wireless access as a whole even more of a force worldwide.

The ability of the industry to sustain phenomenal rates of growth is in great part due to declines in the costs for providing the services in the past 5 years. Most of the estimates for the cost of a network are based on per subscriber costs, and the per subscriber costs have decreased from approximately \$3,000 dollars a subscriber to at least half of that today. Wireline access is traditionally estimated to cost \$1,500 per subscriber, and it is at that cutoff point where many telecommunications companies determine whether or not a certain service will be profitable. As the wireless becomes increasingly inexpensive, it is difficult to find a pessimistic projection for future cellular revenues.⁷⁵

It is this confluence of impressive growth and shrinking margins on customers that have defined the cost structure of the industry and the kinds of business practices that have been developed to support the provision of services. The result of the technological and policy changes we have alluded to will be a dramatic rearrangement of the cost structure for providing telecommunications services in general. By fusing together network construction costs from a number of sources, the following cost curves for wireline and wireless services can be projected.

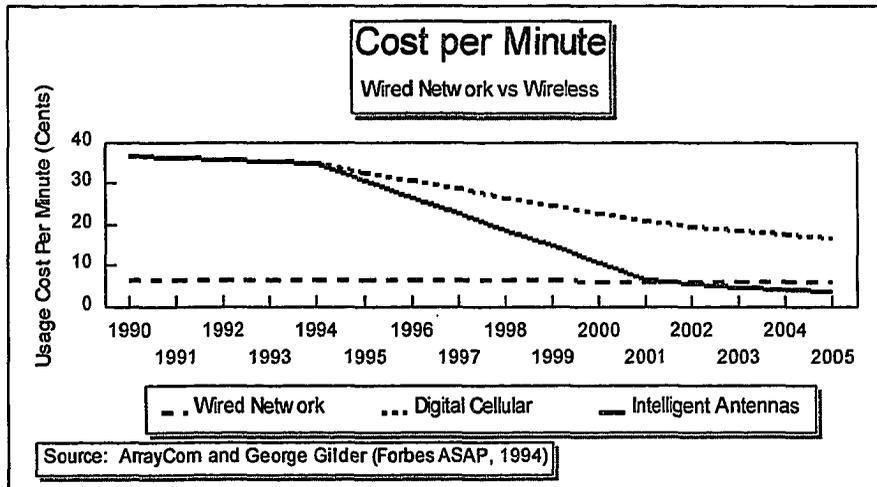
⁷² Ibid, p. 1.

⁷³ Teleselector, Press Release, November of 1993.

⁷⁴ The Cellular Telephone Atlas, (Paul Kagan and Associates, 1993).

⁷⁵ Susan Stahl-Gibney, "Telecommunications: Current Analysis," Standard & Poor's Industry Surveys. November 25, 1993. See also, *Telephony*, June 20, 1994 for additional projections on the growth of the market for wireless access in general and PCS, ESMR and Cellular services in particular.

The Wireless Advantage



The cost of constructing a network is distance sensitive when it comes to wireline access. The longer the wire, the more expensive the fixed cost of providing the access. The present cost structure of access services would seem to indicate that for moderately long distances, wireless access is the more economical of choices. The cost of wireless access, though, is decreasing at a faster pace than for wireline access. In the coming years, the costs of wireless access will definitely be cheaper overall, and some claim that the cost is already cheaper with the advent of the new digital technologies.

The industry faces a crossover from wireline to wireless access for many of the telecommunications services to be provided. Characterizing that in economic terms and then relating that characterization to the problem of strategic liberalization is the concern of this section. We will begin our search into the cost implications of strategic liberalization by understanding the individual sources of expense that are represented in the above three cost curves. Our goal will be to point out some institutional consequences of the cost reductions for wireless access vis-a-vis wireline access.

We will then speculate, using the work of Terrence McGarty as a sounding board, as to how those costs can be pushed down further. By suggesting ways to lower costs and identifying specific public policy initiatives, we will sketch out a more sustainable environment for competitive wireless access

provision. We will then develop a cost per subscriber model to indicate what some of the sources of investment return in comparison to the investment return on a competing wireline system.

3.1 Understanding the costs of wireless service

We can group the fixed and marginal costs of a wireless access network into four categories:

- Switching
- Wireline transmission
- Cell site
- Subscriber hardware (handset)

Other costs, such as the cost of administration and other overhead will be integrated into the discussion after these technological costs are accounted for and described.

The cost of switching has dropped dramatically, in great part because the computer components that make up the modern telecommunications switches have dropped in cost dramatically.⁷⁶ Continuing declines in switching costs will continue to push more entrants into the marketplace, a fact which will have a direct impact on competition for wireless access in general. The cheaper the switches, the more likely it will be for new entrants into the market to define lower cost services that can become economical with the appropriate economies of scope.

Most of the “backhaul” for cellular systems are dependent on wireline transmission, which is the second cost component listed above. Connecting cell sites into a network requires a system of interconnection, and wireline, which has a higher capacity and greater possibilities for economies of scale, is generally the transmission medium used.

Each individual cell site requires both the purchase of hardware and the purchase or leasing of a cell site. Surprisingly, the latter generally causes more problems than the former. In part, it is because of

⁷⁶ It was the drop in switching costs that formed the basis of Peter Huber’s prescient analysis of the telecommunications industry in 1987, when he argued that further competition would emerge because of reductions in the fixed and variable cost of switching technology.

the engineering of wireless transmission, but it is also because of zoning regulations and geographical facts. As we will discuss, one of the potential cost bottlenecks in the development of multiple wireless access providers is the lack of usable cell sites.

Finally, there is hardware, which comes in many shapes and guises. To date, most of what has been sold is a cellular phone, but that is quickly changing as personal communicators with a whole range of functions are introduced into the market. With the advent of wireless data transmission systems, many will be using their laptop computers as personal communicators for all kinds of messages and data.

Of all the existing service models that we have discussed, only one has been connected with the need to push down technology costs: PCS. Since PCS is heralded as the low-cost wireless access of the future, if we are looking to define a service that would push down operating expenses and thereby spur competition, we should begin with a more detailed examination of the projected costs of constructing a PCS network. The most readily available public sourcebook for these questions was written by David Reed while he was still with the Federal Communications Commission.⁷⁷

Reed begins by setting up a hypothesized geography of a standard layout and assumes a range of frequency blocks for providing services. At a 10% penetration rate, he estimates the total capital costs per subscriber as approximately \$700 and the average annual cost of running the network as \$546 per year. The breakdowns for these costs are included in the tables on next page.

⁷⁷ David P. Reed, "Putting it All Together: The Cost Structure of Personal Communications Services" (Washington, DC: OPP Working Paper No. 28, November 1992).

PCS Capital Costs for Network Construction

Item Cost per Subscriber (25-40 mhz allocation)	
Switching	\$125
Wireline	\$236
Cell Site	\$182
Handset	\$160
Total Cost	\$703

PCS Annualized Cost Function

Item Cost per Subscriber (25 mhz allocation)	
Switching Node	\$136
Feeder Network	\$14
Cell Site (Optical Network Interface)	\$143
Handset	\$300
Overall Total	\$593

Although the costs would appear to be lower than the per subscriber estimate for wireline access (\$1,296 in the first year of wireless access vs. about \$1,500 for wireline access), the differential is not great enough to make a substantial inroad into the established revenues in developed countries. Considering the sunk cost of the wireline network, it is also not likely that the incumbent providers will take kindly to the obsolescence of their existing investment.

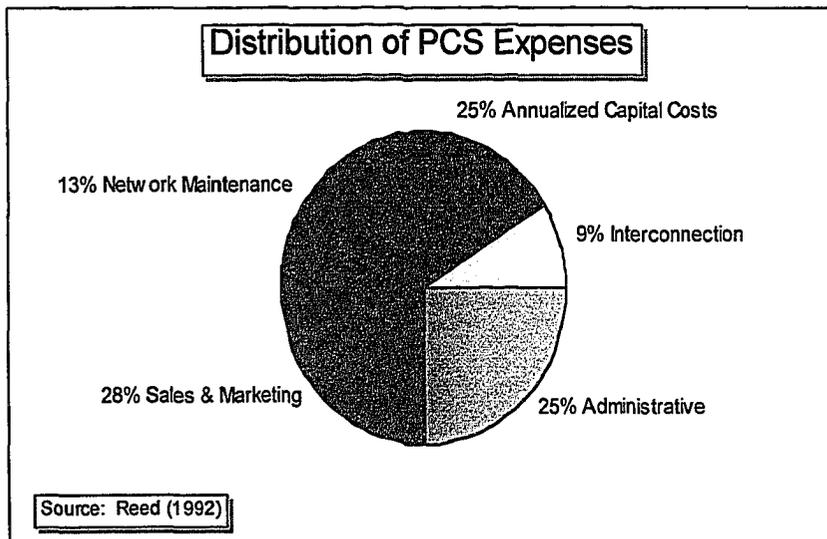
In addition, Reed indicates that the economies of scope and scale embodied in the financial model diminish after the 20%-30% penetration levels. The lack of increasing returns to scale indicate that a rush to sign up more subscribers will not solve the problem. For developing countries, the reduction in cost would also certainly have an impact, but the cost is still prohibitive, especially for those countries that also have the option of purchasing cut rate, used equipment from developed country telecommunications providers.

Taking Reed's model of PCS as a starting point, it is clear that if we are to stimulate access competition through wireless systems, costs will have to be brought even lower and the economic incentives will have to be made stronger. We have to look for organizational and technological innovations that might allow us to define a technology appropriate for strategic liberalization.

3.2 Bringing Costs Down: The Organizational and Technological Innovations

Reed breaks down the annualized expense of PCS services in the following manner:⁷⁸

⁷⁸ Reed, p. 28.



Reed estimates that approximately one half of all expenses come from the administrative and sales and marketing efforts of the corporate institution. Capital costs are another 25%. The costs of interconnection and network maintenance are comparatively less significant. Looking at the pie chart breakdown, it would be evident that the cost reductions would have to come from the administrative and sales and marketing categories. The annualized capital costs could be reduced with new equipment and less of an emphasis on mobility but, for the moment, we can stay with Reed's divisions so that we can better understand the kinds of innovations that will be required of corporate institutions as they make the transition from high-cost to low-cost services.

Reductions in administrative and marketing costs are the targets of Terrence McGarty's speculation as to how the expense of PCS services can be brought even lower.⁷⁹ McGarty starts from the assumption that if a typical subscriber of telephone service in the United States would spend \$30 a month on telephone calls, wireless access has to be able to sustain itself on that revenue stream. He assumes no economies of scale because, in his words, "wireless systems are predominantly variable in cost and they have limited fixed cost structures."⁸⁰ The only way to reduce costs is to increase

⁷⁹ Much of the thought for this section is taken from two papers by McGarty, "Wireless Access to the Loop" (Presented at the MIT Symposium of Universal Personal Communications) and "Wireless Communications Cost Strategies for Extensive Market Penetration (Presented at Carnegie Mellon University, February 17, 1992), and two personal conversations with Mr. McGarty.

⁸⁰ McGarty, "Wireless Cost Strategies," p. 5.

productivity and, if the revenue drops to \$30 dollars per subscriber per month, the fully loaded expenses have to drop to \$300 per year. He suggests that the following breakdown should be the goal:

- \$150 for sales and support, of which \$100 is for the acquisition of new customers and \$50 is spent on retaining each existing customer.
- \$150 for operations and depreciation, of which half is for operations and half is for depreciation.

He lists a four-point strategy for achieving these goals:

- 1) Separate the set (meaning the communicator) from the service and market the service through cost effective channels
- 2) Reduce churn through the development of brand loyalty and customer support
- 3) Automate all operations and use outsourcing to minimize unit costs
- 4) Utilize the most frequency and power efficient technology to maximize the cost per unit spectrum per customer.⁸¹

All of these are clearly critical to achieving market success for wireless access services, but only two specifically impact on our elaboration of a cost structure for the model of strategic liberalization through wireless services. The first proposal, which will reduce the sales and marketing costs (listed as 28% of annualized costs by Reed), and the fourth proposal, which has a direct impact on the cost of network management (listed as 25% of the annualized costs).

McGarty's suggestion is that wireless access companies should outsource their sales and marketing functions to the greatest extent possible. An external marketing or sales organization would be able to achieve a greater scope in providing a similar service to a number of wireless access providers, and the reduction in administrative costs would permit a more beneficial cost structure for the company.

⁸¹ Ibid, p. 6.

Nevertheless, any wireless access provider will still need to maintain a strong resource base for customer support, especially when it comes to hardware and software. Establishing brand recognition requires a central source for questions and technology solutions. This is especially true for developed countries' markets where there will soon be a number of providers prepared to compete for the same customer base.

The second organizational innovation suggested by McGarty that would provide substantial cost savings is the co-location of cell sites. The need for a number of companies to pay for individual sites greatly increases the fixed costs of developing a network. If a number of companies could share the same facilities, the overhead cost of maintenance, rent and upkeep could be reduced.

The problem is that the companies with an economic advantage may wish to purchase sites and stockpile them, thus stalling or even preventing network expansion in critical areas. This is a situation where a political solution might be essential in establishing a firm economic foundation for competition as the market for wireless access begins to develop worldwide.

The third and fourth innovations specifically relate to the possibilities of competition in the developing world. When asked if the whole of his model might be applicable to developing countries, McGarty answers "no," but with a number of caveats.⁸² Although the outsourcing of the sales and marketing function is not possible in a market that has yet to be developed at all, there are other cost savings that may be captured in the administrative cost area.

For example, one of the most vibrant markets in the world for telecommunications services is India. India is also the home of some of the most talented accountants in the world, as well as perhaps the most active group of computer software and hardware producers in the world. Lower labor costs in these countries might allow for the outsourcing of billing systems, and governments in the developing world might wish to consider the possibility of assembling organizations with the complementary skills that can act as a flexible backbone for a number of providers. This innovation would reduce the Administrative cost (25% of total) in a fashion that might not be identical to the automation procedures in developing countries, but might actually turn out to be more efficient. In fact, if such services turn out to be successful, it is likely that these kinds of administrative functions could be marketed to telecommunications companies in the developed world.

⁸² Personal conversation with Terrence McGarty, November 13, 1994.

Finally, the PCS cost structures that Reed outlines in his report assume the most expensive element of all: Mobility. The complexity of the MTSO in being able to monitor the distance of each subscriber from the base station, adjusting the strength of the transmission, handing off the call to another cell site when the person moves out of range is incredible. Being able to establish the point to point relationship for wireless access makes things much more manageable. Taking mobility out, when necessary, reduces costs even further in the area of fixed network costs.

The first cost reduction comes from the accelerated pace of service roll out that the simplicity of the hardware and software can provide. According to Richard Silber of Anderson Consulting, this element might be the most attractive part of the package: "When you think about how important telecommunications is to economic development, it's no surprise that people are interested in any technology that allows them to deploy services quickly."⁸³

More importantly, fixed services can be rolled out in tandem with mobile services, which provides a company the opportunity to differentiate its pricing and achieve proper rates of return for the different kinds of services. Additionally, a fixed wireless local loop application can also offer cutting edge, digital technology years ahead of the mobile systems presently in use in the developed world. In sum, this is a perfect opportunity for developing countries to leapfrog to the next generation of telecommunications technology.⁸⁴

We conclude with a combination of cost strategies and organizational innovations appropriate to strategic liberalization:

- Increasing institutional flexibility by outsourcing marketing and sales functions, thereby reducing operational costs;
- Decreasing network maintenance costs by creating incentives for co-location of facilities;
- Outsourcing billing and other elements of service provision to organizations that might achieve economies of scale in providing those services; and,
- Applying fixed wireless services in order to reduce capital costs.

⁸³ As quoted in Charles F. Mason, "The Wireless Local Loop: A Niche Market in The United States?", *Telephony*, June 20, 1994. p. 28.

⁸⁴ *Ibid*, p. 24

It is difficult to estimate if these changes in the cost assumptions for wireless services would bring down the price of constructing and operating a wireless network to the levels that McGarty suggests might be possible. Nevertheless, it can be safely estimated that cost reductions, if implemented, would increase the possibility of competition in the telecommunications industry by lowering the cost of entry and increasing the possibility of price-based competition for services. In turn, the replacement of the wireline network would become possible in the developed world and a wholesale leapfrogging should be an option for many developing world countries. This kind of opportunity is characteristic of strategic liberalization; connecting new opportunities to the social and economic goals of development.

3.3 Valuing Wireless Access Providers Under Strategic Liberalization

So far, most of the conversation has been built around cost per subscriber estimates for valuing the worth of investment in the telecommunications industry. In order to take the conversation one step further, we should outline what these alterations in the general business strategy in wireless access services might mean for the balance sheet of the company. The reason such a step is significant is outlined by Tom Copeland in his book, Valuation:

The key problem with maximizing accounting earnings can be demonstrated with an example of another common valuation approach. Cable television companies are sometimes valued by placing a monetary value on each subscriber, say, \$2,000 each. Using the number of subscribers as a comparable for share value suggest that the latter can be increased simply by signing up for more subscribers. But if that is accomplished by slashing subscriber fees, for instance, value might actually be destroyed rather than increased.

The essential problem with the cable television dollars-per-subscriber approach is that it does not value what directly matters to investors. Investors can not buy a house or car with subscribers. Nor can they use subscribers to make additional investments. Only the cash flow generated by the business can be used for consumption or additional investment. The price-per-subscriber approach is useful

only when the number of subscribers is a good proxy for cash flow. That occurs only when all cable systems generate the same cash flow per subscriber.⁸⁵

Any company that is going to venture into the realm of providing wireless access services will have to generate cash, not just subscribers. But, as Copeland points out, generating cash has to be part of an overall strategy to invest resources so that they generate a return above the return that could be earned on investments of similar risk.⁸⁶ For that reason, many in the valuation field have turned away from a cost per subscriber and have begun to understand what the discounted cash flow model means for the telecommunications industry.

Without getting too deep into an explanation of the valuation model Copeland suggests, we can identify one important element that will have to be taken into account in the explanation of the policy of strategic liberalization for wireless access services. It will be critical to establish benchmark measures for rate-of-return performance on capital investments so that managers will be able to understand how specific investments add to the value of the company. The problem is that the rates of return on wireless services, especially in the developing world, are largely assessed without regard to this context. To put it bluntly, there are very few if any comparison points for wireless access as a full-fledged competitive service.

Although our case studies will not focus on assessing rates of return and formulating a solid comparison point for managers to analyze the comparative advantage of investments in certain regions, our hope is to suggest avenues where those more expert in the areas of finance might be able to look for these benchmarks. In that fashion, the telecommunications industry can come to a better understanding of how to value wireless services within the context of an emerging, competitive marketplace.

In this section, we have outlined what strategic liberalization looks like as a business proposition. In order to be successful in providing alternative access services, it will be essential to bring costs down and move beyond the existing models for providing wireless access. The critical element of creating a sustainable competitive environment for each provider is to have the opportunity to bring costs in

⁸⁵ Tom Copeland, et. al. *Valuation: Measuring and Managing the Value of Companies* (New York: McKnisey and Co. Inc., John Wiley & Sons, 1994)

⁸⁶ *Ibid*, p. 73. See also Chapter 5 of the book for a formal explanation of the DCF valuation model.

line with the possible revenue stream of a specific population. The innovations listed above are a first step in establishing institutions able to sustain vigorous competition based on price, quality of service, and value of shareholders.

Throughout our earlier discussion of how wireless access has developed and some of the possible future directions of the service, it has been clear that economics, although important, has been subsumed within the politics of information infrastructures and government regulations. Although rearranging business priorities is essential to the success of a competitive wireless access provider, regulatory change must occur if the opportunities of strategic liberalization are to be fully realized.

4. Strategic Liberalization: The Challenge for Regulators

The kinds of strategic choices required of regulators will certainly vary according to the specific circumstances of each country, but even the divisions between the developed and developing world can not separate the challenges of liberalizing the telecommunications sector. The critical challenge is to transform the reactive role of political institutions into a driving force for sustaining competition. This section outlines some of the policies which would help to facilitate that transformation, focusing specifically on the opportunities embodied in the strategic liberalization program.

Given the service model we have just defined, what are some of the regulatory changes that would be required to ensure the sustainability of the institutions which would provide services? We begin with a brief examination of the regulatory function in comparative perspective, drawing from that analysis some of the critical issues for implementing a strategic liberalization program.

4.1 The Regulatory Roles: A Comparative Perspective

More and more, regulatory agencies have begun to establish a more proactive role in directing the investment and resource allocation within the telecommunications industry.⁸⁷ As the following table

⁸⁷ Michael Tyler, Susan Bednarczyk, Stuart Brotman, W. Russell Neuman, "The Changing Role of Government in an Era of Deregulation: Options for Telecom Regulatory Processes and Procedures."

and our previous discussions suggest, the character of regulation for telecommunications services in general has a number of commonalities throughout the world.

Country	Standards Setting?	Licensing of Carriers?	Price Regulation?	Frequency Assignments?
Canada	Yes	Yes	Yes	No*
France	Yes	Yes	Yes**	Yes
Germany	Yes	Yes	Yes, subject to change	Yes
Japan	No***	Yes	Yes	No****
Mexico	Yes	Yes	Yes	Yes
Spain	Yes	Yes	Monopoly	Yes
UK	Yes	Yes	Yes, BT only	No*****
USA	Yes*****	Yes	Yes, dominant carriers	Yes

* Administered by the government's Department of Communications instead of the CRTC.

** For France Telecom only, which is the state owned telecommunications carrier.

*** Standards set by the Ministry of Post and Telecommunications (MPT) Engineering Division.

**** Frequency allocations handled by MPT Telecommunications Bureau Radio Department.

***** Frequency assignments and coordination is handled by the Radio-communications agency.

***** In some cases, the FCC may decline to endorse a standard, leaving outcome to be determined by voluntary industry coordination.

Adapted from Tyler, et. al., "The Changing Role of Government in an Era of Deregulation: Options for Telecom Regulatory Processes and Procedures."

Report prepared for the International Telecommunications Union under the auspices of the joint program on communications policy of Tufts University's Fletcher School of Law and Diplomacy and the Massachusetts Institute of Technology. January, 1993.

There are a number of similarities sketched out in the above table. For example, almost every country in the world, with the exception of New Zealand, has a regulatory body which sets the prices of services for monopoly carriers. In the United States and in the United Kingdom, only the dominant carriers for a particular service face strict rate regulation (which would be BT in the UK and the Regional Bell Operating Companies in the US), but many of the non-dominant carriers choose to set their rates for competitive services only slightly below the costs of dominant carriers so as to reap the greatest margins from their service offerings.

The approaches are similar, as are many of the problems that regulators face. Perhaps the most significant issue that national regulators face is the increasingly global character of the provision of telecommunications services.⁸⁸ Johannes Bauer of Michigan State University has characterized the developments of the past two decades as creating a “fractured, uneven” state in the regulatory environment.⁸⁹ Consider the following chart, which maps out international investments in technologies and services that have been targeted by internationally operating telecommunications carriers.

⁸⁸ See, in particular, Cowley, et. al., *Managing the World Economy*.

⁸⁹ Johannes M. Bauer, “The Anatomy and Regulatory Repercussions of Global Telecommunications Strategies,” prepared for presentation at the Twenty-Second Annual Telecommunications Policy Research Conference, p. 2

Investments by Internationally Operating Telecommunications Companies

Company	Wireline Access	Cellular, PCN, Satellite	Enhanced Services	Manufacturing
AT&T	9	2	5	34
Ameritech	3	4	3	1
Austel	7	6	5	1
Bell Atlantic	1	5	2	-
BCE	9	1	2	2
Bell South	3	16	8	1
BT	8	1	5	1
DPT Telekom	8	2	4	-
France Telecom	5	3	6	1
MCI	5	-	4	-
NTT	2	2	3	1
NYNEX	4	2	3	2
Pacific Telesis	4	9	8	1
PTT Netherlands	1	2	-	-
SBC Corp.	3	1	3	1
Sprint	7	-	5	1
STET	5	1	2	1

Adapted from Johannes M. Bauer, "The Anatomy and Regulatory Repercussions of Global Telecommunications Strategies," prepared for presentation at the Twenty-Second Annual Telecommunications Policy Research Conference, p. 40⁹⁰

⁹⁰ For additional information on the specific wireless investments of each of the above carriers, see "Cellular Operator's International Roll Call," *Mobile Phone News*, March 14, 1991.

The number of international ventures that these companies have started over the past decade are astounding. There are some notable elements in the chart that are specifically relevant to our discussion of wireless access. Bell South's aggressive investment in wireless access throughout the world requires a great deal of regulatory flexibility; for each of those 16 international jurisdictions, there are different regulatory policies and different local needs.

Integrating those systems into global networks is certainly critical for the management of each of these companies, but, for the local regulators, that is probably less of a concern. National regulators are looking to ensure high quality of services for the people within their borders, and, by definition, are less interested in the kind of international regulatory coordination that might make the job easier for Bell South and other international companies. But this is a critical part of the overall challenges facing the political institutions involved in the provision of telecommunications services; companies are globalizing their management practices, compelling national regulators to alter their regulatory scope.

The concrete goals of regulation will therefore have to change, and begin to incorporate factors such as technological innovation and competition policy in new and innovative ways. Now more so than ever, national regulators in developing and developed countries need cross-border sharing of ideas and applications. The companies that will be most likely to succeed in providing wireless access globally will be the ones who have the freedom to experiment with different kinds of technologies and pricing schemes so that they can take that knowledge and export it to other service areas. The countries that open themselves up as a laboratory for the technological experiments of these companies will thereby have an advantage; they will be the test beds for the global telecommunications enterprise, with the results being earlier and better levels of investment in the telecommunications infrastructure. At its core, this is what the prescriptions of strategic liberalization mean for telecommunications regulations throughout the world.

National regulatory agencies need to look to international integration in order to ensure vibrant competition in their local markets, and that fact has specific implications for the provision of wireless access and the foundations of strategic liberalization. In the same fashion that we worked to identify specific economic opportunities that arise from the introduction of new technology and management techniques in wireless access, we need to take these common difficulties and turn them into opportunities for implementing a policy of strategic liberalization. We will begin by discussing some

specific aspects of the regulation of wireless services throughout the globe and pinpoint areas for regulatory change.

4.2 Transforming the Regulatory Environment for Wireless Access

As has been mentioned before, wireless carriers throughout the world face three kinds of regulation: frequency licensing, price and technology. Perhaps the most significant of these is the first; the number of licenses that a country chooses to distribute determines the competitive structure of the provision of services. No country in the world has more than four wireless access providers operating in a single geographical area because of licensing restrictions.

Price is significant inasmuch as certain localities in the United States and many countries have set the rates for calls by mandates, which, in turn, defines how the system can be operated. Nevertheless, prices are often set with an upper limit and the high fixed and operating costs of running a network using the present cellular models forces carriers to keep prices high while the costs of network construction are amortized over an extended period of time. Closely related to price regulation is the problem of interconnection; the costs of connecting a call to a landline network determines the price that a wireless access provider can offer to customers, and the mandating of interconnection fees is often considered to be an important part of ensuring that there is no cost advantage for wireline carriers who might attempt to cross subsidize their operations to offer lower prices.⁹¹

Technological mandates also provide handcuffs by dictating the basis of network construction. Many countries have dictated that licensees will use a specific technology, such as GSM in Europe. Restrictions in this area are much looser in the United States, where carriers have been permitted to use a range of hardware and software solutions. Wireless carriers that face a tight regulatory structure in all three of these areas face a market that has been totally defined for them. The table that follows outlines, in a comparative context, the kind of regulatory environment that exists around the world.

⁹¹ The regulatory practice of “bundling” long distance interconnection for cellular carriers is a hot political issue at the FCC. For more information see Huber, et. al., The Geodesic Network II, Chapter 4.

Comparison of Regulatory Controls for Wireless Access

Countries	Controls on industry entry for cellular services	Controls on wireless access operations	Privatization initiatives
Canada	Closed duopoly; DOC approves licenses	Federal regulatory authority exists, but rates are not regulated	Wireline carrier is mixed public/private in ownership, and no further privatization expected.
France	Closed entry -- duopoly with special licenses required	Essentially no controls, except technical requirements. Resale of excess capacity by third parties recently allowed.	No immediate plans to privatize France Telecom, although existing EU regulations require open markets by 1998.
Germany	Closed market duopolies, third license for GSM recently issued	Spectrum user fees charged.	Privatization of DBT Telekom scheduled to occur starting in 1996.
Japan	Closed entry, multiple licenses. New licenses not presently scheduled	Spectrum user fees charged	NTT privatized in 1984
Mexico	Closed entry duopoly; Telmex in all regions, second carrier private.	Telmex rates regulated by regulatory division of SCT	Telmex privatized in 1991
New Zealand	Open in principle, with four licenses and two operators	No controls	Telecom corporation privatized in 1987
Spain	Monopoly until 1994	Restrictions on foreign investment; carriers use PTO	Government owns minority share in Telefonica, privately held company
UK	Closed entry, duopoly for conventional cellular. Two PCN licenses recently granted	No controls	BT privatized in 1984
USA	Closed duopoly for cellular services, additional licenses for PCS being auctioned in 1995.	No federal regulation. States may choose to regulate rates, but many choose to forbear.	Industry has always been private.

Adapted from Tyler, et. al., "The Changing Role of Government in an Era of Deregulation: Options for Telecom Regulatory Processes and Procedures," with updated information to reflect changes since the publication of the document.

The bottleneck for wireless access is, as always, the problem of market entry. There is a broad commonality in the regulation of wireless access worldwide, with New Zealand offering perhaps the most open system for new entrants into the market, at least on paper. But in every other country around the world, licenses are the key to new market entry, and granting licenses has been a political, not economic decision. If there is no threat of entry, competitive pressures are greatly diminished.

If competition is to be the goal, then regulators must primarily solve the problem of market entry. In one respect, this means the licensing of new competitors. Identifying technological opportunities to use different portion of the spectrum are an important first step, and the development of PCS is due to the technological innovations that permit the provision of wireless access at 1.8-2.2 ghz. But giving out those licenses in an economical fashion is equally as important, and, when we look to make specific recommendations for licensing policy, the recent efforts to auction licenses for PCS in the US will be an important example of strategic liberalization in action.

In another respect, reducing the barrier to market entry means the creative redistribution of wireless service licenses that presently exist. For developed nations that have granted broad swaths of bandwidth to broadcast television stations, it will be important to allow new opportunities to provide cross over services. For developing countries with a more limited market for such services, it will be critical to bring together resources so that these kinds of advantage can be exploited.

Barriers to entry are also driven by costs, and costs, as we have seen, are also closely tied to regulation. In the cases where regulators proscribe certain technological solutions for network construction, the mandate is often tied to the thought that equipment manufactures, having standardized systems to produce, will be more likely to achieve economies of scale. Costs of network construction can thereby be reduced.

Nevertheless, regulators quite often codify standards in a fashion that also codify the cost of providing those services. Mobility, for example, is an essential part of the GSM standard, and the possibility of a company providing a fixed network service using GSM would be possible, but there may be lower cost solutions that are developed for fixed wireless access services. In addition, codifying standards creates vested interests in the equipment manufacturing business, and the introduction of new technology can be stifled.

For those reasons, lowering the barriers to entry also requires a more flexible approach to technological standards worldwide. The codification of alternative standards is clearly a useful exercise, but mandating certain standards may serve to retard the introduction of new technology by keeping costs higher.

By offering concrete solutions to the problems of market entry, regulators can begin to offer their country as a technological hothouse for the growth of new kinds of wireless access. Within the context of these general policy parameters, we can point to specific regulatory opportunities that will be an important part of our articulation of strategic liberalization: auctions and investment in technology.

4.3 Decreasing barriers to entry: Auctions and frequency redistribution

Auctioning licenses gives regulators an opportunity to achieve a solid valuation for the use of the electromagnetic spectrum, while simultaneously insuring that the government receives funds for the allocation of spectrum. This kind of policy should be at the forefront of strategic liberalization, but not necessarily because the idea of an auction is a good one. Rather, strategic liberalization focuses on spectrum allocation insofar as it allows for the introduction of emerging technology and gives regulators the opportunity to reward new technical developments.

The only real example of this policy is the spectrum auction that is presently underway for PCS licenses in the United States. Overall, the auction has been evaluated by economists and regulators as wildly successful.⁹² In our case study chapter on wireless services in the US we will outline the specific history of the auction process and the results of the auction.

The counterpoint that many raise in examining the results of the auction is that the only individuals that have been able to pay for the licenses are those with "deep pockets," and they tend to be the existing telecommunications providers in the United States.⁹³ That certainly has been the case, even

⁹² See, in particular, the comments of Peter Cramton from the 22nd Annual Telecommunications Policy Research Conference, "Money Out of Thin Air: The Nationwide Narrowband PCS Auction."

⁹³ Personal conversation with Terrence McGarty. McGarty expresses concern on this element of the result, which he feels does not prevent the possibilities of collusion in setting prices.

though the FCC has attempted to “put aside” licenses for those without the deep pockets. But the criterion of effective competition in the industry is not the number of players in the marketplace alone, but the in relationship between price, service and customer loyalty.

For that reason, it is more important to open up the possibility of more entrants through a broader licensing scheme than it is to ensure that a certain number of new players are able to come into the market. Auctioning does just that, and although the vertical integration of the industry into service consortia will likely limit the number of providers nationwide, the door has been opened for niche providers of services, such as wireless networks built into offices and then connected into the broader service network.

4.4 Decreasing Barriers to Entry: Promoting Technological Innovation

By creating a market for spectrum licenses and allowing auction processes to value spectrum allocations, regulators now have something to offer to those companies who provide value in return. That fact opened the door for the creation of what the FCC in the United States has called “pioneer’s preferences,” given to those companies that “develop significant new communications services or technologies.”⁹⁴ When defining the licenses for PCS in the United States, the FCC offered unspecified advantages in acquiring licenses to those companies who showed new, innovative and original applications for the provision of wireless access in these bands.

In short, the FCC was offering a concrete value for investment in new wireless access technologies. Eventually, only three pioneers preference licenses were granted, and those are still being discussed in the courts as this paper is being written.⁹⁵ The main concern expressed by the Commissioners at the time of the decision was that the evaluation process had not been stringent enough, nor had it been clearly communicated before the evaluation process had begun.⁹⁶

⁹⁴ Taken from the comments of Alfred Sikes, former FCC Chairman, in PCS: The Quest for 2 ghz Spectrum.” p. 100. For further definition of pioneers preference, the relevant FCC docket is 90-217.

⁹⁵ The three companies that received the pioneer’s preferences are American Personal Communications, Omnipoint Communications and Cox Enterprises.

⁹⁶ See, in particular, the comments of Commissioner Barrett, *ibid*, p. 102.

As a concept, though, the idea of rewarding technological innovation is a critical innovation for regulatory agencies, and has a central place in the policy of strategic liberalization. Any country that has opened up their country to competition through the auction process will have a firm knowledge of the value of that resource in the market for wireless access services, and will be able to leverage that value among companies that wish to provide the service. By bringing in new technologies, even developing countries have the opportunity to shape the future technologies that are used to provide services in the territories they specify.

4.5 Strategic Liberalization as a Policy Prescription

In discussing strategic liberalization as a business proposition, our goal was to understand how to lower costs so that resources could be invested in the most critical elements of service provision. In discussing strategic liberalization as a policy prescription, we have approached the same issue from a different perspective: how can the political process help to orient the resources invested in the telecommunications industry so that institutions are built which can operate in and help to sustain a competitive environment?

We have provided two answers to that question. First, regulatory agencies in both developing and developed countries need to institute auctions in order to clarify the value of wireless access licenses within the market. By defining the value of those licenses, regulators can then direct resources by using the value that they have at their disposal; the concept of the “pioneer’s preference” gives regulatory agencies the opportunity to spur investment and technological innovation in each country.

5. Wireless Access for Strategic Liberalization: A New Service Model

Over the course of this chapter, we have outlined the development of wireless access services and pointed to specific political and economic opportunities which would open the door to the implementation of a strategic liberalization policy in both the developing and developed world. Our main concern has been to sketch out some of the institutional characteristics which help sustain competition through the promotion of wireless access services.

The purpose of this service model, therefore, is to promote a kind of competition that aids in bringing down costs and speeding up service penetration and improving the quality of service. We have discussed the major impediments to such a policy, identifying the high barriers to entry that economic and political arrangements have created. The existing models of wireless access services, ranging from private access to personal communications services, offer little hope as the basis for implementing strategic liberalization.

In constructing a new model for the provision of wireless access based on a policy of strategic liberalization, we have identified six specific economic and political policies that would reduce the barriers to entry and improve the opportunities for competition. They are:

- Increasing institutional flexibility by outsourcing marketing and sales functions, thereby reducing operational costs
- Decreasing network maintenance costs by creating incentives for co-location of facilities
- Outsourcing billing and other elements of service provision to organizations that might achieve economies of scale in providing those services
- Applying fixed wireless services in order to reduce capital costs
- Auctions for frequency licenses
- Preferential treatment for technological innovators

These are the policies that we will seek to identify in our case studies, and we will use the case studies to elaborate on how each of these can be implemented within the context of the country discussed. The chapter that follows completes our first section by outlining, in a comparative context, the telecommunications policies and infrastructures of our four case study countries. We will then move to a specific discussion of each case study before revisiting our definition of strategic liberalization and refining the propositions accordingly.

Chapter 4

Across the Spectrum: Case Studies and Areas of Analysis

Over the past three chapters, we have outlined the elements of the policy of strategic liberalization. We began with the general discussion of how infrastructure services have been provided by national ministries and regulated companies worldwide, and the general consensus that the introduction of competitive practices in those industries will be critical to the improvement in the quality, character and penetration of services. Strategic liberalization was suggested as a general policy to identify new technologies or practices that would aid in the development of a competitive market for services and facilitate the introduction of emerging technologies and practices.

We then turned to a specific discussion of the telecommunications sector, and identified the kinds of competition that presently exist in network services worldwide. The analysis of the present state of telecommunications regulation and technology worldwide pointed us to the possibility that wireless access might be an appropriate choice to serve as the foundation for the policy of strategic liberalization worldwide.

The third chapter examined the economic, technological and political factors which define the marketplace for wireless access, specifically identifying technological and organizational innovations that would contribute to the implementation of a policy of strategic liberalization from the perspective of corporate and policy management. Our next step is to move from the theoretical discussion to its specific application at different points in the world. To further outline what strategic liberalization through wireless access could mean for corporate and policy management, we will look to examples of the policy in the following four countries: The United States, The United Kingdom, Brasil, and Russia.

This chapter provides a comparative context for assessing the relative advancement of the telecommunications networks of the four case study countries to be examined. By identifying some of the traditional performance measures and comparing the performance of each of the four countries, we set the ground for the application of the strategic liberalization model to each. We begin with the reasons for the choice of case studies, and briefly discuss the history of telecommunications infrastructure provision in each country. We then move on to a more specific comparison of the

telecommunications networks of all the countries by comparing both the technological base and service penetration.

1. Choosing Case Studies

The provision of telecommunications services has largely been a national affair. Although there have been significant local and international efforts to provide certain kinds of communications links, the predominant concentration of investment and regulation have been on national levels. This is less true in the United States than in other countries, but it nevertheless indicates that the most appropriate starting point for the comparative analysis of telecommunications structures is likely to be at the national level.

In doing so, we provide a clear analytical link to our discussion in the previous chapters. In this period of nation-states, much of the resources that can be directed towards the goals of economic and political development are centered at the national level. Additionally, the most significant comparative studies that have been published have used geography and regional commonality as the basis for comparison and contrasts. A national approach allows us to make a clean connection between the dominant writings in the literature of development and the case studies we articulate.

Most of comparative political theory has focused on grouping together countries with common characteristics. The most notable, and certainly the seminal example of the application of comparative theory to an understanding of political relations, is based on such an approach: *The Civic Culture*, written by Gabriel Almond and Sydney Verba, uses as its take-off point social science research from a range of democratic countries. Their goal in writing the book was to assess the various cultural factors that affect the particular expression of democracy in each of the countries examined.

But which case studies do you choose in launching such a comprehensive study? The similarities and dissimilarities of culture lend themselves to groupings and aggregations that may not be appropriate for other analytic purposes. Our goal is to show the full range of contexts when strategic liberalization can be of use. Our sample, therefore, needs to be broad and even, comprised both of developing and developed world contexts.

To achieve that balance, we will look at comparisons and contrasts and choose our countries so that there are prima facie elements of similarity and difference. For the sake of balance, we have chosen to work with two developed countries, one developing county and one country undergoing what is being called in the literature, the post-communist transition. This balance allows us to bridge the major socioeconomic gaps as they have been defined by the academic literature since the advent of the cold war: We have examples from the nominally defined first, second and third world.

The two first world countries share an important commonalty when it comes to the provision of telecommunications services: Both have been at the forefront of privatization and deregulation throughout the world. The United States, with its emphasis on managerial capitalism and private ownership, has always relied on a private company to provide telecommunications services, and took a major leap in making the market for such services competitive over the past decade. So too has Great Britain worked to privatize its formerly state-owned telecommunications provider and inject further competition into the marketplace for services.

There are two significant differences between the development of the market in both of these countries that makes them optimal choices for comparative analysis. Most evidently, there is a great difference in scale when it comes to the two markets. The size of the United States, as compared to Great Britain, creates very different conditions for the development of a competitive marketplace for telecommunications services.

Additionally, there is a cultural difference between the countries that is expressed in the form of corporate organization. Alfred Chandler has identified this as the difference between the managerial capitalism of American and the personal capitalism of Great Britain.¹ Although we will not use Chandler's distinctions as the basis for describing structural differences between the providers in the United States and the United Kingdom, it is important to recognize that differences in business practices and cultural norms do impact on forms of industrial organization.

The choice of Russia allows us to look specifically at a country that is making the transition from a totalitarian, communist society to a new social and political order that has yet to be defined. Moving

¹ Alfred D. Chandler, Scale and Scope: The Dynamics of Industrial Capitalism (Cambridge, MA: Belknap Press of Harvard University, 1990).

from the total state with complete ownership of all of the means of production to an open, competitive environment for goods and services is a monstrous transition. Understanding this piece of the puzzle will provide us significant insight into how public policy and corporate management can take advantage of the opportunities afforded by such a transition.

Brazil and Russia are similar in terms of scale, but their political and economic histories are highly divergent. Brazil's consistent struggle with the establishment of democratic forms of governance and its relentlessly bureaucratic politics among the social and economic elites provides a dramatic contrast to the situation in Russia. As we shall see, they start from a similar point in terms of service penetration and other measures of telecommunications performance, but the means of continuing improvement in network expansion and improvements in the quality of services are very different indeed.

Throughout the remainder of this thesis, we will provide a comparative context, but the comparative approach will not be treated as an end in itself in the presentation of these case studies. Rather, the comparisons have been structured to give us insight into the practice of strategic liberalization, expand on that practice, and identify the elements from each case study that might be transferable across national boundaries.

To give the comparative analysis some context, we look to the established performance measures for the quality and penetration of telecommunications networks worldwide. By providing an initial comparison of telecommunications capabilities and development levels, we can move to discuss each in isolation and then combine our results in the conclusion of the thesis.

2. Comparing the Performance of Telecommunications Systems: A Quantitative Analysis of the Four Case Study Countries

In order to understand the relative place of these four countries in the provision of telecommunications services, we turn to the 1994 World Telecommunications Development Report for a quantitative measures that characterize these countries. Some of the numbers will reveal what is an expected trend: The performance of telecommunications systems in developed countries far outstrips the capabilities of those in developing countries. The numbers also reveal the degree of

effort and investment that will be required from countries such as Brazil and Russia as they seek to reach the levels of the developed world.

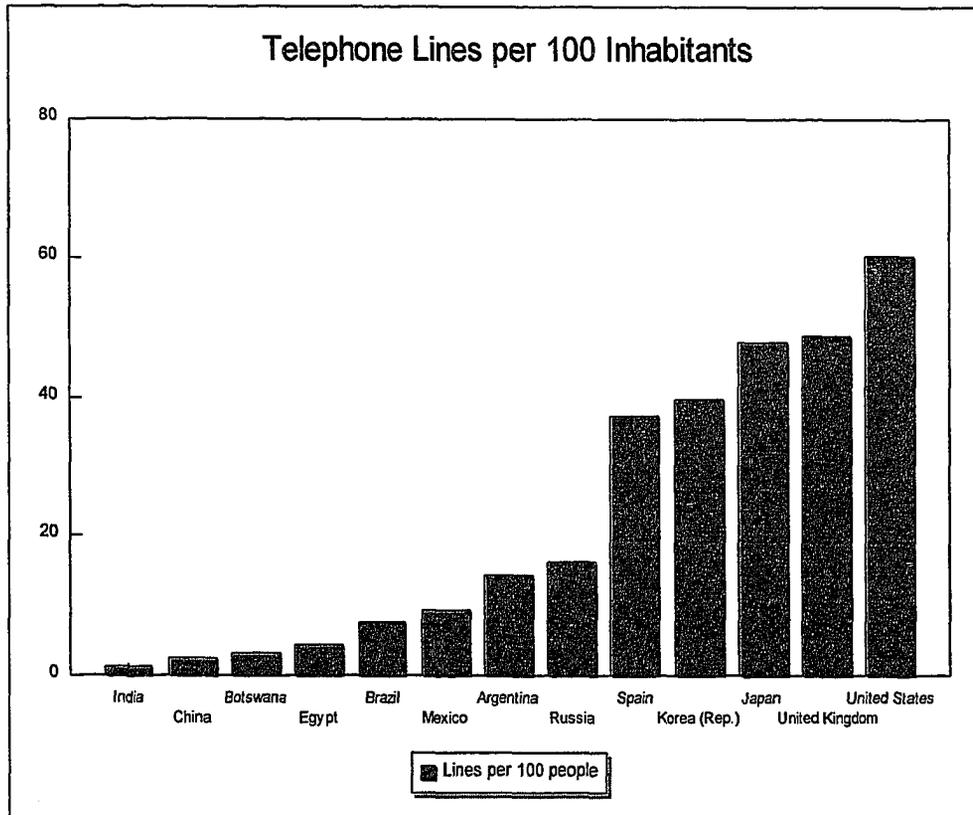
We will examine the following performance measures in the pages that follow:

- Telephone Lines per 100 People
- Percentage of Digital Lines
- Public Telephones per 100 People
- Investment as a Percentage of Telecom Revenues
- Network Investment Requirements
- Cost of a Local Call
- Waiting Time for Telephone Lines
- Percentage of Unsatisfied Demand
- Number of Mobile Subscribers per 100 People

Telephones per 100 People

The first chart shows the classic quantitative comparison for the assessment of the quality of telecommunications services in any country: penetration of telephone lines per 100 people. On the high end of the scale comes the United States and Great Britain, along with the other developed countries that have been included for comparative purposes. With penetration rates as high as 60 per 100, most of the population can be said to have direct access to telephone services and, through the telephone lines, certain kinds of data and information services.

According to the numbers, Russia has a higher penetration rate than Brazil, with almost 20 lines per person. This would seem to indicate that there is a greater degree of access in Russia, but, as the analysis in the chapter on Russia and the other quantitative information presented in the charts that follow shows, this penetration rate does not tell the whole story. Nominal rates of penetration sometimes disguise a chronic inability to service the needs of subscribers, especially in developing countries where resources are often limited.

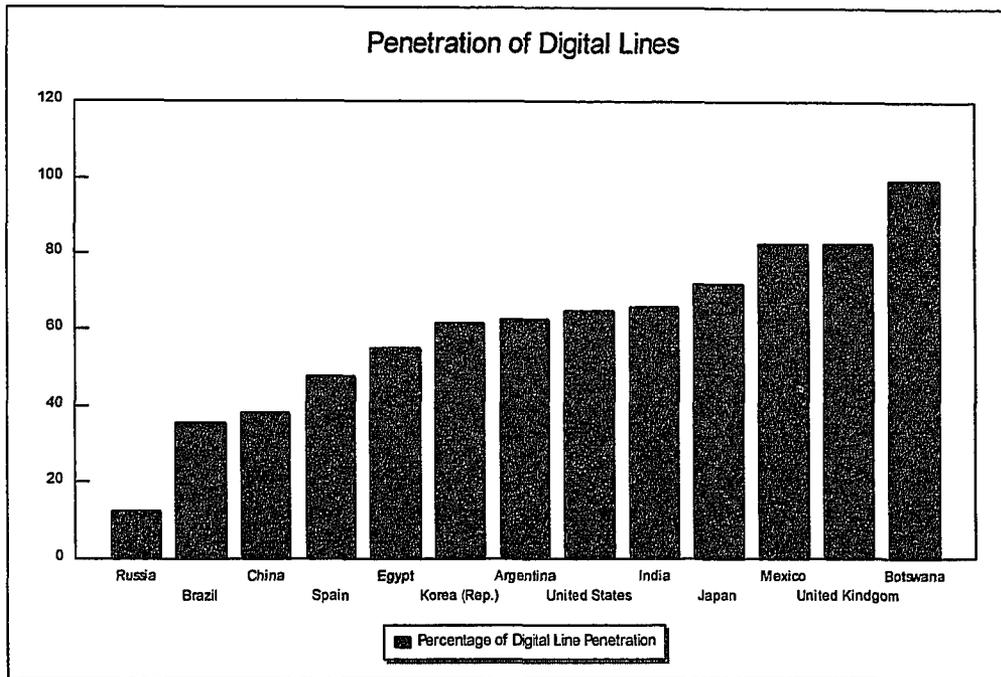


Source: 1995 World Telecommunications Development Report

Percentage of Digital Lines

The percentage of digital lines gives us some idea of the penetration of the most advanced telecommunications technology available to network providers today. Surprisingly, the country with the highest percentage of digital lines in our sample is Botswana, a country that is not known for the high quality of its telecommunications services. This is in great part due to Botswana's dramatic economic growth over the past five years and its ability to invest in new telecommunications infrastructure, even though those services have not been widely distributed throughout the country. As would be expected, the United States and the United Kingdom are among the leading countries globally in the introduction of new technologies into their telecommunications networks.

Russia is among the worst performers in this area, with less than 15% digital line penetration. Brazil fares slightly better. Nevertheless, Brazil's penetration of digital technology is lower than Argentina and Mexico which, as we described in the first chapter, is likely attributable to the steps that those two countries have taken in privatizing the network services. Increased investment in new digital technology will be an important factor in improving the quality of network services in developing countries.



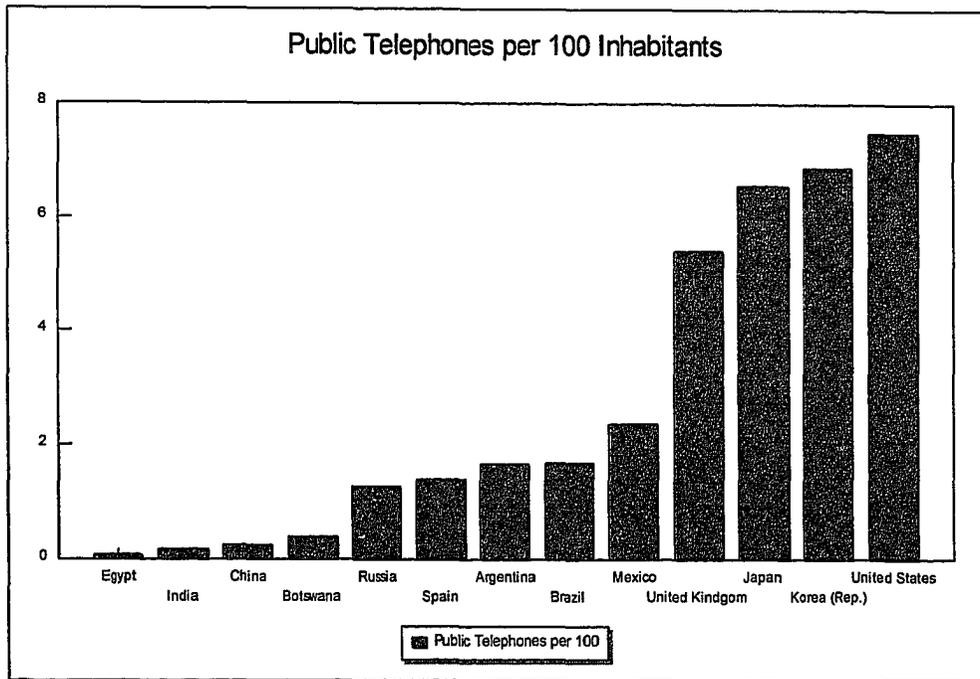
Source: 1995 World Telecommunications Development Report

Public Telephones per 100 People

Public telephony is often considered to be a effective substitute for private lines in most developing countries. The advent of party lines, where more than one household or community is connected to the same phone line, has allowed many countries to increase the penetration of telephony. On the penetration of public telephony, Brasil and Russia are about at the same level according to the numbers that the ITU provides.

For developed countries, public telephony has emerged as a partial answer to an increasingly mobile society with a need to be able to communicate from a number of locations and points. The future of the public telephone, as we will discuss, comes into question as personal communications through wireless access becomes more prevalent.

For that reason, if developing countries wish to reach the service quality of developed countries, this might not be a standard that should draw the attention of corporate managers and national planners. Increases in public telephony in developing countries can help to offset demand, but it will provide a less than adequate solution over the long term.



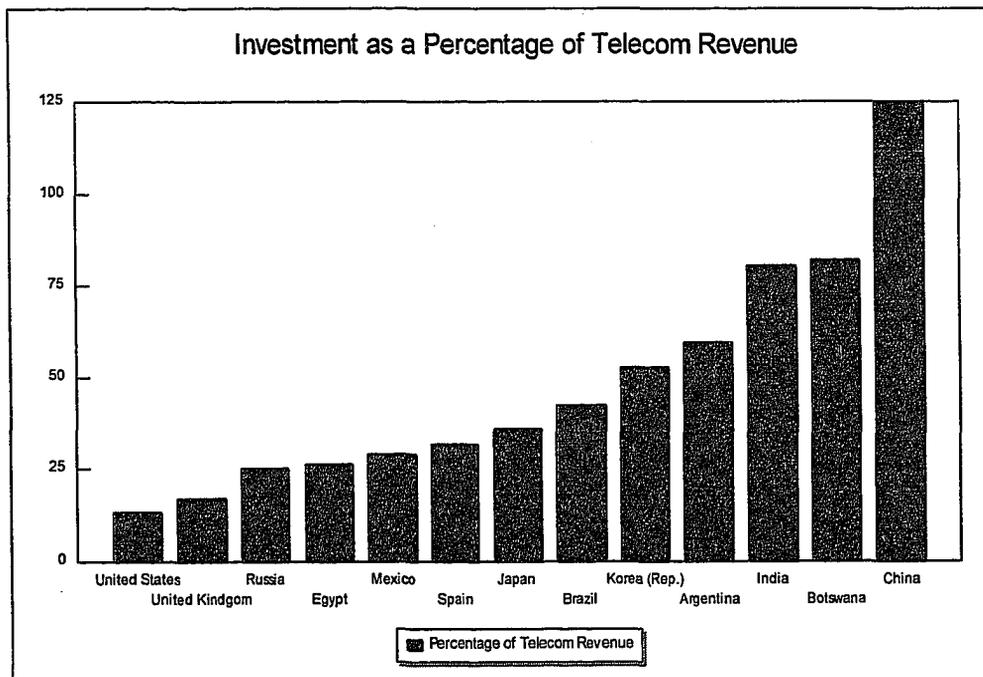
Source: 1995 World Telecommunications Development Report

Investment as a Percentage of Telecom Revenues

The level of penetration for public telephony brings us to a critical question which will be repeated in each of the case study discussions: What are the most appropriate areas for investment in light of the goals of strategic liberalization? The ITU's report provides a investment projection that does not take into account any particular policy objectives beyond the maintenance of the network and the continuing expansion of network services at a rate consistent with each country's historical development. The results of that calculation appear in the chart that follows.

Because of the large revenue bases for providers in the United States and the United Kingdom, the variable costs of network maintenance require a comparatively lower percentage investment of telecommunications revenue. For countries with less of a revenue stream and less access to capital, an increasingly larger share of revenues needs to be invested in the telecommunications networks just to ensure their continuing operations.

It is this search for capital that becomes so critical to developing countries as they continue to look for ways to improve how services are provided. Instituting competition does answer part of the problem, but only sound public policy during this time of regulatory and economic transition will ensure that revenues generated by the telecommunications providers are not emptied into government coffers and used for purposes other than the maintenance of the telecommunications network.



Source: 1995 World Telecommunications Development Report

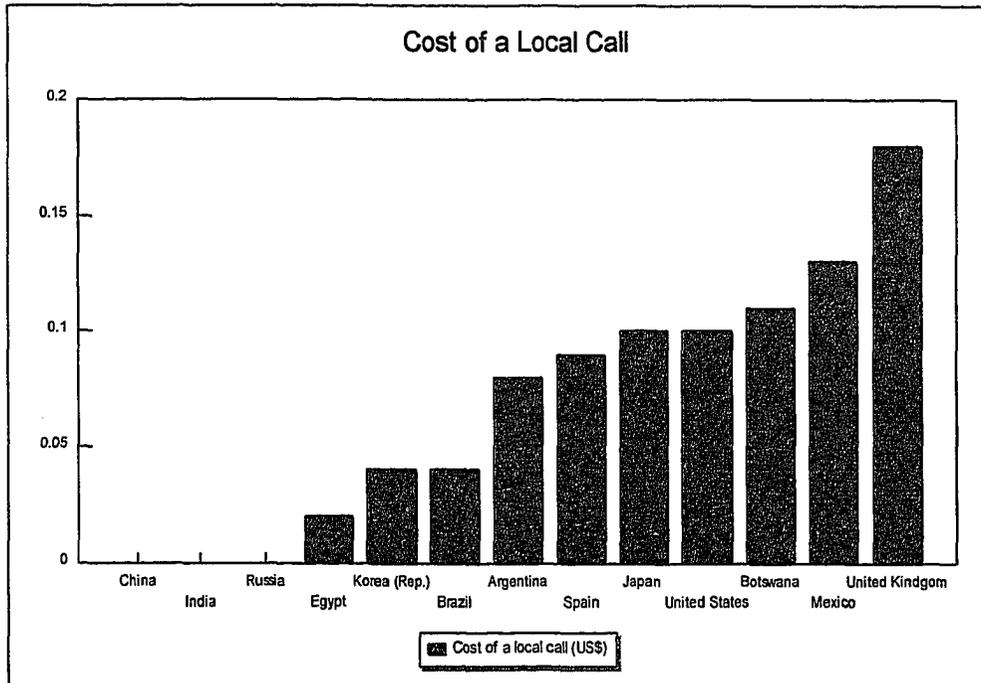
Cost of a Local Call

The cost of a local call will determine the kinds of access that people have to telephone service. For developing countries, the usual response to the higher costs of providing telephone service has been to subsidize the providers so that the cost of a local call is driven downward. It is not surprising, for that reason, that Egypt and Brazil have the lowest cost for a local call in the countries that we have listed in our sample. Both of these countries are a number of steps away from privatization and a reduction in state subsidies; as such, it is likely that those costs will not increase in the near future.

The developing countries that have moved away from state subsidies have much more expensive costs for a local call. Mexico is the most expensive in this small sample, with local call charges higher than the United States and the United Kingdom as well.

The problem with these numbers is that they are very sensitive to exchange rate shifts. Because of the high levels of inflation in Russia, the ITU declined to include this figure for Russia. Although the Brazilian currency was relatively stable for the last two quarters of 1994, the erosion of revenues because of fixed prices and increasing inflation has a dramatic impact on the ability of network providers to invest in the provision of services.

It is important to push costs down, but the costs for the consumer have to be structured so as to provide for sustainable competition. In assessing the opportunities for strategic liberalization, our goal is to break through and beyond this measure to the foundation of service costing. That is the only way to ensure that services and costs are balanced in the marketplace.



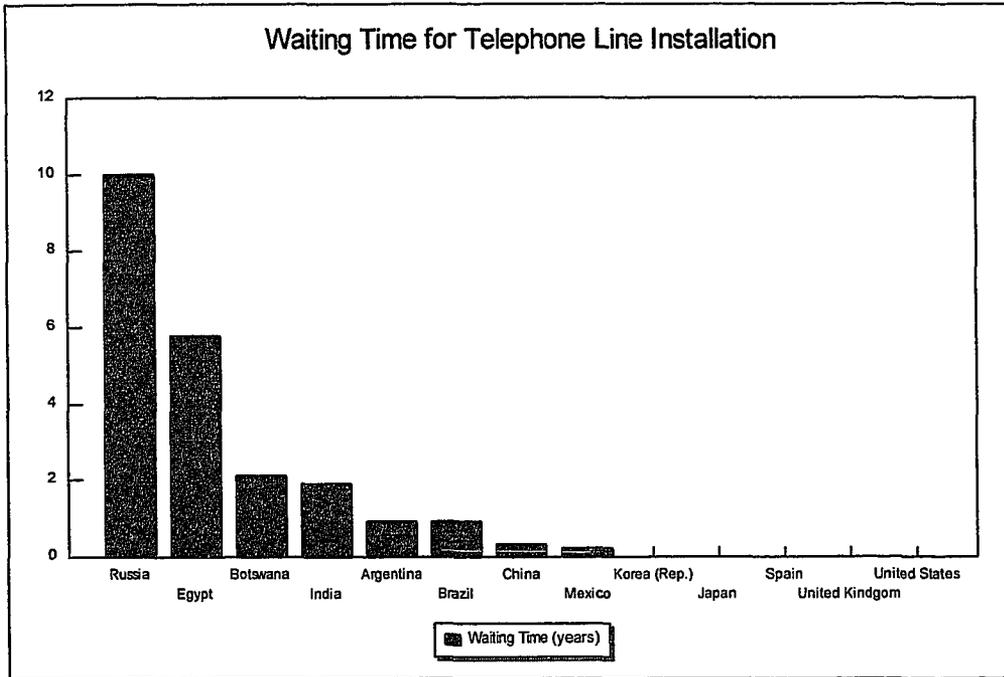
Source: 1995 World Telecommunications Development Report

The Waiting Time for Telephone Lines

The next few charts show that the advantages that the Russian infrastructure may have over the Brazilian on measures of teledensity and infrastructure are counterbalanced by difficulties in other areas. Throughout the developing world, a lack of resources makes it difficult, if not impossible, to install the number of lines that would be required to meet demand. The chart that follows shows approximate waiting times for service installation in a number of developing world and developed world countries.

The one year wait in Brazil does not look good in comparison to the lack of any real waiting time in the US and the UK, but, in comparison with Russia, the Brazilian telecommunications providers are the model of efficiency. A combination of bureaucracy and lack of resources has hampered the ability of the Russian government to meet the demands of residents and business.

The significance of this measure for our discussion of strategic liberalization has to do with the problem of bypass. The longer the waiting time, the more likely it is that subscribers will attempt to bypass the existing service provider, through legal or illegal means. In order to create a sustainably competitive architecture, it is necessary to be responsive to customers and effectively manage the introduction of new services. Access providers will have to work hard to improve their responsiveness in order to effectively develop the market.

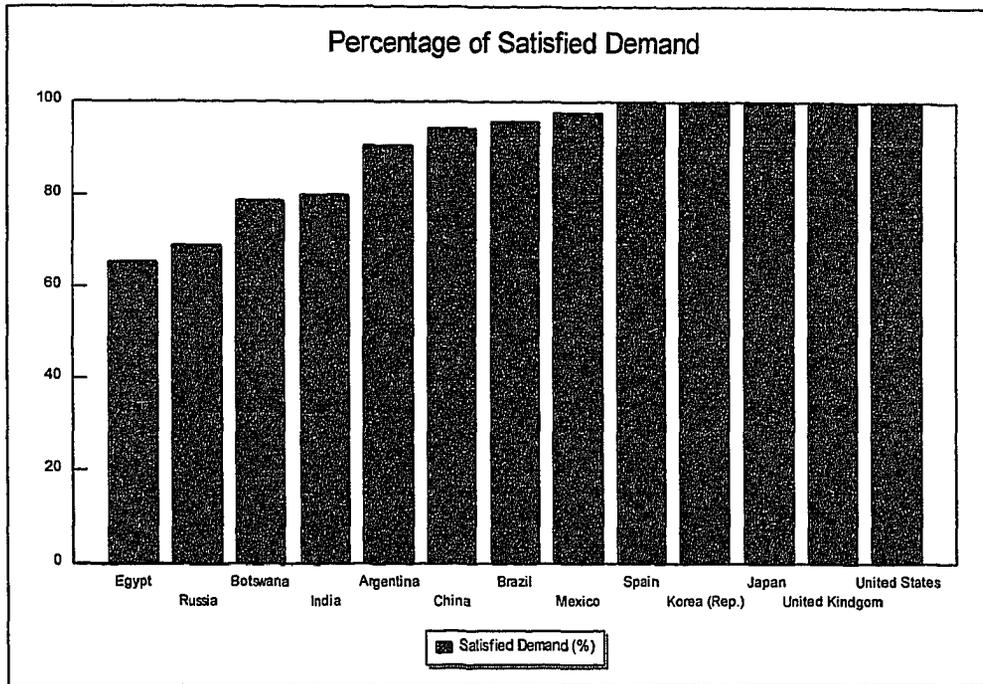


Source: 1995 World Telecommunications Development Report

Percentage of Satisfied Demand

In assessing the percentage of satisfied demand in each of these sample countries, the ITU is estimating the degree to which each country addresses the needs of the marketplace. Clearly, developed countries have had the resources and time to develop an answer to the traditional telecommunications needs for the marketplace through the creation of near ubiquitous networks for telephony.

Developing countries face an uphill battle in meeting unsatisfied demand. The need for capital, as we have seen, convinced many government planners that privatization was the panacea to the long-term problems of unsatisfied demand. What we have come to recognize in the course of this discussion is that competition will likely do more in filling the gap between the levels of satisfied demand in the developed countries and the need for new network construction in developing countries.

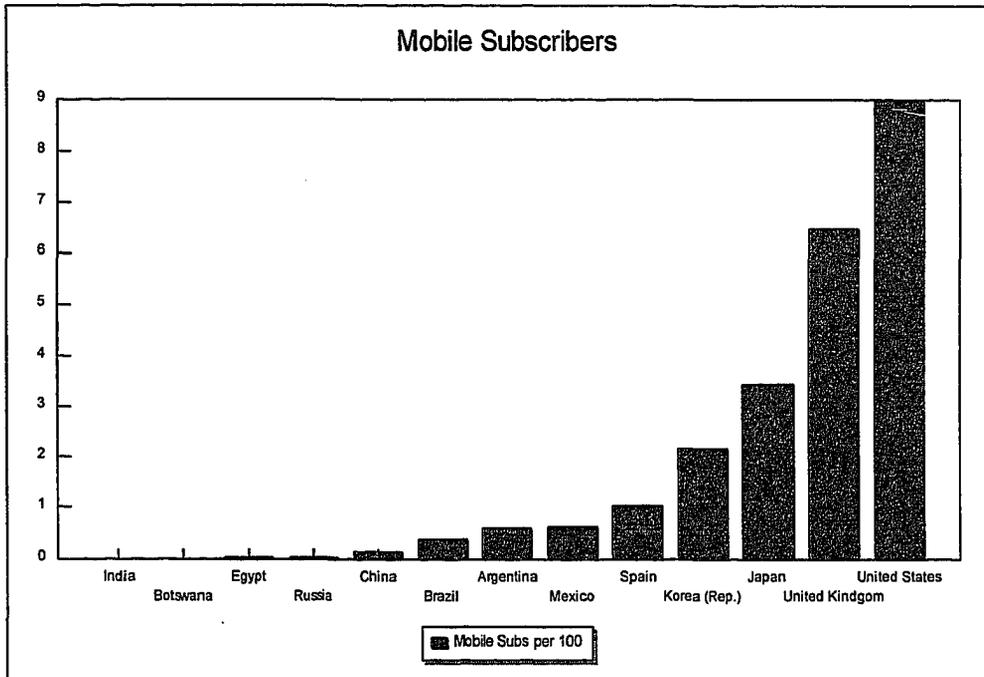


Source: 1995 World Telecommunications Development Report

Number of Mobile Subscribers per 100 People

Filling that unsatisfied demand in developing countries, and identifying means to engender competition in markets where the demand for traditional telecommunications services has largely been met, is the task of strategic liberalization. Wireless access, as a technological foundation upon which future competition can be built, has been introduced in almost every country around the world. But, as the following chart indicates, it has not achieved the levels of penetration that would indicate a fully competitive market is about to emerge.

The United States and the United Kingdom have the highest penetration levels for wireless services from this group of countries, higher than even Japan. This is in great part due to the concentrated efforts of both governments to license new operators and allow for the introduction of new services. Although Brazil's levels of penetration have become more noticeable, the licensing of new carriers has been a highly politicized process that has diminished the opportunities for new wireless access providers to drive market penetration. In the case of Russia, there have been a number of wireless access providers enter the market in the past few years, but they have been largely tied to local interests. Apart from a few urban centers, wireless access in Russia has hardly made a dent in meeting emerging demands for telephony services.



Source: 1995 World Telecommunications Development Report

Each of the measures listed above have been used as the basis for judging the relative advancement of the telecommunications networks throughout the world. In examining the measures comparatively across this range of countries, we begin to see some of the deficiencies in the telecommunications networks of the developing countries: lower penetration, both in traditional and wireless access to telecommunications services, and less capacity. But we also see certain commonalities across the divide of wealth: penetration of new, digital services and increased competition require an understanding of how specific opportunities in each country can be used to improve the quality and character of services.

Having identified some of the quantitative characterizations of the networks we will be examining in our case study analysis, we now need to outline how each of the case study examples will relate to each other and to our articulation of the strategy of strategic liberalization.

3. Connecting the Theory of Strategic Liberalization to Case Study Examples

In examining the nature of network services in four countries, our goal will be to understand the different situations in which strategic liberalization can be applied. There are particular challenges and opportunities to improve the character and quality of telecommunications services for each of the case study countries as they relate to the measures we have just presented. Before beginning the extensive discussion of each case study example in the second part of this thesis, we will briefly summarize the situation and highlight the kinds of examples we will look for in each country.

The United States

The United States has been lurching towards a competitive market for telecommunications services since the deregulation and breakup of AT&T in the beginning of the 1980's. At present, there is limited competition for certain kinds of services, such as wireless access and certain kinds of network services, but a great majority of the telecommunications services throughout the country are still highly regulated.

The amazing growth of the cellular system throughout the United States has been extraordinary, but, as we have already discussed, that expansion has not lead to broad-based competition for wireless access services. For that reason, the growth of cellular services does not lend itself to being characterized as a solid example of strategic liberalization in wireless access.

Similarly, the recent licensing of PCS bands has been dominated by existing players who are not likely to push competitive practices to the fore if such a development is seen as a threat to the existing revenue base of each provider. Although it is still possible that PCS might develop into a low-cost alternative to cellular wireless access, this does not look likely at this time.

There is a portion of the PCS proceedings, though, that does show promise as a potential component of a strategy of strategic liberalization. The Federal Communications Commission has attempted to cultivate and required the development of emerging technologies for wireless access, through its granting of pioneer's preference licenses to technological innovators. At the same time, it has employed an auction format to attempt to ensure that a reasonable amount of investment and actual valuation in wireless access services can be achieved. Both of those elements show strong promise, and connect directly to many of the objectives of the strategic liberalization policy we have articulated. As we examine the marketplace for wireless access in the United States, we will focus on those areas to identify working examples of the success of strategic liberalization in promoting the potential for competition and technological innovation.

The United Kingdom

Since the opening of the Thatcher administration in the late 1970's, Britain has become the world's laboratory for deregulation in a developed country. The Thatcherite revolution included the deregulation and privatization of billions of dollars of state-owned and operated companies. Perhaps the most significant privatization was British Telecom, now known simply as BT. This transaction was completed by the end of the 1980's, and, along with the privatized Cable & Wireless company founded, in part, by Marconi over a century ago, Britain had two national competitors in the market for telecommunications services.

Both of these companies also came to define the marketplace for wireless access services, which, until recently, was a national duopoly controlled by Vodafone and Cellnet, which are both owned,

in part, by BT and Cable & Wireless. To a great degree, the market resembled the market for cellular services in the United States; two providers and not a lot of competition.

There was one substantial difference, though. The British government explicitly separated the provision of retail and wholesale services, which has had a dramatic impact on bringing new entrants into the marketplace. Additionally, the licensing of two new providers for PCS/PCN has dramatically increased the number of possible wholesale/retail relationships and pricing strategies. The result has been a bewildering array of consumer choices. How that range of choices has developed and understanding the character of the competitive marketplace in the UK will provide us critical insight into the opportunities to bring new entrants into the marketplace through both access and retail service provision.

Brazil

Brazil's telecommunications networks are defined by the institution of Telebrás, the state owned and managed telecommunications provider for the country. Telebras was constructed in the early 1970's as the holding company for a number of local telecommunications providers, known as pole companies. These 29 pole companies are organized according to municipalities and regions of the country, and the interplay of local and national interests in the construction and provision of services has shaped the continuing debate on the privatization of Telebrás.

In order to move competition and privatization forward in Brazil, it is necessary first to reconstruct the lines of administration within the state provider. Second, it is critical to expand the number of institutions that have a role to play in the provision of services; the inability of political interests to come to consensus on privatization has been largely because all of the interests intersect at this highly centralized institution, Telebras.

Implementing the strategy of strategic liberalization in Brazil will require a mechanism for working with the top down structure that has shaped much of Brazil's politics and economics through the years. In choosing Brasil as a case study we will be able to identify specific opportunities and policies that would be appropriate for such a situation.

Russia

The market for telecommunications services in Russia is defined by the administrative chaos that presently prevails throughout the country. Although some may see anarchy as a strong word, many of the real stories that will quickly become the focus of our discussions of the Russian case will show the word to be entirely justified. Many of the services that have been rolled out since the breakup of the Soviet Union have been constructed without regard for central regulations or coordination.

It would be more benign to call the situation in Russia an example of a grass-roots approach to the development of telecommunications services throughout the country. If appropriate coordination mechanisms can be defined, future analysts will be able to look back and employ this more benign term with justifiable cause; all grass-roots movements generally tend to be focused on constructing or reconstructing a coordinative institution that incorporates the energies that come from the ground.

Developing a strategy for strategic liberalization in Russia must recognize the need for a coordinative approach among the various localities that have taken the lead in developing wireless access services. Through the standardization and technological coordination of various network offerings, the central government has an opportunity to use some of the most important tenets of strategic liberalization to establish a coordinating role throughout the country.

4. Strategic Liberalization and Institutional Change

In the beginning of our discussion, we focused on the characteristics of institutional change, pointing out that institutions shape politics while they are shaped by the passage of history. For each of these four countries, the existing institutional relationships that define telecommunications development are all products of a common perception: Centralized forms of development are the most appropriate mechanisms for telecommunications development.

But for institutional change to take place, there needs to be a challenge. New technologies are part of the challenge, but until institutions arise that can harness the opportunities represented by new technologies, the existing structural relationships that define telecommunications development will remain unaltered.

The model we have proposed is, in some ways, the inverse of the centralized approach. Working cell by cell and access point by access point, a telecommunications infrastructure can be built from the ground up to provide a competitive challenge against the existing economic and political institutions. By identifying a range of appropriate corporate and public policies, we have sketched out a way to make these newly arising institutions sustainable.

In doing so, we have positioned strategic liberalization as a revolutionary attempt to force institutional change. By fostering the growth of wireless access and allowing new institutions to take form around the more flexible, less costly approach to telecommunications access, it is possible to induce change and move forward more quickly on the path to telecommunications development.

What becomes clear from the discussion in this chapter is that the policy of strategic liberalization will be different in different contexts, and will have to draw on the specific historical and technological realities of each country. Certainly, applying some of the elements of strategic liberalization in the chaotic markets of Russia will lead to dramatically different results than in the highly centralized and regimented administrative bureaucracies of Brazil.

Nevertheless, there is enough conceptual coherence to draw certain principles from each of these situations including the possibilities of identifying technological innovation and rewarding those innovations; the need to overcome the barriers of burdensome regulation and administration; and the possibilities for price competition and the use of appropriate technology.

With those thoughts in mind, we turn to a more detailed discussion of each country in the second part of this thesis. In our conclusion, we will combine some of the theoretical analysis from this first section with the specific findings of the case study analysis. At that point, we will be able to provide a more complete definition of strategic liberalization and understand the potential impact of wireless access throughout the world.

Chapter 5

Through These Portals: Strategic Liberalization in the American Context

The language of telecommunications policy in the United States has become wrapped up in one acronym: The NII, short for the National Information Infrastructure. Championed by the policy community in Washington, the concept of the NII has changed from a government sponsored "network of networks" to a more private-sector driven image of telecommunications companies building the information highway. Considering the resurgent confidence of the United States as the leader of global productivity growth, talk of the NII has been charged with the energy of politicians and economists who see it as the core of a strategy for national competitiveness in a post-cold war era.

As has been clear from the proceeding discussion of strategic liberalization and the general development of the world's telecommunications sector, the United States has been on the cutting edge of telecommunications development. The telecommunications system of this country has been the envy of the world for some time now, which makes the discussion of the NII all the more interesting. The variety of players competing to play a role in the construction of the NII, and the regulatory debate on what role each of these companies should be allowed to have, has continued since the divestiture of AT&T in the early 1980's to the present day. With sweeping legislation pending in Congress, this is as appropriate a time as any to consider what role wireless access has to play in the continuing evolution of this somewhat vague and undefined concept.

A recent report by the Office of Technology Assessment in the U.S Congress, entitled "Wireless Technologies and the National Information Infrastructure," is certainly timely. Broadly speaking, the vision of the paper can be summed up in these two paragraphs which appear in the first chapter:

Wireless technologies can extend the NII in two important ways. First, they allow users to tap into communication and information networks as they move about. Mobility is a key driver for wireless. Second, as noted earlier, wireless technologies can extend NII services to places where wire is too costly or difficult to install. This may prove to be especially important as links need upgrading. In this role, wireless systems will help ensure that future universal service goals are met.

Wireless technologies and systems will also compete in the delivery of NII-related services, both among themselves and against wire-based services. Competition is a key principle underlying the NII, and different wireless services have advantages that will allow them to compete effectively in a number of markets. For example, Broadcast, DBS, and Multichannel Multipoint Distribution Service (MMDS), already compete with cable television systems (and each other) across the country, and competition is expected to increase as companies convert to digital and new competitors enter the market for video services. Wireless technologies are also expected to make a substantial impact in the market for voice and data communications, especially where mobility is desired. A good deal of spectrum has recently been allocated for wireless voice and data services and companies have been working on systems for a number of years. Many analysts believe that wireless could become the voice communications technology of choice -- eventually becoming a substitute for existing telephone service -- because it offers the added advantage of mobility. Over the next five to 10 years, wireless technologies will emerge as significant competitors in most communication, information and entertainment markets.²

Although the above view shares a common perception of the future of wireless services, the conclusions of the OTA are, to put it mildly, unimaginative. At the core, the authors start from the assumptions of the existing cellular and PCS model in assuming that mobility as it is presently offered through cellular services is the critical driver for the replacement of wireline technologies by wireless technologies. Either as an extension of the existing infrastructure, or as a direct competitor to wireline services, consumers will not begin to make the transition until the prices for wireless access are below those for wireline access. Unlimited mobility will be priced as a premium by companies for as long as possible to keep margins as thick as possible. For that reason, the model has to shift if wireless is to take its place as a complete contributor to the NII.

On a more fundamental level, the report misses the opportunity to embrace what could become a revolution in wireless telecommunications services: The complete remaking of the architecture for the provision of services. It assumes severe limitations on bandwidth capability (and availability), and relegates wireless access to a lesser role, competing only for specific kinds of services rather than as a broad backbone for mass access to the NII. Wireless access can become the basis for facilities-based competition, serving as an access technology to sustain corporate institutions wishing

² Wireless Technologies and the National Information Infrastructure, Office of Technology Assessment. (Washington, DC: United States Government Press, 1995) p. 32.

to serve the telecommunications market. It is to that more compelling vision that we will speak in this chapter, as we define how strategic liberalization can be used in the United States to achieve the goal of a more vibrant and sustainable development path for the NII.

This chapter, like the other case study chapters that are to follow, is divided into three parts. The first provides a brief overview of the development of the telecommunications sector in the United States, focusing specifically on the regulatory and structural characteristics critical to our comparative analysis of the various telecommunications infrastructures we are to discuss. We will then focus in on the history of wireless access within the country, showing how the structure of the market for cellular and other wireless access services has developed to the present day. We will then return to the proscriptions of strategic liberalization and map out a sustainable course for the development of the NII.

1. The American Market for Telecommunications Services

The previous discussion of strategic liberalization as a theory of infrastructure development has been informed by the history of telecommunications development in the United States. We will not directly revisit the theoretical issues in this chapter, but concentrate on the critical dynamic shaping the telecommunications sector in the United States: The tension between universal service and competition, and the bifurcation of regulatory policy and corporate operations between the federal government and the individual state governments.

These two tensions, it could be argued, are at the core of the American experience of corporate and political governance, so it is not surprising that we meet them again within the context of a discussion about the country's telecommunications development. In fact, it might not be overstating the point to agree with one commentator who characterized the "regulatory chaos in [American] telecommunications" as "essentially a manifestation of a deep-seated cultural pattern."

Americans have always had a love-hate relationship with 'centers.' In 1832, de Tocqueville observed that 'people wish to keep the Union, but to keep it reduced to a shadow: they would like to have it strong for some purposes and weak for the rest -- strong in war and almost nonexistent in peace -- forgetting that such alterings of strength and weakness are impossible.' They have repeatedly exhibited great

discomfort with the emergence of any authority structure that could impose order in a centralized manner...

Because of this dispersion of authority, the USA has always had difficulty in creating the infrastructure of the day -- canals, railroads, telegraph, electricity, highways and telecommunications networks. The development of infrastructure networks requires placement of interlinked pieces of technological hardware over geographical space. The individual pieces of hardware have never been a problem in the USA. The problem has been of an organizational nature.³

This "decentralized scene of considerable confusion" has been the hallmark of American telecommunications development.⁴ The confusion over goals has been a substantial part of it: Universal service or increased competition? On the other hand, there is the confusion that comes from a federal system of government: Local or national jurisdiction? The persistence of these conflicts have largely determined the development of the telecommunications networks of the United States, and are reflected in the developments in the sector over the past two decades.

Needless to say, any strategy for telecommunications development needs to "suit the national character,"⁵ which is perhaps the most compelling reason to combine the best elements of comparative politics with an analysis of telecommunications development. In the American case, the goal is to define a strategy that is decentralized so as to ensure the participation of local interests even with the direction of national interests. Considering the size of the market, and the increasing complexity of the marketplace, this is quite a daunting task.⁶

³ Harmeet Sawhney, "Circumventing the Center; The realities of creating a telecommunications infrastructure in the USA." *Telecommunications Policy*, September/October 1993, p. 506. Sawhney refers to a number of other works in this passage, including Daniel J. Boorstin, The Americans: The National Experience, (New York: Random House, 1966) and J. E. Vance, Capturing the Horizon: The Historical Geography of Transportation (New York: Harper & Row, 1970).

⁴ Ralph Lee with Barry Cole, "The American Way of Wiring a Nation," from Dutton, Blumer and Kraemer et. al., Wired Cities: Shaping the Future of Communications (Boston: The Annenberg School of Communications, 1987) p. 126.

⁵ US Department of Commerce, The NTIA Infrastructure Report: Telecommunications in the Age of Information (Washington, DC: NTIA Special Publication 91-26, US Department of Commerce, 1991), p. 4.

⁶ The US Department of Commerce estimated in 1993 that the U.S. telecommunications industry serves more than 88 million households and 30 million businesses nationwide, with revenues exceeding \$184 billion. There are more than 2000 companies in the telecommunications sector, employing more than 850,000 persons.

In many ways, the framework laid out in the 1934 Communications Act was enough of a marriage of the two to sustain itself for an extended period of time. Under the guise of economies of scale and economic necessity, the establishment of AT&T as a private monopoly represents an unique consensus in a culture that finds it difficult to implement any public sector system for any kind of service. With AT&T established in place after the period of access competition in the United States, the telecommunications development of the country was driven by central investment dynamics similar in many ways to those that we will find in other countries with state-run telecommunications companies.⁷ But it was different in one fundamental fashion: The goal was to return value to shareholders, not financial gain to government pockets.

Perhaps it was that one difference that allowed the United States to maintain a sizeable lead in telecommunications for such a long period of time. AT&T, through its subsidiaries, serviced the needs of local consumers (through the 22 Operating companies), long-distance services (through its long lines divisions), and produced the world's most advanced telecommunications equipment (most of which was pioneered at Bell Labs). The Bell System had a culture all its own, some of which can be seen in the buildings now used by the regional bell operating companies that represent the local legacy of AT&T. In New York, for example, right in the middle of the financial district, one of the old Bell buildings still stands, with its ceiling tile frescoes of telephones that echo the themes of Michelangelo's Sistine Chapel. Above the door leading to the 29th floor conference room is written: "Through These Portals Pass the Best Telephone People in the World."

That all seems far behind us now. There is no longer one institution with a monopoly on telecommunications services, much less the best telephone people in the world. New portals are being developed, all resting on the uneasy foundation of a culture split between universal service and competition, between local and national authority.

The next two sections focus separately on the regulatory and marketplace change since divestiture emphasizing the role that these fissures play in the reactions and strategic planning of government

⁷ The Kingsbury Commitment that formed the basis of the telecommunications act was, in many ways, the temporary victory of universal service over competition. The government, in the words of one commentator, as the "grantor of monopoly privileges," has been "preventing or slowing new competition at every turn" since the 1934 Communications Act. See Robert W. Crandall, "Regulating Communications: Creating Monopoly While Protecting Us From It," *The Brookings Review*, Summer 1992.

and corporate managers. We then conclude this section with an outline for how strategic liberalization can be targeted to address the needs of telecommunications development in the American context.

1.1 From the the Modified Final Judgment to the Present Day: The Limited Regulatory Compact

Before the first breakup of AT&T in 1984, the history of telecommunications regulation was, to be frank, rather dull and largely uneventful.

For most of the forty years following the passage of the Communications Act in 1934, the most visible and significant questions of communications policy were largely questions of broadcasting policy.... Questions of telecommunications (that is, telephone or telegraph) policy, when they emerged, were generally resolved through negotiations with American Telephone & Telegraph or Western Union.

While commission policy in all of these matters was appealed to the courts (and in more than a few instances, to the U.S. Supreme Court) and was occasionally subject to review and revision by Congress, the development of communications policy after 1934 was generally left to the regulators and the industry. Arcane communications issues were only dimly (if at all) perceived by the public, and there was little political gain to be had from involvement with them, with one exception: as the power and importance of the electronic media in the political realm increased, members of Congress became increasingly attentive to agency decisions affecting broadcasters in their districts.⁸

Antitrust issues had always been at the core of AT&T relationship to the political community, and there certainly was some political interest in the telecommunications industry. But the constant parade of politicians claiming knowledge of and interest in telecommunications policy and investment was lacking as compared to the last few years. Basically put, telecommunications policy had yet to move from closed-door discussions in smoke-filled rooms to the veritable street brawls of recent telecommunications legislation.

⁸ Howard J. Symons, "The Communications Policy Process," from Paula R. Newberd ed., New Directions in Telecommunications Policy (Durham and London: Duke University Press, 1989) p. 275.

The Modified Final Judgment (MFJ) changed all that. In 1956, one of those quiet backroom deals had been made between AT&T and the Justice department resulting in a consent decree, which basically compelled AT&T to ensure that the cross-subsidization of services between portions of the company did not affect local telephone rates. But this agreement became increasingly less tenable as new technologies and new kinds of competition slowly undermined the political and economic viability of the system. The history of litigation regarding the activities of AT&T from the period between the Kingsbury commitment and the divestiture of the company is well documented and does not need to be reviewed again here.⁹ It suffices to say that the pendulum that had swung heavily in favor of universal service in the beginning of the century had begun to swing back to the open the opportunities for increased competition.

The resounding statement of this shift came from halls of the District of Columbia's Circuit Court of Appeals, under the direction of Judge Harold Greene. He gave his blessing to a modification of the 1956 AT&T consent decree, and divided the company into two parts. The decision reads as follows:

The proposed decree would provide for significant structural changes in AT&T. In essence, it would remove from the Bell System the functions of supplying local telephone service by requiring AT&T to divest itself of the portions of its twenty-two Operating Companies which perform that function.

The geographic area for which these Operating Companies would provide local telephone service is defined in the proposed decree by a new unit, the "exchange area." According to the Justice Department, an exchange area "will be large enough to comprehend contiguous areas having common social and economic characteristics but not so large as to defeat the intent of the decree to separate the provision of intercity services from the provision of local exchange service." Court approval would be required for the inclusion in an exchange area of more than one standard metropolitan area or the territory of more than one State.

⁹ The Department of Justice's position on the MFJ appears in Timothy J. Brennan, "Regulated Firms in Unregulated Markets: Understanding the Divestiture in *U.S. v AT&T*," Economic Analysis Group Discussion Paper 86-5 (Washington, DCL US Department of Justice, Antitrust Division, April 1986). For a review of the economic literature of the time on the economies of scale and scope associated with the AT&T monopoly structure, see Leonard Waverman, "U.S. Interexchange Competition," from Robert W. Crandall and Kenneth Flamm eds. Changing the Rules: Technological Change, International Competition, and Regulation in Communications (Washington, DC: The Brookings Institution, 1989). Table 8 in particular.

The Operating Companies would provide telephone service from one point in an exchange area to other points in the same exchange area -- "exchange telecommunications" -- and they would originate and terminate calls from one exchange area to another exchange area -- "exchange access." The interexchange portion of calls from one exchange area to another exchange area [would be provided by companies] such as MCI and Southern Pacific Co.¹⁰

Most of the reasoning that appears in the document is constructed under the guise of economic principles. This is always the case in antitrust litigation, which has always at least tried to start from the basis of economic principles arising from the Madisonian imperative to sustain a market of many small-to-medium-sized competitors, rather than a market dominated by few.¹¹

It is clear that the MFJ was as much a political decision as an economic one. Since this "modification of final judgment" was proposed by AT&T and agreed to by both Judge Greene and the Justice Department, it should not be surprising that the decision is imbued with the political tensions that define America's telecommunications development. But the decision reacts in a fundamental way to

¹⁰ US vs. American Telephone and Telegraph Company; Western Electric Company, Inc.; and Bell Telephone Laboratories, Inc. 552 F. Supp. 131. Opinion by Judge Harold Greene.

¹¹ There is a broad academic and judicial literature on the principles of antitrust litigation, with the titles so numerous it would not be prudent to footnote a few in fear that the broad range of opinions would not be represented. It is worth applying the above point by drawing on a 1994 speech by Steven C. Sunshine, Deputy Assistant Attorney General of the Antitrust Division of the Justice Department.

Our point of departure for analysis of many telecommunications mergers is grounded in a fundamental principle: Antitrust enforcement is designed to promote innovation and efficiency. There can be little doubt that innovation, whether in the form of improved product quality and variety or of production efficiency that allows lower prices, is a powerful engine for consumer welfare. One need not look further than the AT&T divestiture to see the critical role that competition plays in spurring innovation and investment. In the early 1970's, Corning developed fiber optic cable and tried to sell this wonderful new product to AT&T. AT&T, one can surmise, probably didn't respond, "thank you very much, we'd be thrilled to adopt and rapidly deploy a new technology that will make our huge investment and undepreciated plant obsolete." Instead, it took a consortium of small long distance carriers to lay the first fiber optic network, followed by Sprint and the pin drop and MCI before AT&T laid its first such network.

The quote comes from "Antitrust Policy Toward Telecommunications Alliances," an address by Steven C. Sunshine before the American Enterprise Institute for Public Policy Research (Washington, DC: July 7, 1994).

the tension between local and national authority, and between universal service and competition. The problem is that it leaves the issues unresolved, suspending the conflict between the two sets of opposing principles. The MFJ therefore represented a limited compact, one that was bound to be undermined as market participants determined how to position themselves in the emerging environment.

For example, the basis of the justification for an establishment of a monopoly for service provision in the United States was the "universal service" mantra coined and communicated by AT&T as its corporate strategy. The need to sustain that vision for the country's telecommunications infrastructure is reflected in the burden placed upon the Regional Bell Operating Companies (RBOCs) that were created through this decision. They were to be the vehicles for universal service by functioning as exchange operators.

History has taught us that this is an illusion. The RBOCs have done their duty to sustain the public switched telephone network, but the local market has slowly been penetrated by a variety of new telecommunications providers and types of services. Attempts to alter regulations have largely fallen on deaf ears. The judiciary, in the embodiment of Judge Greene, has basically taken the initiative on telecommunications policy away from the executive and legislative branches of government since the MFJ.

In great part, this was a necessary illusion, but it appears that many of those who participated in the decision recognized it as such. Even Judge Greene wrote in the final decision that AT&T might choose to bypass the Bell Operating Companies that had just been created to offer local services directly to customers. In Peter Huber's words, "Judge Greene dealt with the problem by wishing it away,"¹² thereby establishing a space for the idea of universal service and local autonomy to sustain itself.

The introduction of competition was also construed in such a fashion as to freeze the ongoing tension between local and national authority over telecommunications regulations. From the economic point of view expressed in the MFJ, the liberalization of the long distance market represented the best possible option for the introduction of competition in the telecommunications sector, given the

¹² Huber, et. al., The Geodesic Network II, p. 2.6.

technological and organizational state of the market participants. But also it was the only kind of competition palatable to both local and national authority of the time.

On the local level, competition in long-distance did not undermine in any substantive way the significant power of state and local governments. It had always been the state's prerogative to regulate rates and, in turn, dictate investment policy to the individual operating companies. By organizing intra-exchange services by LATAs, the MFJ ensured that telecommunications boundaries mapped state boundaries, since there are no LATAs that are part of more than one state. The state PUCs would (and do) still regulate the RBOCs on a state by state basis, and the MFJ was implemented in large part because it avoided potential local roadblocks.

On the national level, the goal of competition could be met through a national infrastructure: Long-distance networks. The decision also provided for a complete and unified information infrastructure, an issue critical for US national security. The FCC quickly took on the role of managing the interface between the local exchange and the long-distance companies, thereby defining the outer limits of what was nominally competitive and nominally granted to universal service.

So it might be said that the philosophy for telephone systems has been, in the American case, as follows: Local shall be governed by universal service and national services shall be competitive. But both have now coexisted uneasily for the past decade, and the temporary compact is beginning to show signs of wear, especially as it relates to the attempt by the U.S. Congress and executive branch to wrest control of telecommunications policy from the hands of the judiciary.

Congress is still, in many ways, unaccustomed to addressing telecommunications issues. Very little significant legislation has passed through Congress since the MFJ was put into place. Congress did succeed in regulating, then deregulating, then reregulating the cable industry during the late 1980's and early 1990's. The flip-flopping of regulations did little to improve customer service and prices and served to undermine some of the confidence of the investor communities in the big cable companies. Other than that, the talk of telecommunications reform has been like the passing of the cherry blossoms in Washington: It blooms majestically every year only to die someplace between the Congress and the White House.¹³ Even with a Democratic Congress, a Democratic President, and a

¹³ Congress does seem to have been effective in threatening legislative action and prodding action by the Federal Communications Commission. See Henry Geller, "Reforming the Telecommunications Policy

Democratic Vice-President with a substantive knowledge of telecommunications issues, the telecommunications reform package of 1994 died, and this in a year when everyone was talking about the "telecommunications revolution."¹⁴ Now, with a Republican Congress and a Democratic President, the effort is being made again, but resistance to the House and Senate versions of the most recent telecommunications bills is rising among certain groups. By the time this thesis is reviewed by committee, the decisive battle for telecommunications reform in 1995 will likely have been fought.¹⁵

Whether the consequences will be decisive or not is hard to foresee, even from this close vantage point. But any reform will likely move America's telecommunications sector from a uncomfortable legislative and judicial prevarication based upon the limited compact of the MFJ to a new, more dynamic telecommunications environment.

1.2 Preparing for the Next Battle: The Corporate Players in America's Telecommunications Sector

We have reviewed the activities of America's corporate sector in some depth during our initial discussion of the development of the global telecommunications infrastructure. Without covering too much of the same ground, and without trying to follow each detail in the quickly changing environment of telecommunications activities, it is still possible to look behind the daily headlines and find the local versus national and universal service versus competition tensions working themselves out in America's corporate strategies.

The corporate strategies that have been pronounced by American telecommunications and information companies over the last five years all boil down to one basic statement: Each company wants to own its own "platform." The platform is basically the infrastructure required to produce and distribute information and telecommunications services. Telecommunications companies in the US

Process," and John A. Ferejohn and Charles R. Shipan, "Congress and Telecommunications Policymaking," from Paula R. Newberd ed., *New Directions in Telecommunications Policy* (Durham and London: Duke University Press, 1989).

¹⁴ Andrew Kupfer, "The Future of the Phone Companies," *Forbes*, October 3, 1994.

¹⁵ The outline of the bills before both the Senate and House would permit the competitive entry of long-distance companies into the local access market, and would permit RBOCs into the long-distance market.

have been emphasizing their ability to “add value” into their networks ever since the divestiture decree put in place the structure outlined above.

There is good reason for this to be the strategic mantra of the telecommunication industry in the United States today. History tells us that telecommunication companies will live or die in their ability to gain access to and directly serve customers. That is impossible without the technology, the information content and management structure to make the "platform" valuable enough to consumers. The fact that all of the players in this industry have come to this strategic conclusion can only mean one thing: They have seen the future, and it is in the competition between various, separately managed but physically interconnected service platforms.¹⁶ The MFJ, in many ways, has become the illusion that was required to prepare the way for the battle that will now begin to unfold.

The players, though, have started from different points and with different kinds of resources and investments already made. Before moving on to address how the market for wireless services has developed and will impact the progress of competition within the telecommunications sector, it is worth discussing the various positions the wireline service providers as they struggle to define and enhance their own service platforms.

Long-Distance Carriers

The MFJ certainly has had its resiliency, in great part because the decision also reflected the needs of AT&T's corporate culture at the time. Not surprisingly, the contrast between local and national interests was even a significant part of AT&T's character as well. The company's 22 operating companies often pushed for independence vis-a-vis the center, and certain operating companies were predominantly over represented among senior management in corporate headquarters.¹⁷ By letting go of the operating companies, AT&T was able to shed the federative structure imposed on the company through its relationships to the operating companies. The divestiture of the equipment producing arm of AT&T, which was also considered as an option during the proceedings, would still

¹⁶ This vision has developed in contrast to the Open Systems Architecture ideas popular among some industry researchers and analysts in the late 1980's and early 1990s.

¹⁷ For example, a tour of duty at Illinois Bell was almost a prerequisite of advancement to the Chairmanship throughout the heyday of the Bell System.

have left the company in the difficult position of integrating local interests with national ones, a tenuous position at best.

But AT&T has decided to turn around and do just that in 1995. In September of this year, AT&T split itself into three separate companies, one for its communications services, a second for its equipment production division, and a third for its computer business. The new AT&T communications services company, though, will continue forward in the strategy of creating an integrated service platform that reaches customers at the local level, unencumbered by the need to position itself as a company that sells equipment to those with whom it is about to compete.¹⁸

After the MFJ, there was much talk of the emergence of competition in the long-distance market in the United States. The growth of other network providers, such as MCI and Sprint, has changed the telecommunications sector and offered a new range of possible investment. Projections were that AT&T would lose a substantial percentage of its market share, which did decrease from 94% in 1979 to 68% in 1987.¹⁹ During that time, Sprint, MCI and other smaller long-distance providers concentrated on building a largely fiber optic platform that took advantage of the regulatory bottleneck that had been put in place.

But, as we have already discussed, the long-distance market suffers from a great deal of overcapacity, and AT&T has been able to halt the erosion of its share in the long-distance market. The viability of further competition in long distance seems limited. In addition, competition in long distance does little to meet the overarching goal we have set for any appropriate telecommunications strategy: Long-distance investment does not directly increase the quality or reduce the price of local, direct access to telecommunications services.

Companies involved in the long-distance market seem well aware that there is little farther to go in squeezing margins out of services. For that reason, the development of their own "platform" has largely focused on the addition of strategic assets that provide direct links to the customer and subscriber base. AT&T has made a huge investment in direct customer contact through its purchase of McCaw Cellular, a development that will be a focal point for our discussion of wireless access in

¹⁸ "AT&T to Split into Three Companies," *Associated Press*, September 20, 1995.

¹⁹ Michael E. Porter, "Competition in the Long Distance Telecommunications Market: An Industry Structure Analysis," *Monitor Company Inc.*, October 1987.

the United States. MCI, the nation's second biggest long-distance carrier, has made investments in the content portion of the platform by putting millions into Rupert Murdoch's News Corporation. Sprint, the third largest long-distance carrier, developed from its starting point as a local telephone provider, and has returned to emphasizing that role by positioning its integrated telecommunications solutions to its customers.

This need to build a platform that directly accesses local customers is evident in the investment by a number of large telecommunications companies in Competitive Access Providers (CAPs). CAPs basically bypass networks and focus on intensive users of telecommunications services, and they have grown significantly over the past few years, in great part because of the direct investments of various larger telecommunications companies. In 1990, there were four regional networks, 21 alternative urban networks, and 12 trunking networks available for interexchange services, with a total of about \$500 million invested in their construction.²⁰ Because such networks would give local access to inter-exchange carriers, the CAPs have been positioned as critical parts of the broader service platform of the companies playing a role in their construction. In the case of the long-distance companies, this means more local access and an important extension of their service platform.

There has also been a great deal of investments made in international linkages, which is also a natural outgrowth of the network base for long-distance providers. AT&T has established itself through its worldsource service, MCI has entered into a strategic alliance with BT, and Sprint has been in negotiation with France Telecom and Deutches Bundespost Telekom on the creation of yet another global strategic alliance.²¹

From the starting point of a long-distance provider, then, establishing a platform for the future generally means moving back into the business of providing local telecommunications access. Where

²⁰ Huber, et. al, *The Geodesic Network II*, p. 2.24 and 2.38. On 2.40, the authors quote Sanford Bingham's "A 2nd Divestiture Looms in the US: Small Access Carriers Challenging Local Bell Monopolies, *International Herald Tribune*, October 7, 1994, who states that "the growth of access carriers is being encouraged, if not orchestrated, by the long-distance companies."

²¹ It is not yet certain that the European Commission will permit the alliance to be formed. The Commission's reluctance is directly tied to the delays in network liberalization in France and Germany, an issue which will be addressed, in part, during our case study discussion of Strategic Liberalization in the UK.

possible, it also means establishing a global presence which, in turn, increases the value of the platform to a future subscriber base.

Local Telephone Providers (Local Exchange Carriers)

Looking back over the past decade of telecommunications development in the US, it is clear that "the terms of the divestiture have not prevented the RHC [RBOCs] from competing, or from positioning themselves to compete further, against each other in the local telecommunications distribution market."²² In fact, the RBOCs have taken significant steps in constructing a service platform that would allow them to compete in almost every aspect of the telecommunications and information industry.

The first priority for the RBOCs has been to invest in the platform they already have: The local telephone network. The goal, in advance of competition, is to make that local access network as valuable to customers as possible, with intelligent network features like call waiting, call answering and the like making up a great deal of the investment in the local networks. When competitors begin to compete with the local platform that the RBOCs have at their disposal, the companies "aren't going to make the newcomers feel particularly welcome," and expect to put up strong resistance in their local markets as competition grows.²³ In New York, for instance, NYNEX next year faces inter-LATA presubscription, where local callers in New York State will be permitted to choose their local phone company. NYNEX plans to follow competitors on a block by block basis, countering the marketing efforts of the competitors by touting their capabilities as a complete provider of telecommunication services.

Over the last decade, the RBOCs have become decidedly less local and marketly more "regional" and "national" in their focus. The strategy of "vertical integration" became the pattern for many of the RBOCs as they sought to address the problems of technological change and increasing competition.²⁴

²² Charles A. Zielinski, "The Big Bang," *Fortnightly*, March 15 1994.

²³ Leslie Cauley, "Not Welcome Here," *The Wall Street Journal*, March 20 1995.

²⁴ It is interesting to point out that the MFJ decision was an attempt to undo the vertical integration of the industry. For the economics of this argument, see Robert W. Crandall, "The Role of the U.S. Local Operating Companies," from Robert W. Crandall and Kenneth Flamm eds. Changing the Rules:

In more simple terms, the RBOCs strategies to build their own platform ranges from "build, build, build to buy, buy, buy," with each major Baby Bell taking stakes in a variety of other telecommunications companies with complementary assets.²⁵

The strategy was the logical response to the perceived competitive threats of the interexchange carriers and the opportunities that the companies have been granted in cellular and wireless access. As the hype about the information superhighway grew in 1993, the New York Times business section described the Baby Bells as "turning into hunters and prey," fighting to retain their own share of the residential market while exploring a variety of strategic alliances and mergers with various other telecommunications companies.²⁶ The most significant merger proposal involved Philadelphia-based RBOC Bell Atlantic and TCI, the country's largest cable provider.

In the mean time, the RBOCs have applied for and received permission to offer "video dial tone," which would allow them to compete head to head in the delivery of broadcasting and information programming.²⁷ Their investment in technology and trials, though, have not lead any to announce a broad competitive attack on the cable markets.

The RBOCs also have attempted to shed their highly fragmented operating structure as well, with each Baby Bell doing away with the nomenclature of the old Bell system's 22 operating companies and presenting one name for the entire company.²⁸ Although it has mostly been for marketing and public relations purposes, the move to single names and unified corporate cultures took place as part of the downsizing of these companies during the late 1980s and early 1990s. Literally tens of thousands of workers lost their jobs as companies attempted to increase efficiency and improve profitability.

Technological Change, International Competition, and Regulation in Communications (Washington, DC: The Brookings Institution, 1989).

²⁵ John S. Harrison, "Assault on a Stronghold," *Fortnightly*, June 15, 1994.

²⁶ Edmund L. Andrews, "From Sibling Rivalry to Civil War," *The New York Times*. November 28, 1993, Section 3, page 1.

²⁷ Bell Atlantic has even petitioned to become a wireless cable provider, a move that has not been followed by any of the other RBOCs.

²⁸ For example, Bell of Pennsylvania, once part of Bell Atlantic, is now designated as Bell Atlantic - PA. The operational structure of many companies remains constant, with each individual operating company functioning as its own source of revenue and investment.

So the RBOCs are building the core of their existing platform, the local telephone network. They are increasing efficiency where possible, employing new technologies and experimenting with new services, and reorganizing their operating structures.

But even with all of these moves and posturing for future competition, the local telephone companies are still hamstrung by the same regulatory principles that have defined their development since divestiture. That is, simply put, because the local telephone network that they are investing in is still regulated under the assumption that the purpose of the RBOC is to provide universal, or near universal service. Price caps are still the issue of the day at the FCC, determining the rates that the local telephone companies charge for access to the local telephone network by the interexchange carriers, such as AT&T, MCI and the like.²⁹ Those charges still account for a very high percentage of overall RBOC revenues, as the chart below indicates:

Total Access Fees for RBOC Operators

Company	Access Fee Revenue	Percentage of Total Revenue
Bell South	\$3.9 billion	25%
NYNEX	\$3.4 billion	25%
Bell Atlantic	\$3.1 billion	24%
US West	\$2.7 billion	28%
Ameritech	\$2.7 billion	23%
SBC Communications	\$2.7 billion	25%
Pacific Telesis	\$2.3 billion	25%

Source: *The Wall Street Journal*, March 20, 1995

²⁹ For more information on some proposed and possible changes to the price cap regulation, see William Blase and Robert Harris, "Price Cap Reform for Local Telephone Access," *Public Utilities Fortnightly*, December 1 1994.

In short, the local platform is valuable, but a great deal of its value is dependent on the interexchange carriers paying access fees. The RBOCs are very aware of this constraint, and have done a great deal to expand their service platform in other significant ways. First, the RBOCs have had much to say about their desire to enter the market for long-distance services, but, needless to say, the long-distance companies are not particularly happy about the possibility.³⁰ In addition, RBOCs have begun to make investments in international transport facilities, such as undersea cables,³¹ and local services within a variety of countries.

But, as is the case with the long-distance companies, one of the most significant efforts to increase the reach of the RBOC's predominantly local platform has been through wireless access technologies. The RBOCs have invested heavily in cellular and PCS, opening the door for further growth in a variety of other local markets. In that regard, the RBOCs are likely on a collision course as some of them square off for control over local subscribers.

Cable Television

The cable television industry, as we have discussed, finds its foundation in aiding the transmission of broadcast television. As a monopoly service with local franchises under its control, the present platform of the cable companies has largely been configured to support one-way transmission of broadcast information, not the interactive conversations and exchange of information of the local telephone network.

The regulatory push and pull on cable television providers has been highly localized and nationalized at the same time. The issues of zoning and franchise rights have become meshed into the fiber of local politics throughout the nation.³² National regulation of cable rates, and FCC trackling and

³⁰ For an interesting point and counterpoint from two industry leaders of the discussion about RBOC entry into competitive long distance, see Bert Roberts, "No Time for Deja Vu: Preserving Competition in Long-Distance Service," and Philip J. Quigley, "The Time Has Come to Open the Long-Distance Market," from *Issues in Science and Technology*, Summer 1994. For more recent information, see John J. Keller, "Baby Boom," *The Wall Street Journal*, March 20 1995.

³¹ NYNEX, for example, has a major investment in FLAG, a major undersea fiber link for many Asian countries.

³² For example, when Comcast was granted the cable franchise rights to a major portion of the city of Philadelphia, the company had to choose between relocating into center city or fines for breach of the

oversight of consumer complaints has put a second form of pressure on the companies. At the same time, cable faces regulation as a "common carrier" of programming, and many cable systems have faced scrutiny for what some allege (and others have attempted to document) as a system for providing unfair advantage to certain programming channels. Yet there is supposed to be "competition" between different broadcast, information and entertainment options. Like the RBOCs and the long-distance carriers, the platform from which the cable companies begin has been cobbled together in a packwork of philosophies and regulatory fiefdoms.

But from that starting point, there is much the cable industry plans to do to increase its capability to serve the information and telecommunications needs of customers. Unlike the RBOCs, cable companies have not focused on dramatically upgrading their existing local network, in great part because of cash flow difficulties and a lack of regulatory incentives. At the moment, cable companies are not permitted to provide telephone services in their service area, and the existing plant of coaxial cables used to deliver television programming is of a higher quality than the copper wires of the telephone network to begin with.

So cable companies instead have concentrated on another portion of their platform as information and telecommunications service providers: The content of programming. The two biggest cable companies, Time Warner and TCI, have focused on creating cable channels, and purchasing the rights to movies and movie production.³³ Another big cable company, Viacom, leveraged itself mightily to purchase Paramount movie studio, after already having developed a host of its own cable channels, such as MTV. With the merger of Capital Cities/ABC with Disney, there has been a great deal of activity in the integration of the content portion of the telecommunications service platform, and cable companies are well aware that their past, as well as their future, is tied to their ability to produce and distribute information and entertainment.

Cable companies do seem to have an interest in moving into the delivery of local telephony, in great part taking the experience that they have had in the UK (and that we will discuss in the next chapter)

franchise provisions. It chose to relocate into the city, even though the cost of relocation reportedly exceeded the cost of the fine for remaining located in the suburbs.

³³ Time Warner has recently agreed to purchase Turner Broadcasting, with its depth of and access to the "content" portion of the telecommunications and information platform. Ironically, Turner also has the rights to many of the movies produced by Warner Brothers studio before its incorporation into the Time-Warner company.

combining cable television with telephony. The mathematics make the move obvious: "The local phone business is a \$90 billion a year market, while the cellular market is about \$11 billion. The cable industry, in contrast, has revenues of a mere \$23 billion."³⁴ Until the regulatory restrictions are lifted, these companies will be constrained in their ability to move forward in this direction.

But one direction they have moved aggressively into is wireless access. As has been the case for the RBOCs and for the local operating companies, wireless investments have not been restricted, and, as such, form a critical potential extension of these companies' service platform. Through wireless cable and wireless telephony, cable companies are looking to expand both the geographical reach of their services and the nature of their services.

Each of these wireline players developed platform strategies in an age where wireless assets have been defined and seen as an ancillary service to wireline. The cellular model, pioneered in the United States, did not allow for a broader conception of how this access technology could develop. Now the players in each of these category are searching for wireless assets to integrate into their operations, adding to and expanding their service platform so that they will be able to compete effectively for local subscribers. It is significant that wireless access is really the common denominator for all of them, insofar as it is the only access technology that all have identified as a potential mass service for attracting local subscribers. In that regard, the mantra of owning your own platform will be defined, in a significant way, by how each company chooses to operate and manage its wireless network.

1.3 The Tensions Inherent in the System

The corporate platform strategies are constrained by tensions between universal service and competition and between local and national autonomy. To gain access to customers, and to begin differentiating kinds of customers according to various market segments, it will be critical to gain direct access to customers and offer seamless communications solutions. This must transcend the local/national divisions and overcome the posed contradiction between universal service and competition.

³⁴ "Cable-Ready; Time Warner and Other Cable Companies Have Their Sights on the Local Phone Market," *The Wall Street Journal*, March 20 1995.

The regulatory regime is constrained by the same two tensions. On the one hand, it would seem a natural companion to the prevalent Washington program emanating from the Republican Congress that local control is better than national control, but the need and drive for economies of scope, if not scale, need to be reflected in the economic and political space opened up for activity in the telecommunications and information sector. Additionally, the regulatory function will continue to struggle with the perceived political exigency of establishing universal service, even when an opportunity to revolutionize the definition of universal service is evident in the form of wireless access.

How can wireless help to resolve these tensions so that the country can move forward constructively? Basically put, competition in wireless services can be used to cut through the layers of tension and establish a solution for the American telecommunications sector that is truly reflective of the specific nature of the American case. To offer an outline of such a vision, we need to first turn to a brief history of wireless communications in the United States, again taking care not to linger on some of the issues that have already been addressed in our overview. We will outline to a specific program which can bring corporate and political managers together in establishing a coherent framework for the development of the telecommunications sector.

2. Wireless Access in the American Context

Wireless has already clearly been established in the United States as a critical component of the overall growth of the telecommunications sector. As FCC Chairman Reed Hundt recently commented, "we expect more than \$20 billion to be invested in the immediate pursuit of returns on the auctioned licenses. The result will be more than 300,000 new jobs in the mobile communications business, and another 700,000 new jobs stimulated over the next five to eight years as an indirect effect of this job creation."³⁵

To date, wireless access has been able to play a variety of roles in spurring the growth of the country's telecommunications and information sector. From the birth of radio and television broadcasting, wireless communications have very much been at the center of American life. But, as has been the case around the globe, wireless access as a means for two way communications has generally been

³⁵ "Competitors and Allies: Cable TV Companies, Telcos, Broadcasters Jointly Will Create New Markets," *Telecommunications Reports*, April 10 1995. p. 19.

relegated to an ancillary role, significantly less important than the copper wires of the public switched telephone network.

The first major commercial application of wireless communications for two-way telecommunication services involved long-distance and satellite transmission, as we have already discussed in the third chapter. The growth of competition in the long-distance market is directly tied to the development of point-to-point microwave services, put into place by Microwave Communications International (MCI) and other companies that wished to compete directly with telephone giant, AT&T. Satellite communications had been developed to support other long-distance and television broadcast companies.

But the use of point-to-point microwave was not to become a mass service, simply because it was not constructed to become so. Wireless local access was limited to geographically isolated regions and the BETRS system described in George Calhoun's often referred to book, Wireless Access and the Local Telephone Network. Even though cellular systems had been in development for decades, and even though AT&T, the world's largest telephone company, had been one of the pioneers, wireless access in the United States was late in appearing.

The only kind of wireless access available in the United States that ostensibly aspires to serve the mass market is cellular telephony. Recent developments in other forms of wireless access, especially Personal Communications Services (PCS), have dominated the headlines for the past two years, but have yet to appear on the scene.

What we see in the development of cellular services in the United States, and in the regulatory jostling behind the roll-out of new kinds of wireless access services, is that the country's telecommunications sector is still constrained by the limits of its own history. But wireless access has been bred in an environment that is disconnected somewhat from the two tensions of national versus local authority and universal service versus competition policy. For that reason, and because of the nature of wireless access as a communications technology, there is an opportunity for the United States to cultivate growth in wireless access to achieve the critical public policy goal of telecommunications development: Increased penetration of access to services.

This section begins with the history of cellular access, and turns to examine some of the developments in emerging wireless technologies, such as PCS. We examine a specific case study of

how the future of wireless access is determining corporate and regulatory policy today by reviewing the 1994 merger of McCaw Cellular Communications with AT&T. We then point our analysis towards the policy of strategic liberalization, and outline how such a strategy can help this country overcome the historical constraints which hold back the development of the telecommunications sector.

2.1 Cellular and the Birth of the Duopoly

The FCC spent more than a decade considering the issue of licensing wireless systems for cellular access. The initial proposal in 1974 was to allocate 40 mhz of spectrum, with one cellular system per market. In great part, the discussion was dominated by the company that would have been permitted to take and operate the licenses under this proposal, namely AT&T. AT&T, through its subsidiary Western Electric and its research arm, Bell Laboratories, had already developed the framework for the provision of wireless access services in the 400 mhz and 800 mhz ranges.

During six years that followed this initial proposal, all sorts of suggestions were offered, including one proposal to share a single 40 mhz license among several licensed users. In the late 1970s, experimental wireless system licenses were granted to Illinois Bell, one of AT&T's operating companies, for the Chicago area, and to American Radio Telephone Service (ARTS) for the Washington-Baltimore metropolitan areas.

After increasing pressure from a variety of industry participants, the FCC finally outlined a framework for the licensing of cellular operators in 1981. The decision was to offer two licenses for each service area, within the service areas defined by the geographical distinctions of Metropolitan Service Areas (MSAs) and Rural Service Areas (RSAs) as defined by the U.S. Department of Commerce.

In articulating the license structure, the potential for anti-competitive behavior was a critical concern of the FCC as it considered the options for determining who could or should not be permitted to participate in the development cellular services.

Our primary reason for questioning wireline operation of cellular systems at this late date was our concern that cellular technology might have developed the potential to be competitive with local exchange service, thereby creating a

disincentive on the part of wireline carriers to fully develop cellular service in the areas where they also offer local exchange service. From our review of the record, however, there appears to be a consensus that our concern was unfounded. Most commenters believe that cellular systems will initially only be competitive in the traditional 2-way mobile market. Our own evaluation is in agreement with this position. The key to local exchange substitutability in any practical sense is in the availability of an inexpensive handheld portable unit that is light in weight. Until such an inexpensive unit is available, cellular service cannot realistically serve as a meaningful replacement for local wireline exchange service.... Furthermore, the size of the spectrum allocation will limit the number of users of a cellular system, while a landline system can expand indefinitely.... Therefore, we conclude that there is no reason to rule wireline carriers ineligible out of concern that they will have a disincentive to advance the development of their cellular system because of its short term potential replacement of their local landline service.³⁶

The FCC had already discounted the possibility that wireless access could compete with wireline capabilities, and, for that reason, felt comfortable with allowing a "wireline" carrier (namely AT&T) to be permitted to provide wireless access services. This is somewhat perverse logic, since the FCC did recognize the potential for future competition. If such a potential was apparent, why would not the FCC set a structure in place to promote the possibility for direct competition between wireless and wireline service providers? Certainly, if given the opportunity to use a certain model for wireless access as a shield for the massive investment in plant already made by AT&T, the company would promote such a model. To be fair, the FCC did ensure that cross subsidization between wireline services and cellular services could not occur through appropriate regulation and the division of operating responsibilities within AT&T.³⁷ Perhaps the FCC did not think competition in the telecommunications sector as a long-term goal was important, but the above passage shows that it was not because of ignorance about that possibility.

Another kind of competition was more on the minds of regulators and industry participants, because a few months after the decision was handed down by the FCC, the Modified Final Judgment was announced. The cellular licenses were not at the forefront of people's minds. At the initial press

³⁶ *An Inquiry Into The Use of the Bands 825-845 and 870-890 Mhz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems*, CC Docket No. 79-318, April 9, 1981. p. 16-17

³⁷ *An Inquiry Into The Use of the Bands 825-845 and 870-890 Mhz for Cellular Communications Systems; and Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems*, CC Docket No. 79-318, April 9, 1981. p. 27.

conference explaining the breakup of the company, AT&T representatives did not know whether the new cellular licenses would be kept by the company or by the newly created Regional Bell Operating Companies.

Eventually, that issue was cleared up and the RBOCs were granted the right to operate the wireline cellular licenses within their own service territories. The second licenses were to be granted to "non-wireline" companies, which basically meant any other person or company that wanted to create a company to build and operate such a network.

The FCC decided to hand out the non-wireline licenses through a lottery system, with technical and engineering pre-requirements set by the FCC to raise the bar for potential applicants. Literally, hundreds of people who had little or no experience in the telecommunications industry eventually wound up holding licenses throughout the country, forcing companies such as McCaw Cellular Communications to collect licenses and expand their network by purchasing them or buying to existing arrangements. The FCC restricted the sale of licenses until the franchises reached the construction-permit stage, when actual investments in network capability were being made. But that did not prevent a wild West type atmosphere among early cellular service providers, with deals being cut and fortunes made and lost on the license speculation.³⁸

³⁸ The story of how McCaw Cellular Communications collected its licenses is worth relating. As told in "Money From Thin Air," *The Seattle Times*, April 4, 1993:

They bought from communications conglomerates whose executives often thought they were taking advantage of the boys from Kirkland. And they bought from countless small-time speculators in the cellular frontier: a frank in a Fairbanks bar, dentists, a beauty-salon owner, an ambulance driver, a deep-sea diver in Oregon. They paid \$700,000 to a guy named The Fat Man who played porno movies in his office. They paid \$3 million to an Oregon man who lived deep in the woods in a mobile home.

One couple in Arkansas, Bill and Hillary Clinton, collected \$48,000 from the sale of their piece of a partnership in a cellular license. Their \$2,000 stake made five years earlier represented the couple's most successful investment.

Another couple who operated a beauty school in Santa Rosa, Calif., saw a television show on speculative investments hosted by Mike Douglas. They invested \$15,000 on a chance of getting a cellular license and wound up with control of Yakima's license. McCaw bought them out for \$1 million.

The first licenses granted were the Metropolitan Service Area licenses, simply because those were the territories where the most evident demand for such services existed.³⁹ The Rural Service Area licenses were not distributed until 1988, when even more strict guidelines to prevent speculative applications. To this day, though, some RSA licenses have yet to be handed to companies committed to constructing a network to provide cellular services.

As far as technologies go, AMPS became the transmission standard, which had been based on the improved mobile telephone services (IMTS), a trunked radio system.⁴⁰ As digital technologies have been developed for cellular systems, the debate between the various players has revolved around the transmission standards discussed in the earlier chapters. The major cellular players have diverged on their choice for digital cellular access, as the table below indicates:

The Kirkland boys did deals fast. They flew directly to owners of cellular licenses, presented a one-page sale agreement and asked, "What will it take to get you to sign right now?"

The papers would be signed, the seller gleeful for getting more than expected, and the McCaw official would be flying home, while competitors were writing memos to headquarters about their purchase plans.

³⁹ The Metropolitan Service Area (MSA) geography was based upon assessments of the U.S. Department of Commerce regarding the pattern of trading in products and services within a metropolitan region.

⁴⁰ B. J. Menich, "Analog Cellular Radio in the United States," from D. M. Balston and R.C.V. Macario, eds, Cellular Radio Systems.

Planned Technologies for Wireless Access: A Sample of Cellular and PCS Operators

Company	AMPS	TDMA	CDMA	GSM
AT&T	X	X		
Southwestern Bell	X	X		
AirTouch	X		X	
Ameritech	X		X	
Bell Atlantic/NYNEX	X		X	
US West	X		X	
Sprint			X	
Pacific Bell				X
Bell South	X	X		X

Source: *PC Week*, September 18, 1995

We have already reviewed the growth numbers to know that cellular services have been very successful in the American context, with the industry effectively managing compounded growth rates of 20% or more each year since the inception of the service. Cellular, to date, has predominated as the main story of wireless access in the United States, but another story appears to be just beginning: The story of Personal Communications Services (PCS).

2.2 The Birth of PCS

The hearings on Personal Communications Services (PCS) opened in December 1991, and was designated as docket 90-314. The docket remained open for the next four years as the FCC built to a program for licensing PCS services. During those four years, the perceptions of what PCS was and could be, moved from theoretical speculation to the cold, practical reality of regulatory decision.

The original vision echoed much of the language which appeared in the UK as part of the initial "Phones on the Move" report on Personal Communications Networks. Telocator stepped forward with an attempt at a formal definition, which differentiated PCS from cellular services through "personal numbering" and "call management," which were functions not built into existing cellular systems⁴¹ (even though they would soon be, as cellular providers made the transition to digital transmission and switching standards).

The catch-all phrase eventually presented by the Commission defined PCS as "radio communications that encompass mobile and ancillary fixed communication services that provide services to individuals and businesses and can be integrated with a variety of competing networks."⁴² PCS eventually was defined as either a private or commercial mobile radio service.⁴³

⁴¹ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p. 17.

⁴² *Amendment of the Commission's Rules to Establish New Personal Communications Services*, FCC Doc 93-451, General Docket 90-314, Second Report and Order, October 22, 1993. Paragraph 24.

⁴³ A critical part of the regulatory debate was in making the distinction between commercial and private mobile radio systems, and determining how PCS should be classified within the constraints of that regulatory scheme. From the Notice of Proposed Rulemaking in the matter of the implementation of Sections 3(n) and 332 of the Communications Act; *The Regulatory Treatment of Mobile Services*, "October 8, 1993. Paragraph 45:

We tentatively conclude that no single regulatory classification should be applied to all PCS services. As a practical matter, we expect that most broadband and many narrowband PCS services will involve interconnected service to the public or large segments of the public. We believe that a primary objective of Congress in revising Section 332 was to ensure that such service would be regulated as commercial mobile services. At the same time, we do not believe Section 332 requires the Commission to limit PCS to commercial mobile service applications. We have envisioned PCS as potentially providing a diverse array of mobile services, which could include applications that are not interconnected to the public switched network or are not offered to a substantial portion of the public.

Section 332 (c)(1)(a) permits the FCC to establish classes of commercial mobile services, which are generally defined in the Notice as a common carrier service offered for profit and available to the public through interconnection with the local exchange network. A private network is "only used for a licensee's internal use." PCS licenses can be both, and, perhaps for that reason, the FCC did not directly address the interconnection issues as part of the 90-314 docket proceedings; private mobile radio might not require connection into the local exchange. See also the Second Report and Order of the Commission in Docket 90-314, FCC Doc 93-451 of October 22, 1993, paragraph 12. The Presumption appears to be that, with a sufficient amount of market participants, arrangements for interconnection will arise as a matter of course.

The initial question about the purpose and target audience for PCS services revealed a fundamental division. Some argued that PCN would "evolve from the 40-million-unit analog cordless phone base, for which new digital handsets will be sold that can be used in the streets,"⁴⁴ very similar to the Telepoint/CT-2 concept that we will examine in the British case study. Existing industry participants quite often equated PCS with cellular services. That argument was reflected in the equipment being advocated as the best for the development of PCS networks, which ranged from the CT-2 equipment to the TDMA and CDMA transmission standards under development.⁴⁵

What became clear in the years of debate that followed was that the cellular model was much more powerful than the Telepoint model, perhaps in great part because the failure of Telepoint became more and more evident during the first few years of this decade. By the time the service definitions and licensing structure was set in 1993 and 1994, it was the cellular model that predominated.

The discussion about where in the spectrum PCS services should be offered largely focused on the bands under discussion in the UK and throughout the world: The 1.8 to 2.2 ghz range. That frequency range had largely been set by the WARC Conferences and the work of equipment producers to develop products for that frequency range.

Geography was a much more difficult question. Instead of choosing to follow the MSA/RSA territorial distinction of cellular, the FCC did a surprising about face. The Commission chose to license providers according to the Major Trading Area (MTA) and Basic Trading Area (BTA) distinction provided by the Rand McNally Commercial Atlas. Other than dramatically increasing Rand McNally's sales of this rather expensive atlas, some claimed that there were few benefits of this arrangement, but it held through the proceedings and the 51 MTA areas became the basis of the 30 mhz licenses that were to be granted.

The choice not to grant national licenses also came under fire, but the decision reflects the tensions between local and national autonomy, as well as the tension between competition and universal

See "A Barron's Interview with U.S.'s FCC Chairman Reed Hundt," *Dow Jones International Financial Wire*, February 7, 1994.

⁴⁴ Donaldson, Lufkin & Jenrette Cellular Communications Industry Report, January 28, 1993.

⁴⁵ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p.27.

service that marks the development of the American telecommunications sector.⁴⁶ By fragmenting the market, the FCC attempted to make it difficult to assemble a high concentration of licensees, which would, in theory, meet the needs of further competition.⁴⁷ But, as we have noted, just because there are a number of market players does not mean there is real competition.

A further attempt to diversify the marketplace is reflected in the Commission's treatment of existing cellular licensees. The final equation was that cellular licensees were permitted to participate in PCS auctions "outside of their service area or in any area where the cellular licensee serves less than 10% of the population of the PCS service area."⁴⁸ Cellular licensees were defined "as entitled which have an ownership interest of 20% or more in a cellular system."⁴⁹

Finally, the commission decided to set aside the "C Block" (20 mhz licenses based on the 492 BTAs throughout the United States would be set aside for small businesses, women and minority-owned enterprises, and rural telephone companies. Many have been skeptical about the possibilities that the set aside program will work.

Roughly a third of the bands that will be on the table at the upcoming broadband auction have been set aside as "entrepreneurial blocks," theoretically off-limits to fat-cat bidders. In a game in which small is big, the FCC mandated that company bidding on a license within those blocks must have gross revenues of no more than \$125 million a year. In addition, certain bidders huddled beneath the entrepreneurial blocks' umbrella will have the extra edge of being declared "designated entities," roughly the FCC's equivalent of weak golfers who deserve a multi-stroke handicap. Designated entities are small businesses whose annual revenue is \$40 million or less (good for a 10% knockdown on any winning bid) and businesses owned by minorities and/or women (good for a 15% to 25% price cut, depending on annual revenue.)

⁴⁶ The typical argument for the smaller licenses, as opposed to the national licenses, is summed by Richard Stamberger, "Open the Airwaves to Competition," *The Wall Street Journal*, September 22 1993.

⁴⁷ A critical part of this decision was to make 120 MHz available instead of the original 90 MHz proposed. This is three times the size of the individual 40 mhz licenses granted to cellular service providers. See FCC Doc 93-451, General Docket 90-314, "Amendment of the Commission's Rules to Establish New Personal Communications Services," Second Report and Order, October 22, 1993. Paragraph 54.

⁴⁸ "FCC Allocates 2 GHz Spectrum to PCS; Barrett Dissents, Says Decision is Flawed," *Telecommunications Reports*, September 27, 1993. p. 1.

⁴⁹ *Ibid*, p. 1.

Sounds complicated? It is. And rest assured that there are fine print rules above and beyond the basic stipulations. Designated entities are not guaranteed winning bids -- just a leg up in auction battles with the established cellular giants and Baby Bells of the world.⁵⁰

The program has barely gotten off the ground, and the blocks set aside for entrepreneurial bidders were not included in the early 1995 auction of the broadband licenses pending further reconsideration of the rules. As this thesis is being written, there is still an ongoing discussion about how the auction will proceed for these licenses.⁵¹

The Auctions Proceed: Licensing Broadband PCS

Against this continuing backdrop of debate, the Congress passed the 1993 Omnibus Budget Reconciliation Act, which called upon the FCC to begin auction proceedings by the end of 1994 to ensure that all revenue taken in from the proceedings could be used to reduce the federal budget during that fiscal year. The FCC was therefore compelled to push forward where it could and resolve as many issues as possible to get the bidding process going. At the end of 1994, the auction had begun.

The auction represented a significant innovation in the development of telecommunications regulation and spectrum management, so much so that it deserves some further discussion before we present a brief analysis of the results. As we will see, the auction might not have been successful in producing the kind of marketplace diversity that some hoped for, but it did set a valuation structure in place for spectrum. This, in turn, opens other opportunities for a program of strategic liberalization to overcome the local/national and competition/universal service tensions that hold back American telecommunications development.

The PCS auction was the first practical implementation of the competitive licensing idea, but the framework and support for such a process had been set through years of discussion and consideration.

⁵⁰ Tom Dunkel, "Staking a Claim on the Information Highway," *Working Woman*, November 1994. p. 37.

⁵¹ "Entrepreneurs Look for Ways to Resume Stalled PCS Auction, Hold Meeting with Lawmakers," *Telecommunications Reports*, March 20, 1995. "Phone Auction Delayed," *Associate Press*, July 27, 1995.

In 1991, the National Telecommunications and Information Association (NTIA) of the Department of Commerce wrote in its report on spectrum management:

Although changes in regulatory procedures and the block allocation system can improve spectrum management incrementally, the report concludes that greater reliance on market principles in distributing spectrum, particularly in the assignment process, would be a superior way to apportion this scarce resource among competing and often incompatible users.⁵²

Henry Geller, Assistant Commerce Secretary during the Carter administration, once called the lottery procedure "a national disgrace" in testimony before Congress. The FCC had let more than \$84 billion in revenue slip through its fingers.⁵³ In short, the lottery did not work for cellular, and something different had to be put in place for any other licensing that was to be done.

An FCC Docket opened to address this possibility of a competitive auction for licenses, and came to the quick conclusion that "competitive bidding should begin immediately for Personal Communications Services (PCS), some services regulated by the Private Radio and Common Carrier Bureaus such as the Specialized Mobile Radio, Interactive Video Data Service, and certain cellular radio service applications."⁵⁴ The official comments of the FCC indicated that the emphasis in these proceedings was to get smaller, private companies to become part of the auction process, especially companies owned by minority business people and women.

But that is not what happened. Companies began to announce large-scale bidding consortiums and mergers of their wireless operations. Sprint came together with three of the country's largest cable operators, including Tele-Communications Inc., Comcast and Cox Enterprises to form Wireless Co. Bell Atlantic and NYNEX joined forces and merged their cellular assets, only to turn around and come together with AirTouch Communications and US WEST to establish a four-company partnership called PCS Primeco to bid on licenses. For a while, it appeared that even further consortia would develop, but discussions between MCI and a variety of other large

⁵² "US Spectrum Management Policy: Agenda for the Future," U.S. Department of Commerce, February 1991. See, in particular, the initial writings in Appendix D, "Estimating the Value of Cellular Licenses."

⁵³ Tom Dunkel, "Staking a Claim on the Information Highway," *Working Woman*, November 1994, p. 37.

⁵⁴ FCC 93-455, Docket No. 93-253, "In the Matter of Implementation of Section 309(j) of the Communications Act; Competitive Bidding," Notice of Proposed Rule Making, October 12, 1993. Paragraph 3.

telecommunications concerns did not lead to another alliance. Those alliances, however, were big enough to scare many who were considering their participation in the auction.

The first license auction actually occurred in 1994, for nationwide licenses of narrowband PCS. Almost 1400 licenses were auctioned off, some with 50 khz and others with only 12.5 khz.⁵⁵ Most of the companies bidding on these licenses were looking to expand existing paging and ESMR operations, rather than attempting to build full-fledged PCS networks.⁵⁶

The broadband PCS auction took almost five full months to complete, and the stakes were much higher and the players much larger. If the FCC's goal was to bring in smaller players and non-traditional bidders into the fray, the strategy did not succeed. Of the 99 licenses sold, 70 went to Bell Companies or Bell Companies in consortia with other auction participants. Wireless Co., the Sprint-led consortium, was the biggest winner, with 29 licenses totaling more than 2.1 billion. AT&T purchased 21 licenses for \$1.6 billion, and PCS Primeco, the partnership of Baby Bells and AirTouch, the Baby Bell spin-off, took 11 licenses for \$1.1 billion.⁵⁷

From the perspective of income for the treasury and debt reduction, the auction has turned out to be reasonably successful, with a total of more than \$7 billion coming into the U.S. Treasury. But, on the surface, the auctions did not diversify the market for wireless access, insofar as the players in the auction are all major participants in the cellular access market and have construed their services largely along the lines of cellular access. For example, AT&T expects to have its PCS service running by the first half of 1997, and "will integrate the new PCS services with our existing cellular

⁵⁵ "Money Out of Thin Air," Peter C. Cramton, Delivered to the 22nd Annual Telecommunications Policy Research Conference (TPRC). Five hundred ninety-four licenses were also granted in July for interactive-video data services in July 1995 by competitive auction.

⁵⁶ Before this auction, though, some of those bidding appeared to position the licenses as potential direct competitors to PCS. Nextel was perhaps the most visible example of a company with ESMR licenses claiming to be prepared to compete with PCS and cellular licensees. Nextel has since backed away from that position, and its stock has dropped substantially.

⁵⁷ "Broadband PCS Auction Nets \$7.7 Billion," *Telecommunications Reports*, March 20, 1995. p. 3. See also "Sprint Corp. Takes a Leap Into Untested PCS Business," *Wall Street Journal*, September 16, 1995. Sprint is planning to spin off its wireless licenses and turn them over to this company, and its three cable company partners are also considering this move.

services to provide our customers with seamless, advanced wireless communications capabilities, utilizing dual-band, dual-mode wireless phones."⁵⁸

This is not to say that the auction has failed from the perspective of increasing the opportunities to push penetration rates higher. Interestingly enough, it may have set the foundation for such a move through a backdoor that it has opened by setting the auction precedent. For example, the FCC feels that this has been such a successful enterprise that literally thousands more licenses for every kind of wireless service imaginable will be auctioned off in the next few years.

To begin with, the FCC recently cleared the way for the auction of frequencies to be used for paging and messaging through specialized mobile radio.⁵⁹ Another proposal by the FCC offers a framework for licensing local multipoint distribution services (LMDS) and satellite services in the 28 GHz band "to provide immediate competition to franchised cable TV system operators."⁶⁰ These licenses would almost certainly be auctioned, assuming that the Commission does not have a change of heart concerning the effectiveness of the auction process.

The FCC also adopted rules for a new category of wireless services, called "General Wireless Communications Service" (GWCS). Twenty-five MHz of spectrum in the 4660-4685 band will be "transferred from the federal government to the private sector," and the FCC has specifically "adopted competitive bidding rules for awarding mutually exclusive licenses."⁶¹

⁵⁸ Ibid, p. 4.

⁵⁹ "FCC OKs More Mobile Licenses," *Associated Press*, September 14, 1995. A total of 1,020 licenses will be auctioned on November 28, 1995.

⁶⁰ "FCC Outlines New Spectrum Plan for LMDS, Satellites," *Telecommunications Reports*, July 17, 1995. p. 32. "The Notice or proposed rulemaking includes separate primary allocations for LMDS systems (850 megahertz in the 27.5-28.35 GHz band); geostationary fixed satellite service (FSS) systems (250 MHz in the 28.35-28.6 GHz band); non-geostationary FSS systems (500 MHz in the 28.60-29.1 GHz band); mobile satellite service (MSS) feeder links and LMDS (150 MHz in the 29.1-29.5 GHz band); MSS feeder links and geostationary FSS (250 MHz in the 29.25-29.5 GHz band); and geostationary FSS (500 MHz in the 29.5-30 GHz band).

⁶¹ "FCC Adopts General Wireless Service Rules," *Telecommunications Reports*, August 7, 1995. The article quotes the FCC order's characterization of GWCS as a "subscription service," and that the spectrum would be split into five separate 5 MHz licenses auctioned off according to the MTA/BTA geographic distinction used in PCS services.

Finally, the FCC has also adopted auction rules for multipoint distribution services, "a viable competitor to cable TV offerings."⁶² The problem is that more than 100 licenses to use MDS in rural communities had been pending long before the auction proceedings were proposed as a mechanism to distribute licenses. For the 487 BTA areas and 6 "BTA-like" areas to be licensed under the order, competitive auctions will be used, but lotteries still might be used for the 101 MTA licensees in question.⁶³

For a while, the idea of auctions was so popular as to generate a number of rumors and proposals around Washington. One reported move by the Office of Management and Budget would have allowed the FCC "to use auctions to assign all non-government radio spectrum," which would affect private, noncommercial radio services offered by state and local governments, manufacturers, hospitals, educational institutions and the like.⁶⁴ This proposal was killed before it could appear in the Clinton administration's 1996 budget proposal.

The broadband PCS auction may have allowed the major cellular players to protect the investment they have already made in cellular services. If companies do plan to roll out cellular type services (and provide cellular type pricing), penetration rates will stall and the move to replace the landline phone through direct competition will also fail. The broadband competition which wireless could potentially bring would have failed, in large part because of the auction and the nature of the participation.

It is these smaller licenses, this swarm of potential confusion, that could be more viable over the long term. As wireless services merge, and different kinds of services become viable on a variety of different licenses in the spectrum, then there are fascinating opportunities for niche and broad-based competition. If the auction has been a frustrating necessity to motivate government to action, then it has been a necessary frustration from the perspective of the goals we have set out for telecommunications development.

⁶² "FCC Adopts Auction Rules for MDS; Lottery for Pending Applications Leads to Heated Debate," *Telecommunications Reports*, June 19, 1995. p. 13. The article defines MDS as follows: "MDS uses microwave signals to deliver video programming to subscribers. It is often referred to as "wireless cable" because the subscription based service appears similar, at the consumer level, to cable TV.

⁶³ *Ibid*, p. 14. In the debate surrounding the order, it was noted that more than 1,000 licenses for MDS systems had been forfeited because of failure to construct facilities.

⁶⁴ "Industry Trying to Kill Spectrum Plan in '96 Budget," *Telecommunications Reports*, February 6, 1995. p. 7

The auction is a step to a final goal, and can not in and of itself provide the framework for competition. We need to move from competition for licenses to competition for customers -- and a competition to build broadly competing service platforms that are meant to provide access to all of this country's citizens.

Pioneers Preference

Another critical innovation developed as part of the proceedings on PCS licensing was the establishment of a "pioneer's preference" program. The pioneer's preference was established by the FCC to reward companies for innovations in wireless access technology or service development. Conceptually, the idea makes much sense and has a great deal of merit: Those who work to improve the opportunities to provide telecommunications services should be rewarded, when possible, for their efforts and investment. In that way, the pioneer's preference forms another potential economic incentive that promotes innovation in the development of the telecommunications sector.

But the theory was much cleaner than the practice. The whole process for awarding pioneer's preferences, and the establishment of rewards, fell into the morass of telecommunications politics in Washington. Nevertheless, as we review the FCC's efforts in this area, we will argue that the program itself has merit and should be a critical part of an ongoing policy of strategic liberalization.

The first official statement about such a proposal appeared in April 1990, when the FCC linked technological innovation to requests for the spectrum required to provide a new service. The FCC's general docket 90-217 pioneer's preference rules allow preferential treatment in the licensing process to parties that "develop significant new communications services or technologies." In this regard, the key words are "new," "innovative," and "original." Chairman [Alfred] Sikes later explained that there must be a "steep winnowing process when the principal criterion is originality."⁶⁵

The incentive for being "original" formed the basis of what was to become an extended political and legal battle. Not surprisingly, a number of the nation's telecommunications companies lined up to be considered for the pioneer's preference, claiming "originality" in their ability to provide wireless

⁶⁵ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p. 100.

services. Among those was AT&T, which requested an exclusive pioneer's preference.⁶⁶ Considering the goal of the program was, in part, to reward innovation by companies trying to break into the market, the idea of awarding such a license to AT&T, or many of the other established players who filed for consideration, would certainly have defeated the purpose.

In October 1992, the FCC awarded three Pioneer's Preferences to American Personal Communications (APC), Cox Enterprises and Omnipoint Communications, and denied 53 other requests for similar treatment.⁶⁷ APC's innovation was the company's Frequency Agile Sharing Technique (FAST), which optimized PCS channels, independent of both modulation and access techniques. Cox was granted a preference because of its "development and demonstration of technology to use cable television plant for connecting PCS microcells."⁶⁸ Omnipoint had completed innovative work on spread-spectrum techniques for transmission of information.

The grounds for rejecting the other petitioners included:

⁶⁶ Huber, et. al, The Geodesic Network II, p. 2.20.

⁶⁷ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p. 99. The Commission had already dismissed three dozen preference requests earlier in that year.

⁶⁸ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p. 100. The basic strategy was to develop a system similar to the CT-2/Telepoint system in the US, with a twist.

Cox and Cablevision Systems have both demonstrated the use of a technology from Nexus Engineering Corp using remote antenna devices (RADs), which are connected to pole-mounted strands of cable that act as "extension cords" to remote antenna signal processors (RASPs), which are equivalent to microcells. RADs, which can cover about a 1,000 foot diameter area, use the same frequencies as the RASPs, so no handoff is necessary between RADs. They are "dumb," i.e., they don't need to do any of the processing required for handoff, and this allows them to be small and cheap. The tradeoff is the capacity of any one RADs. Calls delivered to the RASPs from the RADs via cable are converted to telephone specifications and relayed to the cable company's headend, where the handoff intelligence lies. Using this technique, which in telephone parlance could be "backhauling," the more complex processing for the whole system is done at a central location where the costs can be shared, rather than at every cell site.

The above description is from Donaldson, Lufkin & Jenrette, Cellular Communications Industry Analysis, January, 1993. This technology formed the basis of Cox's successful pioneer's preference application to the FCC.

- failure to provide sufficient technological showing of preliminary results of an experiment;
- failure to demonstrate development of the capabilities or possibilities of a specific identifiable PCS technology or service;
- lack of demonstrated innovativeness;
- the technology or service proposed was essentially the same as that already provided elsewhere; and/or,
- the technology or service was proposed for spectrum not included in the proposed PCS rules.⁶⁹

Having discriminated between the winners and losers, the FCC now had to determine exactly what the winners had won. In the initial formulation, the pioneer "would immediately receive a license to provide the new service, with no competing licenses to be awarded for six months."⁷⁰ But that idea was derailed with the rise of the Congressional debate on the passage of the General Agreement on Trade and Tariffs (GATT) treaty in late 1993.⁷¹

Legislation passed to implement the GATT used the spectrum valuation of the PCS auction to determine the exact nature of the reward. Pioneer's preference winners must pay "85% of the average price paid for comparable licenses sold at auction. The amount can be paid in a lump sum or in installments over a five-year period."⁷² The FCC was granted the right to identify comparable licenses and apply the payment formula.

With the results of the auction completed, APC chose the license for the Washington - Baltimore market; Cox Enterprises won a Los Angeles/San Diego License; and Omnipoint received a New York license. The three had to pay a total combined price of \$700 million for their licenses.⁷³

⁶⁹ "PCS: The Quest for 2 GHz Spectrum," *Telecommunications Reports*, 1992. p. 101.

⁷⁰ The 1993 Cellular Telephone Atlas, Paul Kagan Associates (Carmel, CA: Paul Kagan Associates, April 1993) p. 5.

⁷¹ Congress eventually passed a new treaty based on the GATT framework to establish the World Trade Organization. The granting of a pioneer's preference was tied to restrictions on trade and concerns about the "unfair enrichment" of preferential licensees.

⁷² "FCC Plans to Fine-Tune Pioneer's Preference Rules," *Telecommunications Reports*, March 6, 1995. p. 45.

⁷³ "Broadband PCS Auction Nets \$7.7 Billion; AT&T, Sprint, Bell Companies Win 70 of 99 Licenses," *Telecommunications Reports*, March 20, 1995. p. 3.

The program's effectiveness has been questioned, even by those who have been granted the licenses. In addition, the FCC's right to offer pioneer's preferences "sunset" on September 30, 1998, which is the same day that its auction authority is set to expire.⁷⁴ But these difficulties obscure the basic fact that an objective was achieved: Three companies that might not have been able to play a role in the development of Personal Communications Systems found a role to play in the auction process. More critically, if the program is continued successfully, the possibilities of being granted such a preference could be included in the calculations that companies make for positioning their research and development work; with a 15% discount on licenses after auctions are completed, there is a definite incentive to win.

2.3 Wireless Access and the Convergence in the American Telecommunications Industry

We have reviewed the proceedings of the PCS auction, focusing both on the regulatory and corporate strategy underlying the birth of PCS. But while the proceedings continued apace during the first five years of this decade, the telecommunications industry transformed itself in a fundamental way: The potential for integration of wireless and wireline assets was recognized and concerted steps were taken to bring about the convergence of the two kinds of access. This strategy will fundamentally alter the progress of both cellular and PCS access as the next few years develop.

The prime case study of the potential for the convergence of wireline and wireless access comes from the giant of American telecommunications: AT&T. In reviewing the purpose and execution of AT&T's purchase of McCaw Cellular Communications in 1994, we will begin not only to understand how the present of wireless access has been defined by the past, but also point to the best future for the development of this kind of corporate institution as it relates to our overarching public policy goal of increased and enhanced service penetration.

⁷⁴ "FCC Plans to Fine-Tune Pioneer's Preference Rules," *Telecommunications Reports*, March 6, 1995. p. 45.

AT&T's relationship with McCaw Cellular Communications began in 1992 with a purchase of a 19% ownership stake in the company. Early on, the move to take a stake in the company was seen as an opportunity to use wireless to break into the local loop.

AT&T's purchase of a stake in McCaw was not a total surprise... For AT&T the stake in McCaw/LIN has both offensive and defensive attributes. First, it enables AT&T to influence -- and perhaps someday control -- the largest cellular operator in the United States. Moreover, most of McCaw/LIN's pops are in major cities (including New York, Los Angeles, Dallas, and Miami), and roughly two-thirds of all domestic long distance calls originate or terminate in the top 20 to 25 U.S. cities. Second, we have long hypothesized that if roughly 20% of the U.S. population is going to use or own a wireless handset early in the next century, heavy communications users (people with a strong need to be continuously in touch) will constitute the vast majority of cellular subscribers. We would further argue that the heavy cellular user is also likely to be a heavy user of long-distance services. The combination of these two observations means that AT&T had to get in front of that potentially huge long-distance calling pattern and subscriber base of the future, or else risk losing it to a competitor like MCI, Sprint, or some other party acting as a "wholesale" long distance carrier that McCaw could market on its own as "McCaw long distance."

From an offensive perspective, the McCaw deal will enable AT&T to better utilize its brand name and distribution channels; to cellular infrastructure equipment to McCaw/LIN; to sell consumer and business wireless hardware; and to tap the potentially huge emerging market for wireless data and messaging. It probably improved AT&T's visibility and status in bidding for the new international wireless licenses.⁷⁵

This is certainly a definite vote of confidence from a prestigious investment house, but it also reflects what was to be perceived as a strategic necessity for AT&T: Gaining access to local customers by integrating its access offerings to customers. This was a business that AT&T invented and abandoned more than a decade before, and now it was trying to rebuild its position in that business. Eventually, AT&T decided to purchase the whole company, a move which cost it \$12.6 billion.

Why did Craig McCaw sell out the remainder of the company? As Bob Ratcliffe, McCaw's Vice President for Corporate Communications in 1993, said, "he was looking for a new challenge. And he

⁷⁵ Dolandson, Lufkin & Jenrette Cellular Communications Industry Analysis, January 1993.

had taken it about as far as it could go."⁷⁶ Of course, the incentive of about \$1 billion in AT&T's stock certainly did not hurt matters much, either.

But there was likely a deeper issue. Despite the tremendous growth of cellular, and the projections for the next wave of PCS growth, McCaw Communications never really made money. In 1992 alone, McCaw lost \$364 million,⁷⁷ in great part because of the mass of debt that had been built up during the explosion of growth in the 1980s.⁷⁸

AT&T had a great challenge ahead, one that faces each of the wireline service providers with wireless assets: How to merge together the wireline and wireless businesses so that the company can directly deal with the customer? AT&T faces a challenge in bring the two cultures together; AT&T is known as a very hierarchial organization, while McCaw's culture is characterized by words like "chaos" and "frenzy."⁷⁹

There were also regulatory hurdles to overcome. After AT&T purchased McCaw, the company was restricted from using the AT&T name to market wireless services for one full year. As soon as that restriction ended, AT&T unveiled joint wireless and interexchange offerings. The aggressive move by the company came, in great part, because of MCI's purchase of a long-distance cellular reselling company, which brings MCI directly into competition with the AT&T/McCaw service network in providing bundled long-distance discounts to cellular subscribers.⁸⁰ Now with AT&T's recent second breakup, the push to integrate the structure and marketing of the company's integrated services will likely receive even more life and energy.

What it came down to was this: Wireless access needed wireline access, and vice versa. The financial burden of building a wireless access network was a critical factor, but it is in the economy of providing a single platform to customers that makes wireless access a critical component to any company's integrated platform. Considering the efforts of some to spin off wireless franchises and

⁷⁶ Personal conversation with Bob Ratcliffe, October 1993.

⁷⁷ *Imagine No Limits*, McCaw Cellular Annual Report, 1992.

⁷⁸ We have already covered McCaw as a case study of the growth of cellular access in chapter 3. The details of how McCaw accumulated the debt and equity financing necessary to build their networks appears, in part, in George Gilder's "Mike Milken & The Two Trillion Dollar Opportunity," *Forbes ASAP*.

⁷⁹ Andrew Kupfer, "AT&T's \$12 Billion Cellular Dream," *Fortune*, December 12, 1994.

⁸⁰ "AT&T Unveils Joint Wireless/Interexchange Offerings," *Telecommunications Reports*, August 7, 1995. p. 33.

licenses, this claim is certainly not the consensus view in the American industry. But if McCaw Cellular can not push forward, even when it is at its strongest and the margins are thickest, how can wireless survive without wireline in an environment with razor thin margins and potentially dozens of competitors?

The story of AT&T and our review of the development of the United States wireless access market tells us a great deal about how strategic liberalization can work in practice, and what the rationale of such a package would be in the American context. If the future of telecommunications service is in the unification and convergence of wireless and wireline access, then the main challenge is to overcome the boundaries that would separate them. Facilitating the convergence of access in the industry will promote the conditions of full competition, with competing platforms and a variety of services being offered over those complete platforms.

The ultimate goal of this development would be the transition from the constrained competition of the present to full-fledged, facilities based competition between a variety of access providers. A company like AT&T, especially after the second divestiture in 1995, is a natural facilities based competitor, and should be considered a model for the future telecommunications development of the country. Other providers will have to struggle to acquire the same assets if they are to offer a full range of services and sustain themselves in an environment of increased competition.

The primary fissures are the two that we have already identified: National versus local authority and universal service versus competition. Given the existing condition of the telecommunications marketplace in the United States, what are some of the essential regulatory innovations in overcoming those fissures? And, what are some of the corporate strategies most likely to promote the close coordination of wireless and wireline access, thereby offering a total solution to a variety of customers with their individual preferences and needs?

3. Strategic Liberalization in the American Context

Part of the answer to that question lies in the program of strategic liberalization that has already been laid out. The specific steps we have already discussed, some of which were pioneered in the past few years of American telecommunications development, are the first step down that road. But to make

strategic liberalization truly applicable to the American case, it needs to be modified to meet the particular history of the sector's history.

Only wireless access can be local and national at the same time. The cost of building a ubiquitous wireline network, a truly national network, is prohibitive. It will not be possible for a company to develop a platform that competes nationally without some major investment in wireless access. Even if all of the Baby Bells were to merge together tomorrow, it would only be a temporary solution to the needs of national and local access; eventually, wireless service providers would acquire the advantage of lower variable costs in maintenance and lower fixed costs in infrastructure investment, and undermine the viability of the wireline network.

Only wireless access can be universal and competitive at the same time. The whole idea of universal service is revolutionized through wireless services: it is no longer universal service, but universal access that is important. As soon as everyone can access, for a reasonable price, basic telecommunications and information services, then the true public policy question can be asked: The private sector has offered access; how can we help people pay for access? That question is not for this discussion, but setting the framework so that the question can be asked and answered by government and corporate managers in cooperation certainly is.

The next four sections provide the outline for how strategic liberalization through wireless access can overcome the local and national divisions, as well as the philosophical divide between universal service and competition. We will examine four aspects of the strategic liberalization program:

- The Convergence of Wireless Access
- Auctions and Pioneer's Preferences
- Co-location of Facilities
- Wireless Local Loop Access

3.1 The Convergence of Wireless Access

As the above discussion makes clear, for wireless access to become national, local and universally available, wireline and wireless capabilities will have to be merged. But before wireline and wireless

access converge, there has to be a regulatory move to promote the convergence of the various kinds of wireless access.

Again, we start from the well established point that bandwidth is bandwidth. Any services that are provided on one part of the electromagnetic spectrum can be supported elsewhere, albeit with different technical specifications and equipment modifications. Given that fact, what is to prevent a licensee for wireless cable to provide PCS type services? From the technical point of view, absolutely nothing. From the regulatory point of view, everything is structured to prevent an operator from crossing over service boundaries.

But the licenses and auction structure that the FCC has put into place does not reflect that at all. As George Gilder has put it, "it is as if the FCC's Reed Hundt is auctioning off beachfront property, with a long list of codicils and regulations and restrictive covenants, while the tide pours in around him and creates new surf everywhere."⁸¹ Gilder's view is that the law of the microcosm will push network intelligence to the edge, replacing the dumb terminals in the traditional cellular paradigm to the end users, and that the present framework for wireless access resembles the mainframe systems which were blown apart by personal computing in the 1980s.⁸² So the constraints of licenses will not hold back technology, only impede its progress and limit the development of the telecommunications sector. The question is, therefore, how do we get beyond licenses in the American context?

Licenses are defined according to the kinds of services that can be provided. But let's be blunt: Given the kind of strategies expressed for PCS during the build up to the auction, is there really any difference between cellular and PCS offerings? No, that's openly admitted by the industry participants. So why is there the illusion that "cellular" is in one band and "PCS" is in another band?

Another example. When the FCC begins to license interactive wireless data licences, what will be difference between the services provided there and sending a fax over a wireless cellular network using CDPD? Technically, nothing, it's an image, encoded and sent through the air from one place to another.

⁸¹ Gilder, "Auctioning the Airwaves," *Forbes ASAP*, May 1994. p. 110.

⁸² "George Gilber's Telecosm; The New Rule of Wireless," *Forbes ASAP*, March 29, 1993.

Wireless services must be permitted to converge, if not in name then at least in character. Regulatory policy, and corporate strategy, needs to move towards an understanding of the basic common denominator of wireless access and begin to permit any services to be offered on any bandwidth.

Part of the purpose in creating such divisions, the regulators would say, is to help establish a structure for competition. By creating the distinction between PCS and cellular, for instance, it was possible for the FCC to prohibit cellular providers to purchase and stockpile bandwidth during the auction proceedings. But what prevents the FCC from establishing an overall limit, say 50MHz throughout the whole spectrum within any specific geographical area, to sustain that position? As soon as the Baby Bells begin to purchase wireless cable franchises, that number will probably be too low, and perhaps the FCC might get put in a position where companies have bits of all sorts of spectrum and the Commission will not be able to do anything about it post facto.

The first step, therefore, is putting into place a regulatory framework that understands the basic commonality of wireless access services and allows providers to begin offering all different kinds of services within their service territories. By pushing wireless convergence, the long term goal of platform convergence will be facilitated, thereby enabling further competition and increased service penetration.

3.2 Auctions and Incentives: Pioneers Preference

With the convergence of wireless access established, the process for auctions and pioneer's preferences becomes clearer and more efficient. Auctions are no longer about one particular service, but focus on opening up the market to new participants. After the market can not bear any further entry and the sufficiency of spectrum is no longer a barrier to entry, the regulators will have achieved their most critical goal: They will have put themselves out of a job.

But there are a number of steps that need to be taken before such a possibility could even be conceived in practice. The FCC still has much to do in ensuring opportunity for new market entrants and motivating technological innovation during this period of intense technological change. That is why the pioneer's preference program, with all of its troubles and evident pitfalls, has a critical role to play.

What has not generally been discussed in the trade press is the necessary connection between the auctions and the pioneer's preference program, a connection that was not recognized by the FCC until late in the game and was eventually imposed upon the Commission by Congressional dictate. The auctions set the ground for incentives to be established by regulators that will aid in achieving the critical public policy goal of increased penetration and enhanced service quality.

Spectrum licenses have been valued appropriately through the most recent auction. If the FCC chooses, it can announce that licenses will be available for wireless services in any of the nation's MTA markets, say a 30 MHz license in the space just above 2 GHz. The license would be given to any company willing to apply for the award at 85% of the cost of the license, and the winner of the award could choose the service territory of their choice. Slowly but surely, companies would target innovations and opportunities to fill gaps in their networks, or small companies would continue to focus their work so that they could take advantage of the program. The cost in administering the program would not be too substantial, and the criterion for acceptance of applicants has already been set. The only downside for this program would be that in the areas where awardees choose to provide new services, the level of competition would be increased. But, in a competitive market with no barriers to entry, that is just a fact of life.

This connection between auction processes and regulatory incentives deserves to be explored further, but there is definitely a lesson to be learned at least from the discussion. Strategic investments in wireless services can be harnessed to induce further competition in the market, because such an investment can be tied to reductions in barriers to entry. And, in an industry which has been characterized as a natural monopoly because of the high fixed costs of entry, this is the most critical struggle in establishing a competitive environment.

3.3 Co-location of Facilities

To run a wireless network, sites for cells and transmitters are required. Once the licensing is done, the most difficult part of constructing such a network is finding the most suitable sites for locating cells. And there are two dimensions to finding a suitable site for cells: The sites have to be technologically suitable (i.e. positioned to provide maximum coverage in appropriate areas), and politically suitable (i.e., acceptable to local authorities with control over zoning issues).

Both of those issues directly impact the costs of constructing and operating a commercial mobile radio service. For example, it is estimated that "costs involved in the acquisition of cell sites can account from about one-fifth of the cost associated with building a PCS cell."⁸³ That would include not only the purchase of the actual site, but the research and occasional political arm-twisting required to get things done at the local level.

As is the case with other areas of conflict between local authority and national development, the problem of zoning and location of facilities is complicated by the vagueness of law and regulation.

The issue of federal preemption of local zoning and other regulations represents a battle between two valid, but conflicting, public policy goals. On the one side, federal policymakers, as set forth in the Communications Act of 1934, are trying to bring advanced communications services to the public. On the other side, communities and citizens are trying to preserve local control over their land and affairs -- a long-standing tenet of American political culture. In essence, the issues surrounding federal preemption of local regulations affecting antenna siting derive from ambiguous language contained in the omnibus Budget Reconciliation Act of 1993 -- the legislation that established the Commercial Mobile Radio Service (CMRS). In that Act, Congress stated in part "...no State or local government shall have any authority to regulate the entry of or the rates charged by any commercial mobile service or any private mobile service, except that this paragraph shall not prohibit a State from regulating the other terms and conditions of commercial mobile services." Each side in the preemption debate has interpreted this passage as supporting its position.

Without adding information or clarification, congressional intent regarding preemption in the case of zoning and antenna siting remains unknown.⁸⁴

⁸³ "Telecommunications: Current Analysis," *Standard & Poor's Industry Surveys*, November 25, 1993. p. T4

⁸⁴ *Wireless Technologies and the National Information Infrastructure*, Office of Technology Assessment. (Washington, DC: United States Government Press, 1995) p. 202. Bolds are from the report. The report points out that two possible resolutions exist: The FCC determines the grounds for preemption through its continuing consideration of such petitions, or that Congress makes clear its intentions regarding the legislative language "and offers a specific interpretation regarding local zoning and antenna siting -- either by supporting it explicitly or by requiring states and local governments to resolve antenna siting issues through negotiations with wireless companies." The FCC docket 93-62 has been assigned to this issue, and Speaker of the House Newt Gingrich publically supported preemption in his speech to the Wireless '95 conference in New Orleans, February 1, 1995.

Besides providing further support for our ongoing discussion of local versus national authority as a defining fact of American telecommunications development, the above quote makes it clear that no Federal action to preempt local authority on this issue is likely to be forthcoming. Even if it is, there is certain to be challenges to the moves made either by Congress or by the FCC in this area, which will only serve to delay the introduction of new wireless services in many areas.

But one of the tenets of the strategic liberalization policy could play a significant role in alleviating, at least temporarily, this difficulty. The co-location of wireless facilities has already been shown to enhance the ability of service providers to reduce the costs of building and running a network by lowering the price of site locations. Interestingly enough, co-location might also be the answer to the problem of local versus national authority on cell locations.

By aggressively pursuing the co-location of facilities, either by requiring such agreements to be made of facilitating agreements through appropriate economic incentives, the cell sites presently in use today for cellular services are much more likely to become available for the initial roll out of PCS services. Granted, this is only a temporary solution; PCS licenses will require more cell sites in order to ensure maximum coverage, so replicating the cell site map for cellular would not be enough. But at least this would give PCS providers a critical first step in putting their network together.

Pursuing this policy option has the added advantage of bringing down provider costs as well, which, in the long run, is much more likely to increase the penetration of services. Although co-location will not resolve the issues facing regulators and the Congress, it provides an opportunity to circumvent those issues and get on with the business at hand: Increasing the availability of wireless access services to America's citizens.

3.4 Fixed Wireless Systems and Universal Wireless Access

The predominant model for wireless access service has been cellular access, a model which suffers from the liability of being a premium service in a world which will require cheaper forms of wireless access. Considering the American romance with the automobile, and the fact that most Americans commute to work every day in an automobile, the fact that cellular systems have relied on providing

high mobility to customers comes as no surprise. But as companies integrate platforms and begin to see opportunities to reduce costs and gain a greater market share, the possibilities of moving away from a cellular model will become more and more attractive.

The clearest alternative is the fixed wireless local loop architecture, which provides wireless access between the telecommunications network and a fixed point, such as a home or office. Such systems are less expensive than those which are used for cellular service provision, and the difference in pricing would allow a market entrant to undercut the prices of incumbent carriers if it could make the service attractive to users.

There is some experience in the United States with fixed wireless local loop applications. Perhaps the most famous is the Basic Exchange Telecommunications Radio (BETRS). The FCC permitted the new class of radio communications to permit companies to use digital radio instead of copper wire "in situations where it was more cost effective," which meant mostly rural applications. By the early 1990s, there were more than 50 BETRS systems serving several thousand customers.⁸⁵

Other experiments with wireless local loop applications in the United States have primarily been based on the same technology as appeared in the UK for CT-2. In 1989, Cellular 21 became the first company licensed for CT-2 experiments in the US, and they were permitted to use the 866-868 MHz band allocated usually to regional public safety communications.⁸⁶ As of April 1993, there were more than 200 license applications for PCN/CT-2 technology trials from companies like AT&T, GTE, Ericsson, Motorola, and a variety of other large and small companies. Certainly, there was at least a broad-based consideration of the way wireless local loop technology might apply to the competitive marketplace.⁸⁷

But the cellular model won the day in the run-up to the licensing of PCS. Many of the initial entrants will use PCS as another way to provide cellular services, emphasizing mobility and the functionality of its all digital network. But as companies face increasing competition and margins are cut thin, there will be compelling reasons to turn to fixed wireless local loop applications as a product

⁸⁵ Calhoun, *Wireless Access and the Local Telephone Network*, p. 38. See also pages 155-188.

⁸⁶ *The 1993 Cellular Telephone Atlas*, Paul Kagan Associates (Carmel, CA: Paul Kagan Associates, April 1993) p. 4.

⁸⁷ *The 1993 Cellular Telephone Atlas*, Paul Kagan Associates (Carmel, CA: Paul Kagan Associates, April 1993) The complete list appears on pages 13-15.

differentiation scheme. For example: When AT&T begins to compete as a cellular provider, and squeezed margins make it more difficult to increase revenues, the company could choose to isolate part of its license for fixed services at a much lower cost. A wireless phone and service package could be offered to customers at a much lower price, with the restriction that the service can only be used in the home (like a cordless telephone) or in the office (if an appropriate cell site is available in the office). Such a system could even be priced under the landline access charge of the local telephone company, thereby winning a customer that might be more willing to invest in more mobility later.

This kind of market development scheme is the first step in replacing the landline phone, which is exactly what AT&T will have to do if it wants to establish a universal network and offer services to everyone. Since the future is in competing networks, George Calhoun's vision would be achieved: Companies would be using a variety of wireless access schemes to promote a world where access to the local telecommunications networks is carried through the portals of the airwaves.

4. Conclusion: Service Through Wireless Portals

The best telephone people in the world did once walk through the portals of old AT&T buildings, supporting the universal network that broke apart as competition became more and more the reality of the telecommunications sector. But the past decade has only been a prelude to the world that lies ahead in American telecommunications development.

Overcoming the divisions of local versus national authority, while simultaneously resolving the philosophical differences between the need for universal service and the goals of increased competition, will be critical to freeing up the resources, people, and institutions that will build the telecommunications networks of the future. Only wireless access can bridge the gap between those divides, but perceptions of wireless access need to change in America in order to ensure that such a goal is reached. Through innovations such as the auctions and pioneers preference programs, government can come together with corporate managers in establishing a framework for the development of the telecommunications sector so that the public policy goals of enhanced service and increased access are achieved. Only then can the best information and telecommunications services pass through open portals directly into the hands of the people who want and need them.

Chapter 6

Strategic Liberalization in the UK: Defining the Institutional Consensus

It seems that you can buy a wireless telephone and service package on any given block in downtown London these days. Advertisements for the United Kingdom's four wireless access providers are everywhere in 1995, and dozens of possible service packages have been offered to tempt consumers from all walks of life to purchase a wireless phone.

But the true nature and the extent of competition is hidden by the fanfare and flurry of advertisements and marketing. As one professional has put it, the market for wireless access in the UK bears the "strong illusion of competition."¹ As we will find, that strong illusion is a few steps away from the policy of strategic liberalization that we have discussed, but the conditions in the UK are such that some of the advantages of strategic liberalization will become more apparent in the years to come. The critical piece of the puzzle will be to establish a model for institutional cooperation; a model consistent with and built on the dramatic leap forward Britain has made in the past decades.

This chapter focuses on a description of the existing market for telecommunications services in the UK, specifically discussing the evolution of the market for wireless access services. We then turn to an evaluation of the government's policy on wireless access, using the policy of strategic liberalization as a criterion for evaluation and the suggestion of policy to support the sustainable development of facilities-based competition. The chapter concludes with a further refinement of strategic liberalization, giving us more insight into how the practice of this theory can help ensure a vibrant and competitive market for telecommunications services.

¹ Interview with Clive Ansell, Director of Strategy, Marketing and Planning, BT, March, 1995.

1. The History of Telecommunications in the United Kingdom

Like in the United States, the first institution which arose to provide telecommunications services in the United Kingdom were privately owned. But, unlike the example from across the Atlantic, the early history of telecommunications development in the UK is marked by a slow but conscious trend by governing authorities to dominate and control the new technology.

The first telephone exchanges were constructed in the United Kingdom by the Bell and Edison companies in London in 1878 and 1879, with the patents for the technology acquired by United Telephone Company (UTC).² As the UTC began to sell exchanges in Britain and raise money for their ventures, the company ran into a number of legal and bureaucratic challenges from the Post Office. Eventually, the company was forced to assign the patents to the Post office in 1880.³

But after the patents were transferred, the Treasury did not allow the Post Office to market the service. Between 1881 and 1898, the Post office installed "only 49 telephone exchanges, of which only three had more than 20 subscribers and nine had no subscribers at all."⁴ The critical battle was being fought for the trunk lines which provided long distance, rather than for the local exchanges. Eventually, the government decided to nationalize the long-distance lines and put them under the control of the Post Office, and the Post Office was given the mandate to compete directly with the local telephone providers.

To further fuel competition, the government granted six municipal licenses to provide telephone services, all of which, except one, failed and had to be repurchased by either the UTC or the Post Office.⁵ By the late 1890's, the National Telephone Company (NTC) had been built on the combination of the UTC, Lancashire and Cheshire Telephone Companies, but there was little economic incentive for them to invest in network construction. "Vague government intentions and a

² Jill Hills, "Back to the Future: Britain's 19th Century Telecommunications Policy," from *Telecommunications Policy* (April 1993), p. 189.

³ Ibid, p. 190 See also F.G.C. Baldwin, The History of the Telephone in the United Kingdom (London: Chapman & Hall, 1938) and Douglass Pitt, The Telecommunications Function of the British Post Office: A Case Study of Bureaucratic Adaptation (Westmead, UK: Saxon House, 1980).

⁴ Ibid, p. 191.

⁵ The only municipality which was capable of sustaining a profitable company was Hull. For that reason, Hull still is served by its own independent telephone company.

serious threat of nationalization discouraged investors from assuming the risk of funding capital expansion," as Raymond Duch points out.⁶ "The impending takeover had the effect of inducing complacency in the NTC directorate," according to historian Douglass Pitt, "which, from 1908 onwards, had placed a moratorium on plant development."⁷ Eventually, the NTC agreed to turn over its network in 1911 after a Select Committee of the Parliament suggested nationalization.

During this period, which mirrors the interval between the expiration of the Bell patents in the United States and the establishment of the Kingsbury commitment, Britain did not experience a dramatic growth in the penetration of telephone service. The explanations for the slow penetration of the telephone before World War I range from the political economic analysis of Gerald Brock (the Post Office was trying to protect the telephone)⁸ to the sociological assessment of Douglas Pitt (the telephone was an instrument of business in Victorian England, and not a social instrument).⁹

Jill Hills' research suggests that there are other causes that should be considered. Hills argues:

[The] Treasury, in coalition with large users, determined tariff structures. Flat-rate tariffs and cost-based pricing resulted in cross-subsidization from small to large users and from local to long distance service."¹⁰

She suggests telephone service in Britain evolved out of the private wires of the telegraph service and resulted in a bias in favor of business users. As was the case for telegraph lines, subscribers had to pay the capital costs of the local loops.¹¹ This is the exact opposite of the experience in the United States, where the establishment of universal service required a coalition of local communities and local service providers -- a fact which resulted in the favorable cross-subsidization of residential

⁶ Raymond M. Duch, Privatizing the Economy: Telecommunications Policy in Comparative Perspective (Ann Arbor: University of Michigan Press, 1991), p. 220. See also John Francis, The Politics of Regulation: A Comparative Perspective (London: Blackwell Publishers, 1993).

⁷ Pitt, p. 54.

⁸ Gerald Brock, The Telecommunications Industry: The Dynamics of Market Structure (Cambridge, MA: Harvard University Press), p. 147.

⁹ Charles R. Perry, "The British Experience of 1876-1912: the impact of the telephone during the years of delay," from Ithiel de Sola Pool (ed), *The Social Impact of the Telephone*, (Cambridge, MA: The MIT Press), pp 69-96.

¹⁰ Ibid, p. 186.

¹¹ Ibid, p. 198.

services over business services and ensured that geographically isolated regions received telephone service. This set of factors defined the development of landline telephony in Britain, giving rise to the "top-down" investment and construction model common to many PTT administrations in Europe.

There is another critical factor, one which echoes the thoughts of Raymond Duch as presented in the first and second chapter. The inability of the government to establish an environment to protect and foster the growth of the telecommunications sector in Britain was a political failure -- one rooted not in the ownership structure per se but in bureaucratic and political constraints.¹² Over the course of the next 60 years, those constraints continued unabated and severely hampered Britain's ability to dramatically expand its telecommunications network and keep ahead of critical technological developments.

1.1 The Period of Monopoly and Public Stewardship (1912-1984)

On January 1, 1912, Britain's telephones were effectively nationalized by the purchase of the NTC by the British government and the incorporation of the network into the Post Office's telecommunications holdings. The resulting combination was less than adequate in comparison to other countries at similar stages of economic development. As Hills outlines in her 1986 book, Deregulating: Competition and Control in the United States, Japan and Britain,¹³ US telephone penetration in 1906 was one phone per 15 people, while, in Britain of 1930, penetration was less than one phone per 25 people. Local telephone calls in Britain were twice as expensive as in the United States and three times as expensive as in Norway and Sweden in 1927. Waiting lists of almost a half a million were not uncommon during the 1950's, and a domestic cartel controlled all equipment manufacturing and network construction through its close affiliation with the Post Office. In other words, the Post Office "inherited in 1911 a run-down network demanding large-scale capital investment."¹⁴ Clearly, the UK faced a significant telecommunications gap early on in the history of the sector's development.

¹² Duch, p. 217.

¹³ Jill Hill, Deregulating Telecoms: Competition and Control in the United States, Japan and Britain (London: Quorum Books, 1986), p. 84.

¹⁴ Ibid, p. 196.

Complaints about service and the relative poor performance of the sector prompted a number of attempts at political action. In the 1920's, members of Parliament publicly argued for the privatization of the industry.¹⁵ In 1932, 320 Members of Parliament supporting the national government signed a statement advocating "the adoption of a utility-type organization or the telco that would encourage a more business-oriented approach to the marketing of telephony."¹⁶ These initiatives did not do much to change the operation of the Post Office, leading to increased frustration among certain segments of the British political leadership. In 1969, the Post Office Act changed the status of the Post Office from a government department to a public corporation which still retained control of posts and telecommunications.¹⁷ Nevertheless, the change did little to improve the ability of the government to overcome three specific constraints: finances, employment and corporate strategy.¹⁸

BT could not borrow privately and had to rely upon government expenditure for its investment. This policy hamstrung its ability to manage its resources in a way that would improve the progress of the sector. As has been the case for almost every PTO organization throughout the world, the finance constraint also consisted of political decisions to keep prices rising at a rate less than the rate of inflation, causing gross margins to shrink and forcing the company to put off infrastructure investments which would have helped to improve services.

The labor unions also restricted the range of possible institutional transformations, and its inflated workforce in 1982 included 50% more employees than the French PTO. This difficulty was compounded by the fact that increases in real staff costs for the telecommunications sector outstripped increases in costs for other sectors of the economy by a substantial rate.¹⁹

Finally, British Telecom was compelled by government policy to choose British manufacturers, and all costs for the development of new digital exchanges were jointly shared by British Telecom,

¹⁵ Katrina Menzigian, "The United Kingdom as an American Laboratory; A Comparative Analysis of the Convergence of the Cable and Telephony Industries of the United States and Great Britain." (Medford, MA: Unpublished manuscript on file at the Edward R. Murrow Center for International Communications.)

¹⁶ Duch, p. 223.

¹⁷ Four Case Studies of Structural Alterations of the Telecommunications Industry (Chicago: Annenberg Washington Program in Communications Policy Studies, Northwestern University. 1988).

¹⁸ Duch, p. 228.

¹⁹ Ibid, p. 230.

Plessey and GEC.²⁰ This additional cost depleted the resources of the company, but not as much as the premium that British Telecom had to pay for the equipment relative to the cost of other potential suppliers from other countries. In sum, the constraints placed upon the company by the political institutions undermined the ability of the company to invest in its network, its people, and the services it provided to its customers.

1.2. The Preparations for Privatization

In 1977, Charles Carter was commissioned to evaluate the performance and organization of the new corporation, and his assessment was not favorable.

The report was highly critical of the Post Office's management structure, financial management and its policies towards the introduction of modern technology. Carter found that the Post Office, as a result of the 1969 Act, believed itself to have thrown off the shackles of Government accounting and to be operating as a commercial organization. However, its attitudes toward costing, toward price decisions and towards its relations with customers were far from those that should arise in a true commercial operation.²¹

This negative assessment of the Post Office's ability to administer the telecommunications network in the face of increasing economic and technological pressure came just before Britain elected the Conservative party to power in 1979. As Margaret Thatcher pointed out after her election: "If we stand idly while we watch others become more efficient, the time will very quickly come when what happened to British typewriters, and British cameras, and British motorcycles will also happen to the British information technology industry."²² To show her commitment to the reform of the sector, one of her early moves was to appoint Kenneth Baker as minister for information technology and placed the extension of competition policy to the telecommunications sector high on the agenda.

²⁰ Ibid, p. 231.

²¹ Garrison, Four Case Studies of Structural Alterations of the Telecommunications Industry (Chicago: Annenberg Washington Program in Communications Policy Studies, Northwestern University. 1988), p. 4.

²² Michael Palmer, Liberating Communications: Policy Making in France and Britain (1990), p. 244.

Baker and the Conservatives immediately set the groundwork for the Thatcher administration's first major policy measure in this area: The 1981 Telecommunications Act. The Act opened market for telecommunications equipment and manufacturing was opened up to competition and licenses to provide private value added network services (VANS) were granted to operators who met certain technical specifications. The Parliament also approved the creation of British Telecom, which became the new public corporation to run the national telephone network -- thereby separating the Post Office from the telecommunications business. Finally, Parliament decided to privatize and sell 100% of Cable & Wireless (The Marconi Company's grandchild) in 1983.

The first major company to be licensed as a value-added service provider was Mercury in February 1982. The license, granted and overseen by the Department of Trade and Industry (DTI), allowed Mercury to run a digital network that provided services directly to business users. A general license was issued soon after, allowing other competitors into the same market. In addition, the Parliament empowered DTI to license two cellular service providers in 1982, with one license eventually going to Mercury and the second to BT.

For BT, the issue was more than a response to changing regulatory realities, but rather a reflection of dramatic corporate culture change. BT's Chairman at that time expressed the intention to "change the ethos of this organization from that of a civil-service mentality to that of a market-oriented, customer service business."²³ This attempt to orient the company to the perceived challenges of privatization was a clear indication that the government's liberalization at the edges was soon to turn into something much more dramatic.

1.3 The Telecommunications Act of 1984 and the Establishment of Oftel

The Conservatives were not satisfied with the liberalization of the market, even though many of the steps they took during this five-year period were revolutionary in comparison to the highly regulated and tightly controlled public telecommunications operators in Europe and in other countries

²³ "Communications: British Telecom Gets Aggressive," *Business Week*, 16 November, 1981, p. 160. See also Kevin Morgan and Douglass Pitt, "Bureaucracy, Deregulation and Technology: The 'Ramping' of British Telecom (BT) and AT&T." Presented at the annual meeting of the American Political Science Association, Washington DC, 1988.

throughout the world. The Government took the final step and chose to privatize BT by selling off all of its shares in the company over the course of the following decade.²⁴ The Act further defined the regulatory authority of government agencies and the possible competitive roles of various private-sector players.

Perhaps the most significant element of the 1984 Telecommunications Act was the establishment of a new regulatory authority: Oftel, which is the abbreviation for the "Office of Telecommunications." Oftel was housed in the Department of Trade and Industry (DTI), a government portfolio with a broad authority over the industrial policy and economic development strategy of the British government.

The relationship to the Department of Trade and Industry is perhaps unique from the perspective of comparative telecommunications studies. The Ministry is formally the ultimate decision maker, but the analysis of the regulatory issues and the decision making in practice occurs at Oftel.²⁵ In that regard, almost everyone considers Oftel to be a comparatively less intrusive authority when compared to the American FCC.

Oftel's authority is also constrained by the other institutions with which it shares regulatory responsibility. The Radiocommunications Agency is responsible for radio spectrum management and the Monopolies and Mergers Commission (MMC) play a central role in determining the appropriate regulatory policy for the sector.

When it comes to implementing competition policy, this structure and division of responsibility has a number of advantages. For example:

²⁴ Garrison describes the decision to privatize BT as "the unanticipated outcome of conflict between different government economic policies." *Four Case Studies*, p. 12. Breaking up BT in a fashion similar to the breakup of AT&T in the United States was not a possibility because of the opposition of both BT management and unions, whereas privatization was seen as a lesser evil. There was even a lack of consensus about the privatization of BT among Conservatives; Harold Macmillian, the former Conservative Prime Minister, likened the privatization of BT to "selling off the family silver" in a 1985 speech to the House of Lords. For more information on the politics behind the decision to privatize BT, please see John A. C. King's remarks, entitled "The Privatization of BT in the UK," to the World Bank Symposium on Telecommunications Policy, 1990.

²⁵ Tyler, Bednarczyk, Brotman and Neuman, "Telecommunications Policy and Regulation," p. 17

The mechanism for changes in price regulation for British Telecom is the adoption of amendments to BT's license that are negotiated between Oftel and BT. If BT fails to agree to Oftel's proposal, Oftel itself cannot impose its view, but can refer the matter to the Monopolies and Mergers Commission (MMC) which has far reaching investigatory and enforcement powers. In practice, the threat of doing so has invariably been sufficient to ensure agreement.²⁶

Licenses for telecommunications providers follow the pattern of other common law in the British legal system; Licenses are evolving documents, and are not fixed in time as they are in the United States' system of jurisprudence. Alterations in regulation and legislation become part of the license of a telecommunications provider. Licenses, therefore, form the critical ground for the ongoing public debate about telecommunications service in the United Kingdom. The construction and alteration of those licenses provides, in many ways, the most telling historical signposts for the discussion of Britain's telecommunications sector because they define and codify changes in corporate institutional behavior.

The first such instance of Oftel referring a license modification to the MMC occurred in 1988.

In July 1988, OFTEL made its first reference to the MMC, asking it to investigate chatline and message services. The Monopolies and Mergers Commission's report on these services was published in February 1989. It concluded that the provision by BT of chatline and message services by means of its public switched telephone networks, and the provision by BT of a telecommunications service to other persons enabling them to provide chatline and message services by means of its public switched telephone network, operated or might be expected to operate against the public interest in that, due to the ease of access to the services and the terms of the contract between BT and its customers, the customer had inadequate control over the types of service which could be accessed and over the costs or charges that might be incurred for the use of the services, which significantly impaired the value and quality of the telephone service to the customer.²⁷

The result of the decision was that the BT license was modified so that the company had to provide its customers, in advance, the transparent costs for chatline services.

²⁶ Tyler, Bednarczyk, Brotman and Neuman, "Telecommunications Policy and Regulation," p. 19.

²⁷ Organization for Economic Cooperation and Development, Regulatory Reform, Privatization, and Competition Policy (Paris, 1992). p. 94-95.

This combination of institutional linkages and bifurcated responsibilities does place Oftel in a comparatively weaker position than other regulatory institutions throughout the world, but that has not prevented Oftel from taking a very active role on certain key issues. On issues of customer satisfaction and responsibility, for example, Oftel has become a critical watchdog on industry matters, often earning the ire of the carriers (particularly BT, which is often the target to Oftel inquiries).²⁸ In addition, Oftel has instituted some direct controls: requiring that BT increase its optical fiber plant from 2.045 million kilometers in March 1992 to 3.53 million kilometers by the end of 1997.²⁹ So the "light touch" is not often as light as would initially appear, a fact that has significant implications when we look in detail at how the sector for wireless communications in the UK has developed.

As of 1984, the newly created Office of Telecommunications had a long way to go before establishing the presence and authority apparent in the preceding passages. Its first critical task was to ensure the implementation of the most important provisions of the 1984 Telecommunications Act: The licensing of new competitors and reconstitution of licenses for existing market participants, most critically British Telecom. As the privatization of BT moved forward and as Oftel began its work to increase the level of competition in the telecommunications industry, a framework for constrained competition developed. This framework, defined largely by the structure of licensing arrangements in the sector, drove the institutional behavior of market participants throughout the remainder of the 1980's.

1.4 1984-1995: The Emergence of Constrained Competition

Following from the Telecommunications Act of 1984, there are three broad categories of licenses in Britain:

²⁸ For more detail on Oftel's activities in this area, see "Oftel: 1994 Annual Report; The report of the Director General of Telecommunications, Department of Trade and Industry." (London: House of Commons, 5 April 1995).

²⁹ Tyler, Bednarczyk, Brotman and Neuman, "Telecommunications Policy and Regulation," p. 18.

1. PTO (Public Telecommunications Operators) licenses, which generally provide for the provision of infrastructure and strict service and competition obligations;
2. Non-PTO licenses for local, regional services and interconnection with PTOs; and,
3. Class licenses, generally to permit operation and connection of terminals, classed as telecommunications systems under the Act.³⁰

Because these licenses define the strategies of corporate participants, it is not surprising that the framework of competition that followed from the passage of the 1984 Telecommunications Act would reflect the classes of licenses outlined above. Competition between providers occurred within each of these classes, but was limited by the nature of the licenses granted and the levels and nature of the investments made by the industry participants. In addition, competition between providers with classes of licenses had yet to take shape. This was a period of constrained competition, a time of preparation for what was perceived to be a broader competitive environment in the 1990's.

The most significant licensing change induced by the 1984 Telecommunications Act was the alteration of the BT license. No longer a government-owned and operated network, BT was positioned as the dominant carrier in a market that was to have at least one major competitor: Mercury Communications Ltd. Section 8 of the 1984 Telecommunications Act places PTO's under an obligation to provide services or connection on a non-discriminatory basis, as defined by the license. In the first category of licenses, that of the PTO operators, a duopoly policy was put into effect; Mercury Communications was licensed as a PTO to provide direct competition to BT for all telecommunications services.

In the beginning, Mercury was an independent operator with little of the infrastructure required to compete directly with BT for market share. Even after the purchase of Mercury by Cable & Wireless,³¹ the amount of investment that would have been required to build a competing network would be in short supply for the company, forcing it to develop a strategy common to many carriers

³⁰ Deloitte & Touche, European Telecommunications Regulation (London, 1994).

³¹ Mercury was initially a joint venture between C&W, British Rail and Barclays Bank. Mercury is presently a wholly-owned subsidiary of Cable & Wireless.

in the early stages of competition. Through the intervention of Oftel, Mercury would use BT facilities to directly compete with the company for market share.

That strategy required a clear definition of the costs and character of interconnection, a factor which remains a common problem for competition in British telecommunications policy up to the present today. The working out of the interconnection policy took more than three years, and focused on the difficult political question of interconnection between the two PTO's. In late 1982, a basic agreement between the two companies was reached, but it was not until October 1985 that Oftel published a determination on the terms of the full interconnection agreement at the switch level between the two networks.³²

When Mercury was licensed, the government promised to license no further fixed link national PTOs to compete with the company or with BT for at least seven years. During that period of time Mercury began to make inroads into certain portions of BT's market share, but did not erode BT's position as the dominant PTO in Britain. As of the end of 1993, BT still held about 89% of the market for voice telephony.³³

Another major investment in wireline capacity occurred since the Telecommunications Act of 1984: Cable television. In 1983, the government published as white paper entitled "The Development of Cable Systems and Services," which set out the policy for rolling out cable systems throughout the country. In combination with the Telecommunications Act of 1984, there was great expectation for cable to penetrate the British market quickly through the second half of the 1980's.³⁴ Those expectations fell flat, though. The initial level of investment was low, and, throughout the 1980's, there was much discussion on why the cable market in the United States was exploding while little or no penetration occurred in the major urban centers of Britain.

Perhaps the critical government action to spur the development of the cable industry was the raising of the ban in July 1989 on significant US investment in the cable industry. The immediate result was a tremendous influx of investment from major service providers and equipment producers such as

³² David Gillick, "Telecommunications Policy in the UK; Myths and Realities," *Telecommunications Policy* February, 1991, p. 6.

³³ *Global Telecommunications Review*, Lehman Brothers, 1993, p. 37. Some place the estimates even lower, with Mercury with a market share in the single digits.

³⁴ Brian Smith, "The Wiring of Britain," from *Wired Cities*, p. 344.

NYNEX, Comcast, and US West. Five years after the ban was lifted, the franchise map of England was almost complete, with 127 broadband franchises covering roughly 14 million homes, with American companies owning roughly 75% of the business.³⁵ Since that time, the cable industry in Britain has begun to achieve what some commentators would view as "critical mass" in terms of market presence.³⁶

With regard to the services that cable operators could provide, the government introduced one critical regulatory innovation in the early 1980's that no other country in the world attempted to implement. Cable operators were allowed to provide telephony in conjunction with cable services, first in association with one of the two carriers (BT or Mercury) and then, after 1990, on its own platform.³⁷ This was the clearest attempt to provide direct competition between two classes of licenses: the PTO and non-PTO industry participants. There are presently 106 operators authorized to provide telephony in their franchise areas,³⁸ all of them potential competitors to (or partners with) Mercury and BT.

The Duopoly Review and the Expansion of Competition

But direct competition had not yet begun in this critical area because of the delay in investment caused by the restrictions on foreign participation. By the early 1990's, as one observer put it, the market for services resembled more of an "oligopoly in which BT and Mercury -- or, more accurately, C&W -- are the dominant players, followed by Racal, British Aerospace Communications, the Regional Bell Operating Companies (RBOCs), North American cable companies and so on."³⁹ Each of the non-PTO players had been given their particular geographic and/or service niche and there was little effort made (and little opportunity given) to cross over into other niches and directly compete for services. BT was still clearly the dominant carrier, and Mercury had focused its attentions on businesses and intensive users of telecommunications services rather than the mass market.

³⁵ OfTel Annual Report for 1994, p. 43.

³⁶ Cornford and Gillespie, "Cable Systems, Telephony and Local Economic Development in the UK," *Telecommunications Policy* 1993.

³⁷ Smith, "The Wiring of Britain," p. 347.

³⁸ OfTel Annual Report for 1994, p. 43.

³⁹ David Gillick, "Telecommunications Policy in the UK; Myths and Realities," *Telecommunications Policy* February, 1991, p. 3.

OfTel responded to these market conditions as part of their Duopoly Review, a process undertaken through 1990 and 1991.⁴⁰ The thinking of OfTel's Director General during the Duopoly Review, Sir Bryan Carsberg, reflects the evident tension between adherence to a strong competition policy and the difficulties inherent in inducing competition in the telecommunications sector:

As existing competitors extend the scope of their operations and more competitors come into the market place, losses of economies of scale continue to mount and a time will come when the benefits of additional competition cease to outweigh the costs. The normal disciplines of the marketplace can serve to guard against the ensuing danger that higher costs are passed on to customers. Policy should be to stop assisting entry by regulatory means while continuing to encourage entry and use all regulatory weapons to prevent its being impeded by anti-competitive practices. New competitors will then succeed if and only if they can win their success through performance -- by superior efficiency, superior quality of service or innovative services.⁴¹

This statement reflected the prevailing view within OfTel that the regulatory assistance granted to Mercury was no longer necessary and that it was possible for the two companies to compete on equal terms through established interconnection agreements. The result of this consensus within OfTel and the government was a set of proposals enacted after the close of the Duopoly Review proceedings, with some of the most significant including:

- Ending the duopoly policy at the local, trunk and international levels;
- Removing the regulations which required cable TV operators to offer telephony only in conjunction with BT and Mercury;
- Permitting companies with partially common ownership with a fixed telecommunications operator to tender for new franchises and provide and carry entertainment services;
- Permitting the assets of utilities, such as electricity, rail and waterways, to be used for competing in the telecommunications market; and,

⁴⁰ For more information about the process of public comment and licence modification undertaken during the period of the Duopoly Review, see Tyler, Bednarczyk, Brotman and Neuman, "Telecommunications Policy and Regulation," Chapter 5, p. 12-16.

⁴¹ "Competition and Choice: Telecommunications Policy for the 1990s," A Statement Issued by the Director General of Telecommunications. (London: Office of Telecommunications. March 5, 1991) p. 3

- Allowing mobile operators to provide fixed communications services.⁴²

The results of these policy changes have been the diversification of the telecommunications market in the UK. In particular, Oftel's own projections indicated that, by the end of 1995, the number of national providers would increase from 2 to between 8 to 10 and that the number of local providers would grow from 3 to anywhere between 10 and 20. Since the end of the Duopoly Review in 1991, Oftel has granted a total of 60 PTO licenses for the provision of local or national telephone service.⁴³

BT: Retaining Market Strength

The Duopoly Review did loosen the protective bonds of BT and Mercury but, to date, no other company or combination of competitors has dramatically eroded BT's market share. That is because BT has done a tremendous job in protecting its market share, both in terms of the business decisions it has made and the active role it has taken in shaping the public policy process. Although some believe that the company will have to face a much bigger decline in its subscriber base in the years to come, it is clear that the company has managed well through the ten years since shares of the company were initially offered to the public.

It has retained its market position even while burdened by the traditional constraints placed upon a dominant carrier. The license granted to BT contains a number of provisions which defined, in many ways, its ability to affect the transformation it saw as critical to its future competitive success. Section 3 of the license requires BT "to promote the interests of customers, purchasers and other users in the United Kingdom (including, in particular, those who are disabled or of pensionable age) in respect of the variety of telecommunications services provided." This provision, along with others constructed to echo the universal service provisions of American telecommunications law, has formed the basis of many criticisms leveled against BT.

⁴² Roger Pye, Martin Heath, Gerry Spring and John Yeomans, "Competition and Choice in Telecommunications; The Duopoly Review Consultative Document," *Telecommunications Policy*, February 1991.

⁴³ Of that total of 60 licenses for PTO's that have been granted, 31 were granted in 1994. See Oftel Annual Report for 1994, p. 34.

As has traditionally been the case for the regulation of the dominant carrier in an environment of emerging competition, the language of the license attempts to define areas where cross-subsidization of service would be a detriment to competition.⁴⁴ In addition, BT was placed under an obligation to permit other authorized systems to connect to its system, with the quality sufficient enough to ensure that:

- Any customer of one public telecommunications system should be able to make calls to any customer of any other system
- When two systems are interconnected, customers can choose which system is to provide long distance.⁴⁵

BT has been able to focus its resources so as to reduce the impact of competition in certain critical areas during the 1980's, such as leased lines and circuits. Through this focused response to the potential of aggressive competition, BT has succeeded, so far, in achieving its "primary priority," to defend its position as the preeminent telecommunications provider in Britain.⁴⁶ Since BT's privatization in 1984, Iain Valliance estimated in a 1993 speech that BT has spent more than 20 billion pounds building "what is arguably Europe's most modern network."⁴⁷ At the same time, it has moved aggressively in its own market and throughout the world to establish itself as a premier telecommunications service provider, first by planning its own global network, then by purchasing a substantial stake in American long-distance provider, MCI.⁴⁸

⁴⁴ BT was brought under strict price regulation, also similar to the utility pricing used by American regulators (commonly known as RPI-X). The pricing regulation allowed BT to raise prices by a margin lower (or, less often, higher) than the increases in consumer prices, with the goal of incenting the company to increase its efficiency in providing services.

⁴⁵ *Ibid*, p. 25.

⁴⁶ Ian Ash, Director of Marketing, Personal Communications -- BT, Speech to the Coopers & Lybrand 1992 Telecommunications Management Forum (Berlin).

⁴⁷ Iain Valliance, Chairman, British Telecom, from the Keynote Address to the 1993 Coopers & Lybrand International Telecommunications Management Forum (Gleneagles, Scotland).

⁴⁸ John Keller, "British Telecom Plans Billion-Dollar Global Network," *Wall Street Journal*, August 18, 1992.

There appears to be little possibility of Mercury significantly eroding BT's present market share. Beyond the city of London, Mercury's impact has been "patchy."⁴⁹ As of 1994, Mercury had only 780,000 residential customers to match BT's 20 million. With BT bringing prices down and girding itself for further competition, the reviews of Mercury's potential for making serious inroads into the local market are mixed.

The direct impact of the development of cable television capabilities on competition for basic telephone service is still limited, but some see the construction of Britain's cable system as the precursor to much more significant levels of competition. By the end of 1994, the total number of subscribers to cable telephony numbered 717,000, an increase of nearly 130% during the whole of the year.⁵⁰ It is estimated that 103,000 businesses and 700,000 residences will be connected to cable telephony by the year 2000, generating 38% of cable's revenues.⁵¹ Nevertheless, this still represents a small fraction of the total number of subscribers for voice telephone service presently held by BT.

Britain's evolving regime for telecommunications legislation certainly had advanced competition for landline telecommunications services. Domestically, the result has been decreased prices, but not the weakening of BT's market position. Internationally, and especially within the European market, the result was a significant strengthening of Britain's comparative advantage as a source of investment, expertise and public policy models for telecommunications development.

But the overall result of the last decades of investment and change in the British telecommunications market has been the emergence of constrained competition. With BT in a strong position to retain market share for the foreseeable future, it will be critical to establish a new model for institutional

⁴⁹ Andrew Adonis, "Imagine All the People; Mercury's strategic rethink has become a rallying point for its 10,500 employees," *Financial Times*, April 1994.

⁵⁰ *Ofel Annual Report* for 1994, p. 43.

⁵¹ Adonis, p. 593. Cornford and Gillespie argue that such an increase in service and revenue is possible because, after the cable network is in place, the cost of equipment to support telephony is much lower than the revenue increase to be accrued through telephone service. John Malone, Chairman and CEO of TCI, which is the United State's biggest cable provider and a major investor in cable systems throughout the UK, recently commented in a speech that "we got 25% of BT's telephone market [quickly], with no elaborate services being offered." (*Telecommunications Reports*, April 10, 1995). International CableTel, which has a number of subsidiaries in the UK which hold cable/telecommunications licenses in a number of cities, report that 75% of new subscribers took both cable and telephony services. (*Telecommunications Reports*, February 27, 1995, p. 34).

interaction that removes the constraints on marketplace participants. If not, Britain could find the development of the telecommunications sector stunted by the same kinds of political failures that undermined the development of its networks in the early part of the century.

1.5 The European Context

Britain's conscious policy has been to position itself as the leader in the European Union with regard to the telecommunications sector. It also has played a central role in the development and promulgation of the European Commission's present policy advocating increased competition in the provision of telecommunications service and infrastructure.⁵² For evident reasons of comparative advantage and commercial interest, this opportunity to compete throughout Europe has been a significant part of the institutional consensus supporting the continued liberalization of the telecommunications regime to date.

Changes in the telecommunications policy of Britain should therefore be understood within the wider context of alterations in the European public policy framework. To a certain degree, Britain's policies were a response to the potential for increased competition within the European Union, but, as has become clear in recent years, Europe has more to learn from Britain's telecommunications policy than Britain can borrow from Europe. The ability of Britain to achieve a new institutional consensus for increased competition in the marketplace will depend greatly on how well Britain's comparative

⁵² Paschal Preston, "Competition in the Telecommunications Infrastructure; Implications for the peripheral regions and small countries of Europe." *Telecommunications Policy*, August 1995. On p 267, Preston writes:

It was not an accident nor merely a question of ideology that the Thatcher government pushed for the opening up of EC telecommunications markets in the wake of BT's privatization. Its active promotion of a pro-competition and free-trade regime in telecommunications markets elsewhere was clearly based to a great extent on perceptions of BT's comparative advantages compared to other PTO's, the economic advantages and benefits that were perceived to flow to BT, the UK national economy (and government revenues) as a result. This is made quite explicit in a number of UK policy documents on the 1980s.

position is improved and its commercial interests bolstered in Europe by the competitive development of the sector.

While Britain was rewriting telecommunications history in 1984, Europe began down the long road to a general proscription for EC-wide liberalization of the telecommunications market. The cumulation of a number of consultative documents on competition policy for the telecommunications market led to the 1987 Green Paper on the future of the telecommunications sector.⁵³ The European Commission laid down a set of objectives in the Green Paper for the member countries, including:

- Preparing the market for new innovation and development by supporting the industry;
- Allowing the telecommunications administrations to compete for new services with other suppliers;
- Starting a dialogue with the telecommunications industry and other organizations concerned to prepare for the expansion of the infrastructure; and,
- Initiating the establishment and implementation of European-wide standards in basic network infrastructure.⁵⁴

There was good reason for the Commission to focus on this sector in particular. By the end of the century, up to 7% of the combined gross national products of the Union's member countries will consist of telecommunications and related activities.⁵⁵

In setting these goals, the Commission was focusing its resources on how to address the particular "integration of the regulatory functions (such as licensing, type approval, certification, tariff setting) with network management and operational functions controlled by nationally sanctioned

⁵³ Towards A Dynamic European Economy -- Green Paper on the Development of the Common Market for Telecommunications Services and Equipment. Com (87) 290 Final, 30 June 1987.

⁵⁴ Euroscape Report, Telecommunications. Coopers & Lybrand Europe (Brussels, January 1994).

⁵⁵ "New Opportunities in Telecommunications: Towards a Dynamic European Economy," S.J Berwin and Company (Londong and Belgium: September, 1990).

monopolies."⁵⁶ But there was also a more subtle agenda being pushed forward. Since the publication of the 1987 Green Paper, one commentator notes, "the EU has become the major arena, influence and player in reshaping and setting the parameters of national telecommunications policies within member states."⁵⁷ The Commission was also using telecommunications policy issues to meet a broader objective: The assertion of Commission authority in integrating and deepening the Union itself.

Some of the Commission's influence came through the establishment of technological standards and infrastructure goals. A number of standards and consultative bodies were established, including the European Telecommunications Standards Institute (ETSI) and the acceleration of the effort to develop common infrastructure projects (mostly based on ISDN during that period). The Open Network Provision (ONP), the analog to the Open Network Architecture (ONA) espoused by many in the United States during this same period, was set as a long-term goal for a common, seamless infrastructure to deliver information and telecommunications services within the entire Union.

But the more overt attempts to determine policy within the member states provoked a number of legal challenges.⁵⁸ In 1992, the Court ruled that the relevant provisions of the Treaty of Rome "did not restrict the Commission's activities to checking up on how Community rules are applied in the

⁵⁶ William B. Garrison, "The European Telecommunications Directives: Provision Requiring Regulatory Restructuring," American Bar Association Communications Committee Monograph Series (1990/2) (Washington, DC: August, 1990), p. 2.

⁵⁷ Ronnie Preiskel and Nicholas Higham, "Liberalization of Telecommunications Infrastructure and Cable Television Networks; The European Commission's Green Paper," *Telecommunications Policy*, August 1995.

⁵⁸ *Ibid.*, p. 11. The grounds for the Green Paper, as outlined by the Commission, are derived from specific articles from the Treaty of Rome. In particular, the Commission cited the limits on the exclusive rights of public enterprises (Article 90), the rules on competition (Article 85) and on the abuse of a dominant market position (Article 86) and the free movement of services (Article 59). These Articles served as the basis of the Commission's defense in the late 1980's and early 1990's as member nations sought to overturn the Commission's policy on the liberalization of the sector before the European Court of Justice. See, in particular, the case brought by France against the Commission on the liberalization of the terminal equipment market (OJ 1988 L131) and the case brought by Spain, Belgium and Italy against the commission on the abolition of all exclusive rights other than voice telephony (OJ 1990 L192). More and more, the Commission is relying on Article 90 as the basis for its authority to press for liberalization of the telecommunications markets, arguing that the state-run telecommunications providers have too much control over the markets within member states.

Member States. It can also be used to end exclusive rights, particularly when these rights contravene Article 86 of the EEC Treaty (abuse of a dominant position [in a national marketplace])."⁵⁹

During this period of legal challenges, there was some liberalization in the regulatory framework of many European countries. But, as the table below indicates, no country was close to the standard for competition set by the British.

	General Alternative Provision	Discretionary licensing for self-provision	Discretionary licensing for corporate users	Commercial third-party provision
Belgium	No	No	No	No
Denmark	No	Yes	Yes	No
Germany	No	Yes	Yes	Yes
Greece	No	No	No	No
Spain	No	No	No	No
France	No	Yes	Yes	Yes
Ireland	No	Yes	No	No
Italy	No	No	No	No
Luxembourg	No	No	No	No
Netherlands	No	Yes	No	No
Portugal	No	No	No	No
UK	Yes	Yes	Yes	Yes

Source: "The Impact of Liberalization of Alternative Terrestrial Infrastructures for Non-reserved Services," Coopers & Lybrand. (London: 1994).

With the legal mandate clearly established and an apparent reluctance on the part of many member states, the Commission began to take the next logical step: Mandating the deregulation of the marketplace through the liberalization of the telecommunications market in all member states. The results of an extensive consultation procedure lead to a document, published in April of 1993, which

⁵⁹ Ibid, p. 10.

stated that the deregulation of the market would occur by 1998.⁶⁰ The Commission also commissioned and published what is known as the Bangemann Report in early 1994,⁶¹ further making the case for competitive changes within member countries.

The timetable for telecommunications service and infrastructure liberalization is as follows:

	Services	Infrastructure: Dates for Lifting Constraints on Alternative Infrastructures (i.e. Cable TV)	Infrastructure: Dates for full liberalization (including new operators)
Data/Non-voice communication	Since 1990	1995	1998
Voice telephony for corporate and closed users	Since 1990	1995	1998
Satellite communications	Since 1994	July 1995	1998
Mobile communications	Underway	1995	1998
Public voice telephony	1998	1998	1998

Source: R. Preiskel and N. Higham, "Liberalization of Telecommunications Infrastructure and Cable Television Networks," *Telecommunications Policy*, August 1995. p. 386.

To keep the above timetable on track, the Commission has set the goals of the harmonizing legislation and network standards, rebalancing tariffs as national liberalization proceeds, allocating funding for additional infrastructure investments.

These and other ideal steps may have been implemented in an ideal world, but the European Union of the present is not the ideal world. Spain, Ireland, Portugal and Greece almost immediately requested that they be exempted from the 1998 target date, and they have been given additional years for preparation. Germany's privatization process has moved forward in lurches and stalls, with union and

⁶⁰ COM(93) 159 Final.

⁶¹ "Europe and the Global Information Society: Recommendations to the European Council." (Brussels: The European Commission, 1994).

regional political difficulties hindering the ability of the government to implement the Commission's directives.⁶² Almost to the week after he took office, French President Jacques Chirac publicly stated that France Telecom would not be privatized because "threats of labor unrest make privatization politically infeasible."⁶³

These roadblocks have forced the European Commission onto dangerous political ground: The Commission has proposed to invoke Article 90 of the European Union Treaty (the Treaty of Rome) to compel the lifting of restrictions on the development of alternative networks.⁶⁴ The Commission's attack on the roots of national telecommunications sovereignty will probably not go untested by countries like France that have shown outward reluctance to liberalize the marketplace.

Even so, some more optimistic observers point to the emergence of "some major federative principles," such as:

- The separation of regulatory and operational functions;
- The establishment of independent consultative bodies on telecommunications policy; and,
- The reorganization of telecommunications systems through the definition of the different services likely to be offered by the networks (i.e. basic and value-added services).⁶⁵

The amount of variation within these general trends will make it difficult for the Union to balance the needs of harmonization and liberalization; the tension will remain between standardization by law and technical specification rather than through the development of the market.

⁶² At the time of this writing, the German Minister of Posts and Telecommunications, Wolfgang Boetsck, has publicly committed himself to the liberalization of the market by January 1, 1998, and the passage of legislation in time for the scheduled initial public offering of 25% of Deutsche Telekom's shares. See "German Minister Outlines 1998 Liberalization Plan," *Telecommunications Reports*, February 13, 1995, p. 42.

⁶³ "France Telecom Privatization Postponed," *Telecommunications Reports*, July 17, 1995, p. 40.

⁶⁴ "EC Approves Telecom Liberalization Directives," *Telecommunications Reports*, July 24, 1995, p. 27.

⁶⁵ Jaques Arlandis, "Trading Telecommunications; Challenges to European Regulation Policies," *Telecommunications Policy* (April 1993), p. 176.

Britain's Performance Vis-à-Vis Other European Countries

Ironically, Britain can safely be said to be far ahead of the curve when compared to its European compatriots. The irony is in the fact that Britain has generally been the advocate of national-over-European determination, but that the implementation of the Commission's directives offers a competitive advantage to British service providers.

Liberalization and privatization have given the British an advantage. For example, value-added networks have generated almost one billion dollars in revenue over the past decade, as opposed to \$666 million in France and \$428 in Germany.⁶⁶ The depth of experience for companies like BT, Mercury and the cable television companies should not be underestimated -- and, considering the fact that further liberalization is being resisted by the politicians of France and Germany may be a tacit recognition of British strength in this area.

Iain Valliance, the Chairman of BT, frames it as an advantage derived from BT's experience in an open, competitive market:

The UK prides itself, quite rightly in my view, on having the most open telecommunications market in the world. Certainly the UK is by far and away the most open in the world to entry by overseas firms. All other markets which allow competition of any significant extent impose restrictions on foreign companies. In the US, foreign owned operators cannot get common carrier radio licenses -- essential if you are to compete on equal terms with US carriers. In Japan, the maximum foreign shareholding in a type-1 facilities based carrier is limited to 33%. No such restrictions apply in the UK, as witnessed by the fact that 88% of cable franchises are controlled by North American companies, monopolists in their own domestic markets, and fiercely jealous of the monopoly that they have been awarded in the UK for conveying entertainment services to the home. The inequity, or asymmetry, is uniquely and comically British. Far from promoting competition, it discriminates against UK companies in preventing competition.⁶⁷

Having faced those kinds of pressures, Valliance is confident that BT can translate success into other markets as they open to foreign competition.

⁶⁶ Frost & Sullivan Ltd, from *Communications Week International*, June 4, 1990.

⁶⁷ Iain Valliance, Chairman, British Telecom, from the Keynote Address to the 1993 Coopers & Lybrand International Telecommunications Management Forum (Gleneagles, Scotland).

Given those comparative experiences, why has the Britain been able to chart a dramatically different course than most of the other countries of Europe? Duch suggests that the "British policy response is different because of the decidedly pluralist nature of its policy-making institutions."⁶⁸ He points to three important ramifications of pluralism:

1. Interest groups are much less beholden to the state and more comfortable with the lobbying of civil servants, ministers and members of Parliament;
2. Barriers to participation in the policy process are much lower in the United Kingdom; and,
3. Pluralist institutions in Britain permit policy outcomes that are build on the support of minimum winning coalitions.

Writing in 1991, Duch seems to feel that the British model will win out as the European Union charts its course towards consolidation. As he puts it:

A corporatist model could be imposed on those European institutions where European interests have very centralized organizations and are willing to participate in consensual decision-making forums. Similarly, the statist model could only succeed if the European Commission were able to command the degree of authority that is exercised by the French state, for example. Neither of these situations is probable because of the important role of the United Kingdom in the European Community. The country's pluralist structures (antagonisms between labor and industry and the passive role of the state bureaucracy) are inconsistent with corporatist or statist approaches. On the other hand, because pluralism accommodates diversity by its very nature, this institutional model is most likely to be adopted.⁶⁹

The European context is critical for Britain, but not because Britain has been able to learn from the Europeans. It is because Britain has the opportunity to dramatically affect the course of European

⁶⁸ Duch, p. 234.

⁶⁹ Duch, p. 270.

development in the telecommunications sector by example, and later through direct competition and investment.

1.6 The Legacy of Privatization, Deregulation and Regional Change

If Duch is right, and it is the ability of the British system to bring together diverse interests on common ground through an open political process, then the competition policy articulated in the early 1980's must be seen as the source of strength of the present British position. It is a policy which has benefited all of the major institutions and players significantly over the past decade, and puts each institution in the position to benefit further in the years to come.

For government, it has meant the implementation of a new philosophy: Competition and privatization of the public sector. No matter what the final judgment of history is for Margaret Thatcher's reign as Prime Minister, it can not be denied that the privatization of British Telecom, among other formerly public properties, brought billions of dollars of investment into the British economy and dramatically changed the nature of the economy and society. The acceptance of this model for political and economic relations is seen in the Conservatives continuing hold on power and the left's repositioning toward the center on issues of competition policy and public-sector involvement in economic affairs.

For BT, it has meant increased profitability and the opportunity to access telecommunications markets in Europe and throughout the globe. Without the liberalization of the UK market, it would have been that much tougher for BT to get a substantial head start over other companies in the developed world, and even take active roles in competing in a market as advanced as the United States. Britain's ability to mobilize expertise and capital in the European market can only help BT as it continues to expand beyond its previous role as a state-run telecommunications monopoly.

For companies like Mercury and other potential direct competitors with BT (such as cable telephony providers), it has meant an opportunity to compete and invest in a growing market. The expansion of the market has made the game of telecommunications more than zero-sum; with increasing subscriber bases and the future of enhanced services, getting a slice of the pie and the opportunity to get more of the pie has been incentive enough for many investors.

But that consensus can only go so far. Considering the lack of competition at the local level and the likelihood that the liberalization in other markets will soon close the gap between Britain and the rest of the developed world, Britain has much to do if it is to keep its lead in regulation and service provision. This is the heart of strategic liberalization for Great Britain: Building the consensus on competition policy for the next two decades of telecommunications development.

We begin with a discussion of the history of wireless access in Britain, and then turn our attention to the emerging possibilities for strategic liberalization as a focal point for continued development in the telecommunications sector.

2. Wireless Communications in Britain

Britain is the origin point for the modern story of wireless communications, in great part because of the efforts of one man: Guglielmo Marconi, the inventor of the wireless telegraph and telephone.⁷⁰ Although born in Italy and closely tied to his home country, the bulk of Marconi's work was done in Britain, the bulk of initial investment came from Britain's private sector, and, perhaps most significantly, the first contract for Marconi came from the British Government.

The first major application of wireless communications in Britain involved the construction of a global communications network for the British fleet in the early years of this century.⁷¹ The increased international tensions and the rise of a more powerful Germany put Marconi's invention to the forefront of naval planning as both Britain and Germany raced to put in place a radio communications network for their military forces.

⁷⁰ Marconi applied for the world's first patent in wireless telegraphy on June 2, 1896 (British Patent No. 12,039).

⁷¹ Marconi founded the first wireless company in the world, called the "Wireless Telegraph and Signal Company," on July 20, 1897. Before that time, he had serviced various government institutions and attempted to establish some private wireless telegraph services. But the Telegraph Acts of 1868-69 (which entrenched the government monopoly of telegraph transmission in Britain) prohibited the company from instituting a competitive inland message-carrying service, forcing the company to look to "ship to shore" communications. Since Britain had the largest naval presence in the world, the market for the British government was enough to sustain the new company.

But commercial applications of wireless communications were put in abeyance by the same government: The consolidation of the government's control over wireline communications (both telegraph and telephone) created great resistance within the government to the development of wireless telegraphy or wireless telephony.⁷² Even though Marconi had developed the first wireless telephone by 1908, the Wireless Telegraphy Act of 1904 had constrained his ability to operate to such a degree that the limited efforts of his company to create a commercial service were to no avail. More than 50 years after Marconi developed a wireless telephone, BT (then the Post Office) first offered a radiophone service, relying on 55 channels in the VHF band to carry voice traffic for commercial users.⁷³

Ironically enough, the same government that discouraged the development of wireless communications for fear of competition at the beginning of the century is now advocating the further development of wireless telephony at the end of the century to enhance competition. Establishing direct competition between wireless and wireline communications is at the forefront of Oftel's stated policy:

I believe that other European nations will come increasingly to recognize the desirability of competition in operating networks. I also believe that they will find a certain inevitability in progress towards competition. Several countries have introduced competition in mobile networks and once mobile communications becomes a comprehensive competitor with fixed communications, as I believe it soon will, competition for basic services will have arrived, as it were, through the back door. I also believe that competition in value added services and in data services will lead to the acceptance of competition in basic voice services: The distinction between basic services and value added services will become harder to

⁷² For more information, see W.J. Baker, The History of the Marconi Company, (London: Methuen, 1970) p. 28-30. Baker points out that the conflict between the emerging service of wireless communications and the government wireline network was as much a personal as an institutional conflict. The Chief Engineer of the Government Postal Office (GPO) and Marconi were often at loggerheads during the first decades of this century.

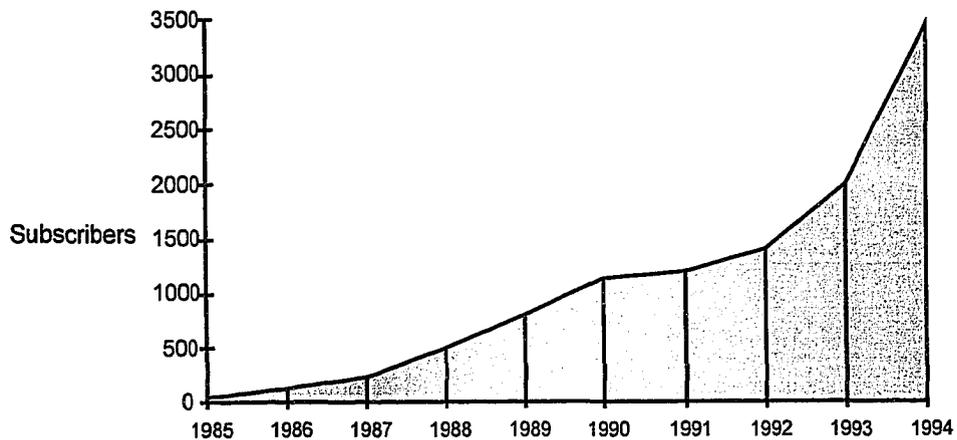
⁷³ The Financial Times Media Intelligence Unit Report (June 1985), p. 6. The service was offered in 1959.

draw and will cease to have a clear significance as the concept of basic service changes under the impact of developing technology.⁷⁴

This speech, given by OfTel General Director Sir Bryan Carlsberg at the tail end of the duopoly review in 1991, offers a broad-reaching perspective on how wireless communications could impact the marketplace. Wireless competes directly with wireline services for basic voice telephony. Then, value-added and basic services converge on wireless and wireline networks, creating a broad framework for competition throughout the telecommunications industry. This vision is embodied in the "Phones on the Move" report which we have discussed earlier. In setting the foundation for the establishment of Personal Communications Networks in the UK, Phones on the Move was born of the same conviction that wireless and wireline networks would and should directly compete.

There is good reason for the regulators at OfTel to be optimistic about the prospects for direct competition in Britain between wireless and wireline communications systems. The dramatic growth of the subscriber base within the country bears out one simple fact: More and more people are turning to wireless communication systems for their personal and professional communications needs.

Cellular Radio Subscriber:



Source: OfTel Annual Report for 1994

⁷⁴ "The UK Duopoly Review -- What it Means for Business Users," a speech by Sir Bryan Carsberg, Director General, Office of Telecommunications. 10 July 1991.

This growth has been driven by the four major players in the market for wireless access today: Vodaphone, Cellnet, Mercury One-2-One, and Orange (Hutchinson Telecom). Vodaphone and Cellnet were licensed as cellular providers in the early 1980's, while One-2-One and Orange are both licensed as Personal Communications Networks (PCN). The breakdown of the subscriber base for each of these four countries, as of the beginning of 1995, was as follows:

Estimated Subscriber Base for Britain's Service Providers

Operator	System	Launch	Subscribers (1/95)	Subscribers (1/94)	Yearly Growth
Cellnet	TACS-900	1/85	1,587,000	932,551	70.18%
Cellnet	GSM	1/94	23,000	n/a	n/a
Vodaphone	TACS-900	1/85	1,554,000	1,076,412	44.37%
Vodaphone	GSM	7/92	133,000	13,141	912.00%
Mercury One-2-One	DCS 1800	9/93	241,000	42,000	473.81%
Orange	DCS 1800	4/94	115,000	n/a	n/a

Source: Financial Times, Mobile Communications Report (February 23, 1995)

The four wireless operators have all benefited greatly from the increases in the subscriber bases. Other wireless communications services have grown almost as dramatically. The subscriber base for pagers, for example, has expanded to almost 800,000 since 1980.⁷⁵

But, as we shall see in the section that follows, the flurry of growth and activity in the sector has not yet set a firm foundation for direct competition between wireline and wireless access, in great part because of the institutional constraints that have been placed on the development of the sector. In

⁷⁵ Oftel Annual Report for 1994, p. 41. There are a number of satellite television providers, such as BSkyB, that have made services available to British subscribers. There are, as of now, no published reports to use these facilities to provide telephony or other forms of two-way wireless communications.

order to ensure a vibrantly competitive market, Britain will need to achieve a new institutional consensus to push the penetration of wireless communications systems.

This section discusses the institutional framework for the development of wireless communications and telephony in Britain. We begin with a discussion of the initial cellular duopoly and its impact on overall sector development in the 1980's. We then analyze a failed experiment in local wireless access, CT-2 (Telepoint), and identify the structural and institutional constraints that lead to its demise. Finally, we focus on the continuing experiment: Personal Communications Networks (PCN). The end of the section outlines some of the institutional barriers which need to be overcome in the redefinition of wireless access, setting the stage for a discussion of how the goals of strategic liberalization can be used to further spur the development of Britain's telecommunications sector.

2.1 The Initial Duopoly

As Britain began to consider the opportunities for the deregulation and liberalization of the telecommunications sector, worldwide recognition of the commercial potential market for wireless communications systems began to attract the attention of regulators and industry participants. In the early 1980's, the Department of Trade and Industry opened the discussion of possible applications for nationwide cellular telephony licenses.

The government invited applications for two 25-year licenses in 1983, and, of six applicants, two were chosen as the basis for a cellular duopoly: Vodaphone and Cellnet. Initially, Vodaphone was owned by Racal (80%), Millicom (15%) and Hambros Bank (5%). At the end of 1986, Racal Millicom became a 100% owned subsidiary of Racal, and then was floated as its own limited company. The other company licensed to provide cellular services, Cellnet, was a partnership between British Telecom and Securitor; in 1991, BT increased its ownership to 60% and Securitor retained 40%.⁷⁶

The licenses for Cellnet and Vodaphone includes two components that will be the focus for our overview of this period of duopolistic competition:

⁷⁶ E.W. Beddoes and J.R. Eastal, "TACS: The UK Approach," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993), p. 113-114.

- A common air interface was required, which led to the development of the Total Access Communications System (TACS) standard for UK analog mobile communications; and,
- Network service to individual and corporate users could only be offered to subscribers indirectly through service providers, a provision constructed to spur additional competition at the retail level.⁷⁷

The two competing mobile communications networks began service in the United Kingdom in January of 1985 and remained the sole providers of wireless telephony until the licensing of CT-2 (Telepoint) systems later in the 1980's. These two provisions have greatly defined the institutional framework for wireless access services, and deserve further attention.

The Common Interface and Transmission Standards: TACS, GSM and DSC-1800

The Total Access Communications System (TACS) was the institutional response of a government that wanted to position Britain on the cutting edge of equipment manufacturing throughout Europe. The UK had already fallen behind the United States, which had its own specifications for analog mobile radio (AMPS) and the Nordic countries (NMT-450 and 900); the thought that Britain could tie the development of cellular systems locally into a springboard for international equipment sales led to the development of system standard.

As was the case in the United States, the service was construed to be a premium one based on the added value of mobility. The Financial Times Media Intelligence Unit Report of cellular radio put it in 1985, "cellular radio is most commonly used for mobile telephones in cars."⁷⁸ The technologies to support such a service would not be constructed for broad consumer use, but rather for highly mobile professionals capable of paying the premium for mobility.

⁷⁷ Ibid, p. 114.

⁷⁸ Financial Times Media Intelligence Unit Report, Cellular Radio (London, 1985), p. 4.

Britain borrowed from the already established and operational AMPS standard from the United States to construct TACS. Companies modified the AMPS specifications to meet the European mobile radio frequency allocation (862 to 960 mhz) and the European channel spacing practice.⁷⁹ Over time, the E-TACS standard was developed to improve upon the original system and apply it to a new frequency band just below the initial applications for TACS.

Even with its initial difficulties, TACS has been rated highly as the standard backbone for providing cellular service in Britain.⁸⁰ It has also grown with the times. One of the provisions of the licenses granted to Cellnet and Vodaphone was that the carriers cover 90% of the UK population by 1990, a goal achieved by both companies in mid-1987. The two TACS systems still in operation today handle more than 3.2 million subscribers, indicating TACS has been up to the task of managing Britain's cellular boom.

From the viewpoint of competition policy and international trade, TACS has also been successful. The standard has been exported to a number of countries for use in the construction of analog cellular systems, as the following table shows:

⁷⁹ For more information about the technical specifications of the TACS system, please see A Guide to the Total Access Communications System, UK Department of Trade and Industry, 1985.

⁸⁰ E.W. Beddoes and J.R. Easteal, "TACS: The UK Approach," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993).

TACS Systems Deployed for Cellular Mobile Radio in 1993

Country	Number of Subscribers
Ireland	42,900
Italy	768,100
Spain	133,860
Austria	120,222
China	160,000
Macao	10,000
Kuwait	42,500
Pakistan	16,000
United Arab Emirates	36,000

Source: E.W. Beddoes and J.R. Easteal, "TACS: The UK Approach," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993), p. 133.

TACS has made limited inroads on the European continent. UK equipment providers still face competition from other companies, especially Noika and Ericsson, both of which actively pushed the NMT standards developed earlier in the decade for mobile telephone systems throughout Scandinavia.

The result of this competition between equipment providers and technical standards was the fragmentation of the market for cellular radio equipment in Europe. That factor was certainly on the mind of the European Commission in the mid-1980s. The advent of digital communications, and the rise of the computerization of telecommunications networks, made it clear that various digital systems for the provision of wireless communications systems would soon be rolled out. A number of working groups, under the sponsorship of the Commission, had begun to test and trail various digital systems, with the goal of developing a "Global System for Mobile Communications," or GSM.⁸¹

⁸¹ D.M. Balson, "The Pan-European System: GSM," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993).

A number of digital transmission techniques were suggested for the basis of the GSM standard, the most significant of which (TDMA, CDMA and FDMA) have already been described in the third chapter. The choice of TDMA as the transmission standard in 1987 set the foundation for the first articulation of the standard by the Commission on European Post and Telecommunications (CEPT). In 1989, the responsibility for the specification of the GSM standard passed to the newly formed European Telecommunications Standards Institute (ETSI).

The difficulty facing Britain during this period was the intensive investment made in TACS and the lack of any digital transmission system being advocated by UK equipment producers that could meet the requirements for high mobility. The government faced the prospect of falling behind again to other European equipment manufacturers with experience in producing the components for the future GSM system.

Britain responded by establishing a comparative advantage in service provision. While other countries thought of GSM as the standard to facilitate the transition from analog to digital transmission in the cellular bands, Britain began developing a framework for licensing Personal Communications Networks (PCN) in the 1800-2000 mhz band.⁸² The goal of PCN would be the establishment of wireless access services at a lower cost than the traditional cellular services, with the overall objective of increasing competition in wireless services.

Instead of relying on British manufacturers to develop a standard for Britain and face the prospect of falling behind yet again, the Department of Trade and Industry used the European developments in this area to their advantage.

The DTI recognized from the outset the importance of adopting internationally agreed upon standards for the ultimate success of PCN, including the conditions for roaming between PCN networks. It was stipulated that the specification must be based either on the emerging digital European cordless telephony (DECT) standard for cordless private branch exchange (PBX) or on the pan-European GSM digital cellular mobile system.

⁸² The framework for these licenses was developed as part of the "Phones on the Move" consultative document already discussed in this chapter and the third chapter.

All PCN licensees stated their preference for developing a standard for PCN based on GSM, redefined for operation in the 1710 to 1880 MHz band, incorporating initial PCN requirements. This view was consistent with one of the key recommendations made by the ETSI Strategic Review Committee on Mobile Communications in Recommendation 8 -- Digital Cellular System at 1800 MHz (DCS 1800): "GSM must be asked to elaborate an enhancement to the GSM standard for using frequency bands compatible with the plans of CEPT and located in the vicinity of 1.8 Ghz. This new version of the standard should be aimed primarily at providing a service for handheld or pocket terminals in densely populated zones and must be suitable for pan-European implementation."⁸³

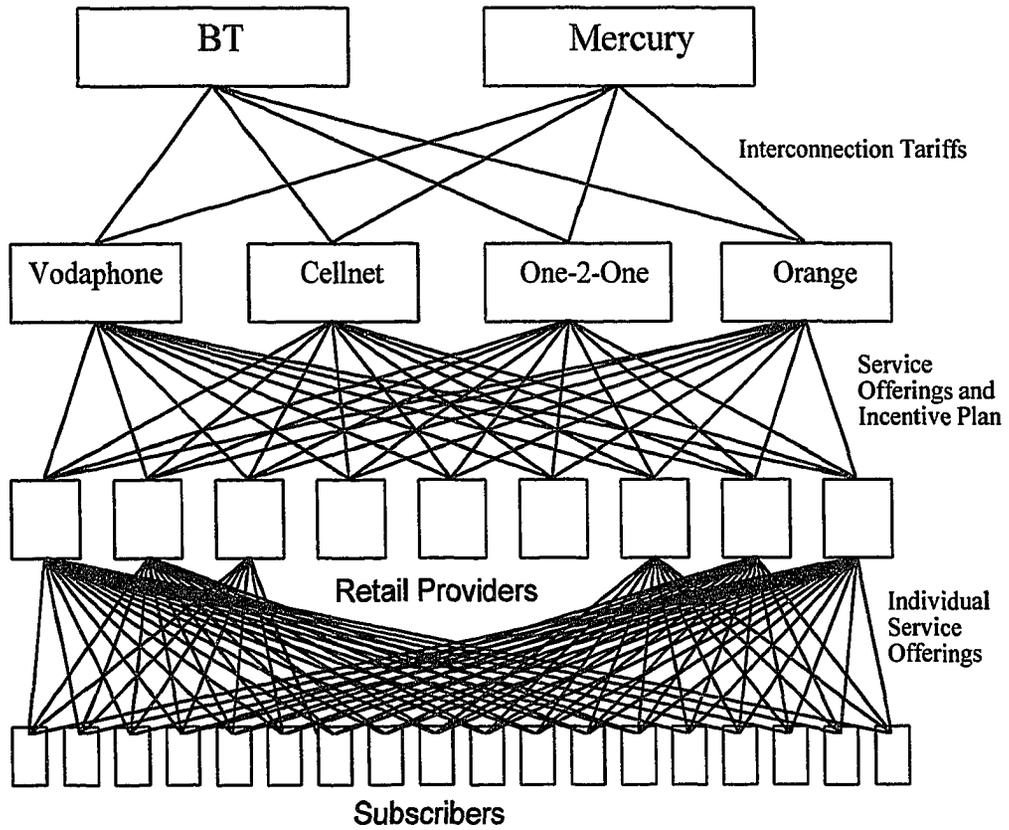
Even though Britain had fallen behind in terms of equipment production and development, they were moving fast ahead on service implementation, pushing the European standards-setting bodies and putting solutions into place before other European countries. In turn, a number of British companies have acquired direct experience in producing components of the system and the support infrastructure for DCS 1800 -- and Britain has become the major testing ground of the new technologies of all of the European equipment manufacturers. With an eye to serving the critical European market over the long term, the UK established a comparative advantage by licensing providers and turned a weakness in equipment production into a competitive strength.

Retail Competition and the Illusion of Choice

This method by which the comparative advantage has been established, though, threatens to hamper the continued development of the sector. This is due to the complicated arrangement between retail service providers, wireless access providers, and the two major PTO operators. The following chart shows three layers of interaction between the corporate institutions that provide wireless access services in Britain:

⁸³ A. Hadden and P. Knight, "The Birth of Personal Communications Networks," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993).

The Structure of the Market For Cellular and PCN in Britain



The first layer is the relationship between the PTOs and the cellular/PCN operators. BT and Mercury are responsible for setting interconnection tariffs for the carriage of those phone calls which are transported on their network. The PTO can set various interconnection agreements, although certain agreements have been tested and overturned after inquiries by OfTel. Much attention has been focused on the relationship between BT and Cellnet, of which BT is a majority shareholder, and between Mercury One-2-One and its parent company, Mercury. In both cases, regulators have investigated the need to restructure tariffing arrangements to ensure cross-subsidization of wireless operations from wireline revenues does not occur.⁸⁴

The second layer is the relationship between the four operators and the more than two dozen retail service providers. From the outset, Cellnet and Vodafone could not sell their services directly to customers. This restriction caused the explosion of retail service centers in the late 1980s and early 1990s. Much like the traditional relationship between a wholesaler and a retailer, the retail service outlets would offer service packages directly to customers, often bundling the wholesale offerings of a wireless operator with the sale of a headset. Although the restriction has been lifted and no such restriction was placed on the two PCN operators, the market has been saturated by participants at the retail level; walking around London, it would appear that there is a retail outlet on each block of the downtown district.

The basis of the relationship between the service providers and the retail outlets is a mixture of incentive packages and discounts for service that allow the retailers to make money on increased sales.⁸⁵ One interesting case study of incentive packages for retailers is the Dimensions incentive package offered by Cellnet towards the end of 1994. The meat of the deal, interestingly enough, has

⁸⁴ The most notable complaint about the cross-subsidization of services came from Talkland International (UK) Limited, an independent service provider company retailing airtime on cellular telephone networks. Talkland filed a complaint with OfTel in 1992, and OfTel's findings were announced in 1994. OfTel concluded that unfair cross subsidies were provided by BT to Cellnet and by Mercury to One-2-One. OfTel threatened an order to require immediate compliance from BT in removing the cross-subsidy. Because of Mercury's position in the marketplace, OfTel did not deem these cross subsidies as inappropriate for the starting of operations, but decided that they should continue for no longer than one year from the announcement of the finding. For more information, see "Fair Competition in Mobile Service Provision," Statement by the Director General of Telecommunications. (London: OfTel, May 1994). These directions were revoked after both companies were found to be in compliance in October of the same year.

⁸⁵ As of June 1994, the four wireless network operators were offering a total of 17 wholesale tariffs. *Mobile News*, 13 June 1994, p. 7

less to do with finances than it has to do with supporting the ability of the retail service provider to market someone's shop.⁸⁶ Dimensions sets up a fund to support the marketing and sales efforts of the dealers with its Marketing Fund Administration. A binder walks shop owners through basic marketing and PR strategies. For every connection, Cellnet contributes a certain amount of money to a joint marketing fund which the dealer can use to market its retail services -- under the condition that it uses the Cellnet logo and markets itself as a Cellnet dealer. If any other provider logos are used in the marketing material, a percentage of that money is taken away.

The financial incentives, such as bonuses and reduced rates for higher and higher volumes of subscribers, are still a part of the package. But Cellnet is trying to gain access to more customers by providing a critical value-added service to the retail outlets. It has "identified that dealers need a particular kind of support,"⁸⁷ and it also shows that the service providers can not simply compete on price.

But the retail layer has become a bottleneck in the provision of services. Instead of providing the value added of differentiated rates and service information directly to customers, wireless operators have to offer a value-added to retailers in the hopes of motivating them to pass on the value-added and pricing components to customers. This takes us down to the final level of the service structure for wireless telephony in the UK: The relationship between the retail outlets and the customers. By the time the information reaches the customer level, there are literally thousands of permutations of tariffs, prices and packages. Most of them appear to be less differentiated by price than simply by marketing name and image.

From the perspective of regulation, this is a troublesome bottleneck. The institutions that have been identified as the critical component of further competition, namely the wireless service providers, are highly constrained in the breadth and depth of their strategic business choices. One of the results is high levels of customer churn, with customers changing providers at the rate of 20-25% per year.⁸⁸ It becomes difficult, if not impossible, to institute strategies to reduce churn through the layer of retail service providers, themselves a source of churn as retail-outlets change favored wireless operators with alterations in tariff strategies.

⁸⁶ *Mobile News*, 8 August 1994, p. 10.

⁸⁷ *Ibid*, p. 11.

⁸⁸ *Mobile News*, 13 June 1994, p. 7.

This arrangement of retail competition and service oligopoly appears not to be sustainable from the business point of view, either. Reports are than few, if any of the retail outlet chains that have grown up in the past decade are profitable at all. Although companies can run deficits for an extended period of time, creditors are not known for their infinite patience. Financial difficulties of certain retail chains make their purchase by the providers a likely trend.

But that is as it should be. Consolidation will allow service providers to define direct relationships with customers, and will help service providers in their efforts to offer a total solution to the customer. With wireless providers sandwiched uncomfortably between a dominant wireline carrier and a bewildering system of retail competition, the market bears the only illusion of competition.

From the technological point of view, the development of the market in the UK has been largely successful. Standards have been chosen and effectively rolled out to achieve national coverage. But the institutional arrangement for the provision of services will hamper future development of the sector. Britain has attempted two specific experiments to break through these constraints and break open the market for differentiated and competitive services. One of the experiments has largely been judged a failure, the other is an experiment still in progress. We now turn our attention to a discussion of CT-2 and PCN and conclude this section with a summary of the institutional constraints that will require regulatory and managerial attention in the years to come.

2.2 CT-2 (Telepoint): The Failed Experiment

CT-2, known as Telepoint in the UK, was meant to work like a cordless telephone (thus, the designation "CT"). The difference was in the range; base stations would allow a 100 meter radius for wireless access, and various minicells would be constructed to offer pedestrians or local users basic telephony. In concept, the idea sounded promising. The execution, though, turned out to be no less than a disaster.

Four providers were licensed and permitted to offer Telepoint services. The winners of the Telepoint licenses were:

- BYPS (Rabbit) -- Barclays Bank, Phillips and Shell (later purchased by Hutchinson Whampoa of Hong Kong and Hutchinson Mircotel subsidiary formed);
- Callport -- Motorola, Shaye Communications and Mercury;
- Phoneport --- BT, STC Telecom, France Telecom and NYNEX; and,
- Zonephone -- Terrantic, British Technology Group, with various others.⁸⁹

The initial problem was in the technology. As Ian Channing puts it in *Mobile Communications International*, "unlike cellular radio, where there is general agreement on technology, there have been long and often acrimonious discussions concerning the appropriate technology for cordlessness, and these discussions are still on-going."⁹⁰ The lack of a standard for the service was caused by a direct conflict between the investment of local manufacturers and the work of the European Community to codify a different standard for cordless communications based on an incompatible transmission technique.

A number of UK equipment manufacturers developed the CT-1 standard in the mid-1980s as an application to support cordless telephones, and CT-2 was a domestic effort to improve the quality of cordless access for home and business users. CT-2 was based on frequency division multiple access (FDMA) technology. At the same time, the ETSI was working on the development of the Digital European Cordless Telecommunications (DECT) standard, which was based on time division (TDMA). The inability to determine, early on, the standard for the provision of Telepoint services reduced the commitment on the part of service providers and equipment producers to fully develop the system. As a result, the three carriers that eventually rolled out the service instituted their own proprietary headsets and base stations, allowing for no interconnection and interoperation even though all of them were using the same frequency bands (864-868 mhz).

But the difficulties were more than technological. Some would argue that the very nature of the service was ill-conceived and that Oftel prematurely released Telepoint because of the pressure to

⁸⁹ "The Market for CT-2: The UK Experience and Market Potential in the US," EMCI Report (London: Malarkey-Taylor, June 1990).

⁹⁰ Ian Channing, "Driving Back the Frontiers of Mobile Communications; Regional Focus -- UK," *Mobile Communications International*, June 1993.

increase the level of competition in the telecommunications marketplace.⁹¹ Considering some of the drawbacks of the service, it would be difficult to argue with them. Even though it was priced reasonably at 5.50 ECUs per month (versus ECU 19.25 for cellular), Telepoint could not receive calls, only send them.⁹² Before Hutchinson's Rabbit service collapsed in late 1993, a paging capability had been built into the system to notify subscribers that an incoming call was being made so that the subscriber could return the call, but that was certainly too little, too late. In addition, service coverage was spotty and there were a number of technical difficulties in placing calls from the perimeter of the advertised cell coverage.⁹³

Clearly, the CT-2/Telepoint experiment in the UK was a resounding failure,⁹⁴ but, towards the end of the CT-2 experiment, Britain opened a new chapter and began a new experiment: Personal Communications Networks (PCN). This ongoing experiment appears to have been largely successful but, as we have already noted, a number of institutional constraints have arisen that threaten to choke the life out of PCN's future. This section reviews the successes and difficulties of the two PCN operators in the UK: Mercury's One-2-One and Hutchinson's Orange.

⁹¹ "The Market for CT-2: The UK Experience and Market Potential in the US," EMCI Report (London: Malarkey-Taylor, June 1990).

⁹² Raymond Okonski, "The Color Orange," *Mobile Europe*, p. 12.

⁹³ "European Cellular Markets: 1992. Volume 2," Malarkey-Taylor Associates, p. 222-260.

⁹⁴ Some still see a victory in the conception and construction of the initial Telepoint systems, but it is doubtful that any of the initial investors and licensees would concur. Channing, "Driving Back the Frontiers of Mobile Communications." Channing writes:

Telepoint's failure in the UK is counterpointed by its market success elsewhere, most notably in Hong Kong, Singapore and France. Fortunately, although there are no UK Telepoint operators left, UK manufacturers of telepoint equipment are enjoying considerable success. GPT is deeply involved in the provision of Telepoint and CT2 equipment in China, where the technology is highly regarded for both public access and local loop applications. Orbitel, after a lull in the telepoint business, is once again seeing a sharp rise in orders and Racal Antennas has become the world leader in the provision of antennas for both telepoint and cordless office installations.

There are few references to the successes mentioned by this author in other sources, which leads this writer to believe that the writer has fallen prey to the overly optimistic public relations materials of the individual British equipment manufacturers. Most reports indicate that DECT and other systems based on CDMA technology are much more prevalent for the kinds of applications mentioned above. But Mr. Channing is not alone. See also Adrian Morant, "The Growth Sector in UK Telecommunications," *Cellular & Mobile International*, May/June 1993.

2.3 PCN: The Continuing Experiment

It is a fitting tribute to Marconi's legacy that the concept for and first implementation of Personal Communications Networks (PCN) occurred in his adopted homeland of Britain. The experiment that is presently being undertaken, at the cost of billions of dollars of investment and huge investments of time and risk, is perhaps one that Marconi would have wanted to take himself: The establishment of a network of personal wireless communications to link an entire country together.

The experiment is no less than the construction of competing networks for telecommunications services. The success of this experiment will depend largely on how regulatory and economic institutions choose to support these newcomers to the sector, and how attractive PCN networks can be to consumers. If they turn out to be as successful as CT-2, then there is little future for them. Fortunately for the experimenters, this kind of failure is not at all likely considering the amazing growth in PCN since the launch of the first PCN network in 1993.

This is in great part because PCN is built on a foundation which avoids the mistakes of CT-2. The technologies of PCN are well established, and both networks presently in operation are implementing the DCS-1800 standards discussed above. The services offered have already been determined as attractive, and follow the cellular model. From the perspective of international competitiveness, Britain has much more to gain through investment in PCN than it did in CT-2. "The Commission sees personal communications as an area in which Europe could lead the world," Ian Holt of Coopers & Lybrand wrote in 1994. As developments in Britain indicate, Britain feels that personal communications is an area where Britain can lead Europe and, in leading Europe, perhaps even lead the world.⁹⁵

But what exactly is the nature of the "PCN" model that is arising in Britain? Is it similar to the cellular model, as has already been suggested during the overview of the models for wireless access presented in the third chapter of this document? On the surface, there would appear to be some

⁹⁵ Ian Holt, "The Mobile Green Paper," *Mobile Communications International*

substantial differences between the nature of the licenses and business operations of the PCN providers. Licenses for PCN operators were different from cellular in three critical ways:

- PCN operators are allowed to provide their own millimetric radio links between base stations, sites and switching centers. Incumbent cellular operators were prevented from doing this until two years after the last of the PCN networks entered service.
- PCN operators are allowed to share infrastructure, which could be especially useful in low-traffic areas or rural areas.⁹⁶
- PCN operators were permitted to establish their own retail-sales organizations to directly solicit business from subscribers.

Even with these major variations, the substantive differences between PCN and cellular in the UK have had more to do with the institutional constraints established by the existing market for cellular services. Alterations in licenses such as the ones mentioned above have only changed the marketplace itself in a limited way, and much more will need to be done to dramatically alter the model for providing wireless access services in the UK.

Mercury One-2-One

Initially, three PCN carriers were licensed. Two of the carriers, US West and Mercury, decided to merge their PCN networks to form Mercury One-2-One, and the service was launched in September 1993. Allen Hadden, head of Business Policy at Mercury One-2-One, describes the network as "the first mobile telephone service designed, built and geared to the mass market."⁹⁷

When the service was launched, the coverage for the system extended to the M25 orbital motorway around London, a region which addressed a residential and working population of over 10 million. The catch was free local calling during off peak periods. As Hadden describes it:

⁹⁶ A. Hadden and P Knight, "The Birth of Personal Communications Networks," from Cellular Radio Systems, D.M. Balston and R.C.V. Macario, eds. (Norwood, MA: Artech House, 1993), p. 209.

⁹⁷ Alan Hadden, "The UK PCN Story," *Mobile and Cellular*, March 1994, p. 18.

Mercury One-2-One offers the lowest priced mobile telephone service available in the UK, and is the only service which provides free off-peak local calls to the fixed network for customers on the personal call tariff. This is equivalent to 234 days per year of free off-peak local calling, and is ideal for people wanting to make greater use of the service in the evenings and at weekends, and as an economic alternative to dialing using the fixed network.⁹⁸

The pricing strategy was constructed to establish a competitive position -- not only vis-a-vis the two other wireless access providers, but also against BT's wireline network. According to Mercury's estimates, the share for radio base access in telephone services is set to leap from 2 percent to 15 percent by the year 2000, and these kinds of pricing plans would drive wireless access.⁹⁹

The results of this innovative pricing strategy were, to say the least, unexpected. Parents began to buy the phones for their children and restrict their calling to the off-peak hours so as to reduce their use of phones in the evenings and on weekends. By establishing a small circle of friends, a parent could give their parents a really cool gift while simultaneously circumventing all call charges for their children.¹⁰⁰

From an operational point of view, the regional strategy was the best starting point for a service that had yet to be tested in a large market. From the point of view of increasing the level of competition within the sector, though, the strategy meant one thing: "The existing operators could relax."

One-2-One was not going to be the threat they originally anticipated. By early March (1994), Mercury One-2-One announced they had initiated a programme of accelerated city centre coverage in a number of major UK towns: Liverpool, Manchester, Leeds, Sheffield, Nottingham, Bristol and Southampton. Additionally, Birmingham would follow in the autumn. This pre-emptive strike appeared to be nothing more than an effort to gain publicity and show their network was still expanding, albeit slowly.¹⁰¹

⁹⁸ Ibid, p. 19.

⁹⁹ Mobile News, 27 June 1994. p. 18.

¹⁰⁰ Personal conversation with Clive Ansell.

¹⁰¹ Raymond Okonski, "The Color Orange," Mobile Europe, p. 12.

The pricing strategy is certainly an innovation, but the limited nature of the experiment so far makes it difficult to judge whether or not One-2-One will be able to sustain itself such that direct competition with wireline service providers becomes feasible.

Orange

In mid-1994, Hutchinson Microtel launched Orange, the second PCN network to offer services in the UK.¹⁰² The main differences between Orange and Mercury One-2-One are less in the nature of the service as they are in the initial strategy for infrastructure development.

The initial coverage map for Orange looked dramatically different than for One-2-One. When Orange became operational, more than 40% of the country could access the network. To achieve this kind of coverage, Orange spent over 700 million pounds sterling by the end of 1994, and expects to have more than 90% of the country's population covered by the end of 1996. This national strategy will make it more difficult for the two cellular providers to "hide" by differentiating prices in specific regions of less competition.

PCN licenses permit the sharing of facilities with other PCN providers in order to promote increased and enhanced service coverage, but Orange has declined to work with One-2-One. In addition, Orange management consistently rejects assertions by some that a merger between Orange and One-2-One is in the cards as competition puts downward pressure on margins. In fact, Hutchinson expects Orange to be in the black by 1996.¹⁰³

¹⁰² The origin of the name choice for the network is worth a footnote. Marketing Director Chris Moss, in a speech during the press event to launch the network, explained:

[Orange] could never simply be just another mobile phone. It had to be an attitude of mind. A new frontier-breaking, wire-free world, a distinctive new service. Most of us were uncomfortable with the Microtel name. It fitted well with our technical profile of small telephones. But we researched it and we were staggered to discover that over 1,200 companies had either "micro," "tel" or "phone" in their name. It was too reminiscent of microwave and Microsoft. It was a me-too image and this was no way to convey a wire-free world.

¹⁰³ Raymond Okonski, "It's Not a Lemon," *Mobile and Cellular*, April 1994. p. 14

The service has only been available for a year, so it is difficult to assess the impact and effect of Orange to date. It is clear that the company has made the investment necessary to compete within the cellular and wireless access market but, as we will now discuss, it will have difficulty competing directly with the two major wireline service providers. PCN has become trapped by the institutional constraints of the cellular market structure, and it will take more than innovative pricing strategies to clear that market.

UK PCN: Trapped by the Cellular Model

The problem is that these two PCN providers have had to work within the constraints of the three tiered model for wireless services. As wholesalers, they have established service offerings for retailers. Considering the overwhelming presence of retailers on the streets of London, the alternate strategy of bypassing the retail structure would be expensive and time consuming. Even though the option is open to them, the bulk of their work to expand their subscriber base will be through the retail outlets.

That places PCN operators at a disadvantage. The incumbent carriers have already been able to establish relationships; cellular companies responded in advance of the entry of these two PCN competitors by introducing new wholesale tariffs to capture the non-business market.¹⁰⁴ They continue to respond as their digital services become more widely available and additional intelligent network features are built into the service offerings.

But this does not condemn PCN networks to the trash heap of history, only make their entry more difficult. With regard to their ability to compete with existing cellular service providers, it appears that PCN providers are doing well. "PCN is outselling Cellnet and Vodaphone by 5 subscriptions for every 2," *Mobile News* reported in January 1995. "This fiercely competitive market may be producing losers as fast as winners," the article continues. "Although revenue from mobile operators are rising, revenue per subscriber is actually falling, which is putting pressure on margins. And the trend is set to continue for at least 10 years."¹⁰⁵

¹⁰⁴ Cellnet started with a tariff called "Lifetime," and Vodaphone followed with their "Low Call" tariff.

¹⁰⁵ *Mobile News*, 23 January 1995.

This is the real problem. The margins are disappearing just at a time when new entrants need margins to remain stable so that they can establish a presence in the market. It is a race between decreasing margins and the undercutting of the retail bottleneck. The chief concern is that a wireless provider or two will be lost in the process, thus returning the British market to the duopoly provision of wireless services.

In the mean time, customers are more and more confused. "The choice to users is now so wide as to be bewildering, particularly to a new and perhaps dubious customer."¹⁰⁶ Many a new technology and technologically-base service has been tripped up by consumer frustration and skepticism at its introduction, and there appears to be no mechanism in place to diminish the negative effects of the illusion of retail competition.¹⁰⁷

2.4 Summary: The Market for Wireless Access in Britain

The institutional consensus that has been shaped since the passage of the Telecommunications Act in 1984 has worked well enough. By constraining competition and ensuring that Britain remains on the forefront of European telecommunications development, there has been enough of an expanding market in wireless and wireline services to ensure that market participants have incentive to invest in new technologies and services. But the institutions that have provided much of the energy in developing networks and services need to be brought into a new institutional relationship based on more direct competition for customers.

In order to achieve that goal, elements of the existing institutional relationship need to be pushed aside. In particular, the practices must be identified to help support wireless and cellular providers as they make the direct connection to customers and offer the value-added services that will help them grow their business. Wireline players, be they PTO or other licensed service providers (such as cable

¹⁰⁶ "Confusion Constraints," *Mobile News*, 27 June 1994.

¹⁰⁷ The development of PCN has promoted some favorable trends for consumers, though. Prices are lower for GSM services in the UK than in most of Europe. Vodaphone, for example, has the 5th lowest cost of all the GSM operators in the world, dramatically lower than in France (most expensive) and Germany (second and third most expensive). Paul Quigley, "GSM Digital Cellular Tariffs in Europe: 1994 Annual Update," *Mobile Europe*. June 1994, p. 24.

telephony providers), also need to be given a direct stake in the market for wireless services. As it presently stands, the development of Britain's telecommunications sector could be rocked by the failure of wireless systems unable to define and protect a market share. It is also threatened by what might be a lack of interest among providers to open their markets further.

In other words, the lines that have been drawn between PTOs, wireless access providers, cable telephone and television providers, enhanced service and value-added providers, all of those lines need to be erased. This convergence of institutions would fulfill the vision of OfTel as revealed in the speech quoted earlier: Direct competition for basic services through the expansion of wireless networks and the convergence of basic with enhanced services to provide a fully competitive market with a number of differentiated service providers.

Some of the steps outlined in the third chapter of this report would have a positive impact on erasing those lines. The final section of our discussion on Britain's wireless access market focuses back on the proscriptions of strategic liberalization, and offers some direction as to how the market for telecommunications services can be broadened to ensure a competitive future.

3. Strategic Liberalization in the UK

Britain has already taken some of the steps outlined as the core of the strategic liberalization program. In particular, the PCN licenses allowed for the co-location of facilities to decrease network costs. In other areas, Britain can benefit from the strategic liberalization program. This discussion will focus on three specific elements:

- Increasing the number of providers and decreasing the number of retailers through the auctioning of new licenses;
- Crediting technological innovation through an international pioneer's preference;
- Re-establishing the market for fixed wireless services to reduce capital costs.

3.1 More Providers, Fewer Retailers: Auctioning New Licenses

The bottleneck right now is at the retail level. Institutions have been constructed and put into place which restrict the development of a direct relationship between the company and the customer. Retailers do not need to differentiate themselves by operator affiliation at present because there are a limited number of providers, a limited number of tariffs being offered, and they are the only ones with direct access to the broad customer base.

Breaking up that bottleneck requires more operators and fewer retailers. If the retailers are not profitable, then the "fewer retailer" problem will correct itself over time. But, as is always the case with wireless services, the British government must step forward and begin the process for a more extensive licensing scheme so that there are opportunities additional providers to enter the marketplace.

The next available band for the provision of wireless services being contemplated throughout the world is the 2.6 to 3.2 ghz range, a band that has yet to be licensed or commercially served in any country. In addition, there have been a number of experiments with wireless cable franchises in the United States at the 26 ghz band, and many of those trials have been sponsored by some of the present investors in the UK marketplace.

The success of the auctions was not in the revenue gained for the government, although that is a significant benefit; it was the valuation of the spectrum. By valuing the spectrum, it becomes possible to make sound public policy and business decisions based not on the whim of regulators but on the needs and interests of the market. Britain has used the "beauty contest" method to date, accepting proposals and bids from various companies and deciding on the merits of those bids. For that reason, there exists no valuation scheme for spectrum in the country.

The introduction of a valuation scheme provides a range of planning benefits, not the least of which is to provide direction for businesses that would consider entering the market for wireless services. The opportunity to open other frequency bands through an auction would create the preconditions for increasing the number of providers.

It would also serve to decrease the number of retailers. As margins are squeezed and the value added of customer service becomes more and more a critical element of profitability, operators were

vertically integrated from the retail to wholesale levels, and existing franchises will become ripe for purchase by new or existing licensees. Auctions will likely increase the number of providers and decrease the number of retailers, and also provide a foundation for the implementation of other potentially beneficial policies, such as an international pioneer's preference.

3.2 Crediting Technological Innovation: The International Pioneer's Preference

The UK does have a vibrant local market for electronic components and equipment for wireless systems. But there is no single provider that has the international reach of a Motorola, AT&T, NTT, Ericsson, Siemens or Nortel.

As we have detailed above, Britain has been able to turn this disadvantage into an advantage by establishing an advanced market for services. Creating a framework for increasing the number of providers in the marketplace will do much to sustain that competitive lead, but there is another piece of the equation that UK regulators should consider: Putting in place a technological preference scheme to ensure that Britain retains its position as the most innovative market in the world.

The pioneer's preference that the FCC tied to the PCS auctions in early 1995 were fraught with political difficulties. Between court challenges, extensive comments by industry participants, and FCC decisions, the level of frustration was high, obscuring the benefits of what is a very good idea. By establishing a preference scheme for the development and implementation of new technologies, government can help to speed the benefits of new innovation to the marketplace.

For the United States and its wide variety of equipment manufacturers, the opportunity to work with a number of large and smaller companies in defining what is truly innovative has its advantages, but it also has its price. There is no political will to look outside of the country to solutions which may be more appropriate or just as worthy of recognition and investment. As a smaller country and integral part of the European system, Britain could establish itself as a judge of emerging technologies and the best trial ground for these new technologies.

As licenses are prepared for auction, OfTel should take proposals on solutions for the next generation of wireless technology, most likely two-way limited interactive multimedia systems that can directly compete with wireline networks. With an auction system in place, companies interested in playing a role in the process will know the value of the reward and will be able to allocate research and promotional resources accordingly. Additional licenses can be provided to those systems considered most innovative, either at a discount to the auctioned price or free for the use of the licensee.

The licensee would then be asked to produce a certain percentage of the components for the system in partnership with local businesses. In addition, the depth of experience in providing wireless services throughout the country would offer a vibrant talent pool of human resources for the new entrant to use in establishing broad-based services, should they choose to do so.

At worst, such a system rewards technological innovation and brings an awareness of and opportunity to invest in the innovation to the participants in the British market. At best, such an incentive structure ensures an ongoing investment in the British telecommunications marketplace, both in services and in equipment manufacturing.

3.3 Re-Establishing the Market for Fixed Wireless Services

The market for fixed wireless services collapsed after the failure of CT-2, (Telepoint) services. The reasons for the collapse of the service have already been discussed but, like many good ideas that did not work on first implementation, Telepoint deserves a second chance.

The main reason has to do with cost. Wireless services in the UK are still predominantly focused on mobility. As in the United States, PCN providers will be challenged to serve the automobile mobile market as much as the pedestrian and residential marketplace. These pressures increase the capital cost of the network and the cost to consumers, thus delaying the time when wireless and wireline networks can directly compete with each other for market share.

At the moment, the most likely competition for local fixed-link services will occur between the cable telephony providers and BT. But the cable providers are not using a single platform to provide that competition. Reports are that cable providers are extending a phone line separately to the home and

treating the telephone system as independent from the cable system. Now there are three wires to the home (cable telephone, cable television and BT), which certainly is an immense investment in plant that would be difficult to replicate for other entrants. At best, such a system can support two competitors, but, as the Duopoly Review made it clear, there need to be more than two competitors for there to be a competitive marketplace.

From an economic point of view, the logical competitor is a fixed wireless access system, with an architecture similar to the one described in the initial discussion of strategic liberalization. A fixed wireless service provider could offer both cable and telephony on a single platform at substantially less cost, while simultaneously establishing a pattern for business operation that other providers could modify and improve.

Such a system could be licensed on a nationwide basis as part of the auction process, and an international pioneer's preference program could accompany the auction. Considering the experience of British equipment providers with the CT-2 experiment and their continued work on wireless PBXs, this might be an opportunity to showcase British capabilities as well.

4. Conclusions

In combination, these three steps would provide the framework for a new institutional consensus built around the following concrete benefits:

- Improved access to new technology and service provision opportunities, thereby allowing Britain to retain its comparative advantage as a global leader in the telecommunications sector;
- Improved opportunities to directly reach the customer base and integrate resources to achieve comparative advantages over other competitors;
- Improved value to customers as competitive pressures bring down costs and increase the qualitative choices between network providers.

One thing should be made clear. The above proscriptions set a dynamic in motion that could be unpalatable for one specific reason: Telecommunications companies could fail. Saturation of the market will be achieved as penetration rates increase, and companies will collapse under the competitive pressure. In any other industry, this would not be considered a problem, it would be perceived as the natural consequence of market development. But in telecommunications policy, there is still little understanding of the consequences of such a position, either in the short or long term.

That would be the boldest experiment of all, one for which Britain is already largely prepared. The question for the next decade is clear enough: Will Britain embrace the experiment by implementing a policy of strategic liberalization, or will it allow the present institutional arrangement to fix itself in place? Considering the strengths of the open political system that Britain has established in the post-World War II period, it is likely that further changes will be made and that the gains of the past decade will certainly not be for naught.

Chapter 7

Strategic Liberalization for Russia: Establishing an Open Communications Environment

Many western observers view developments in Russia today similar to the way the prosecutor from Fyodor Dostoevsky's The Brother's Karamazov viewed things. In speaking of the rise of liberalism in the Russia of the late 1800's, he describes the Russian nation as a fast moving troika, teetering on the edge of control, with nations stepping aside out of fear or respect, depending on the interpretation of events.

There are many horses that are driving the path of Russian development, and some raise a concern similar to that expressed by the prosecutor in his use of this metaphor: There is a need for some order if the troika is not to drive itself into the ditch. This is especially true as it relates to the continuing evolution of the telecommunications infrastructure of Russia. The country embarked upon a wildly chaotic telecommunications development path. And it is a real possibility that the sector will establish business and regulatory patterns that will negatively impact the overall development of the country.

The difficulties in managing the telecommunications sector of Russia is a part of the continuing devolution of authority throughout Russia. As the Economist has recently put it:

Political power is eddying out from Moscow. Local governments now control over 80% of public spending on welfare. They have done most of Russia's privatizing. They still have the main say on who owns the country's land. They decide how fast the next stage of reform will proceed on the ground. That means they can influence how much the poor are cushioned from the harsh side of reform and thus, to quite a degree, how they will vote in parliamentary elections at the end of the year.¹

¹ The Economist, March 24th, 1995, p. 54.

The policy of strategic liberalization has a critical role to play in Russia. Strategic liberalization can be modified to meet the specific requirements of the Russian case: allowing for a "grass roots" form of development which links localities together into a broader communications confederation. The policy of strategic liberalization provides the rules of the game which can form the basis of the linkages between the different local and national interests.

Russia needs to establish an open and unified communications space for telecommunications development.² This unified communications space would consist of:

- A standard economic and technological pattern for the integration and interconnection of communications networks; and,
- A system architecture appropriate to the needs of the country, specifically one founded on wireless communications technologies.

Through the support of the unified communications space, government and private sector managers can ensure healthy grass roots investment which contributes to the overall economic development of the country. By using the policy of strategic liberalization to establish this unified communications space, Russia can do much to keep the troika on track for the future.

This chapter opens with a detailed examination of Russia's present telecommunications infrastructure, including a brief discussion of the Soviet period and its impact on the present infrastructure. We then analyze some of the specific elements of the market for wireless communications in the country, pointing to examples of low penetration and what we have defined as the "cellular" model for the provision of wireless access services. Finally, we will test how some of the provisions of the policy of strategic liberalization might be leveraged to increase the quality and penetration of services in Russia.

² Much of the research for this chapter was conducted in cooperation with Russ Neuman, Franklin Miller, and Shawn O'Donnell, and first appeared in "A Unified Communications Environment for Russia; White Paper on the Future of Russia's Telecommunications Sector." The idea of a Russian telecommunications "confederation" was first suggested by Franklin Miller of Innovaconsult.

1. Understanding the Russian Telecommunications Industry

Any discussion of the future of Russia's telecommunications infrastructure has to take into account the uniquely Russian social realities: There will always be more than one horse driving the troika. The issue can not be one of depriving the Russian society of the strength of the many different efforts that have emerged on the local level. Rather, we must find a way to harness the opportunities for grass roots telecommunications development through appropriate leadership and a solid understanding of the technological dimensions of the provision of telecommunications services.

Russia has always been threatened by fragmentation, even during the enforced stability of the Communist period. In great part, this is because the links of communication constructed to bring the country together have not been constructed to achieve that goal. When the first railroad was put into place in Russia during the reign of Nicholas I, for example, it is said that Nicholas himself resolved a dispute among his engineers concerning the route for the train by laying his sword on a map and connecting with a straight line the points between St. Petersburg and Moscow. In the words of one Western historian, "he drew a straight line between them which the railroad obediently followed, even through the line sometimes led through swamps and passed nowhere near the townships it served."³

Telegraph lines were first built in Russia in the 1840's, and, in 1843, a telegraph line was extended to connect the summer and winter residences of the Czar in St. Petersburg. Soon after Alexander Graham Bell patented the telephone in the United States, a number of Russian engineers worked to modify that invention with new kinds of microphones and switching apparatus. The work of Russian engineers lead to the construction of the first telephone exchanges in Russia in the early 1880's; by 1885, urban telephone exchanges were in place in St. Petersburg, Moscow, Odessa and Kiev.⁴

³ Edward Crankshaw, The Shadow of the Winter Palace (New York: Viking Press, 1976), p. 67

⁴ Olga Mnatsakanaova, unpublished manuscript, University of Colorado, Bolder.

1.1 Telecommunications During the Soviet Period

Many of the present difficulties faced by the participants in the telecommunications sector are due to the market inefficiencies that generally characterize state ownership of a telecommunications provider. State-owned telecommunications companies tend to be underinvested because governments manage them as cash generating activities rather than as businesses to be developed. Profits that could be reinvested for long-term returns are diverted to cover immediate government expenditures.

Another distortion that affects all state-owned telecommunications providers is overstaffing. Administrators are unable to cut staff when appropriate because of the political problems of government layoffs. Bloated staffs make payroll expenses higher than they might otherwise be and make the return on investment in telecommunications correspondingly smaller and less attractive.

Both of these systemic difficulties face the public telephone providers in Russia. But the problems do not end there. Soviet underinvestment in telecommunications was a result not only of general tendencies of state-owned telecommunications operators, but also of distinct factors related to the lack of market signals in the Soviet economy. In the Soviet case there were additional factors discouraging investment in the telecommunications sector: First was the traditional Soviet aversion to light industry and service industries. Throughout the Soviet era, the high-status industries were large-scale, heavy industries such as steel, industrial equipment, and military hardware. Industries such as telecommunications, with less tangible economic benefits, were starved and allowed to grow at a very slow pace.

A key impediment to telecommunications investment concerned the output indicator method of evaluating industrial performance. Heavy industry lends itself to tangible output measures — tons of steel, coal and oil, thousands of tractors, and so forth — while only the hardware side of the communications industry is amenable to such metrics. The real value to the consumer of a telecommunications service — the connection itself and the ability to communicate — is difficult to measure in the absence of meaningful prices. The prices in which the Soviet authorities enumerated

were uncorrelated with the true value of goods, so there was no way for authorities to learn how valuable communications services were to the national economy.

Another distortion caused by the output indicator method was its irrational application. Indicators such as "kilometers of cable laid" or "apartments wired for telephone service" were declared, regardless of whether the cable was ever put into use. Similarly, the target for apartments wired for telephone service was calculated regardless of whether the apartment dwellers actually received telephone service. All that mattered was that the cabling had been installed.

There is also the harsh reality of Soviet totalitarianism to blame for the configuration of the telecommunications network. After the Bolshevik revolution of 1917, the purpose and structure of the telecommunications networks were transformed into a portion of the totalitarian system that was to be developed by the Communist Party. Along with a total control of the press, the telecommunications infrastructure became intimately tied to the political system.

The architecture for the country's telecommunications networks reflected the centralized power base in Moscow. As technologies advanced, the political tension between the demand for access to communications and the Soviet government's need for absolute control increasingly were at odds — a trend which likely contributed to the collapse of the communist system earlier in this decade.⁵

The center for the political control of the telecommunications network was the Ministry of Communications, usually abbreviated in Russian as Minsviaz. During the later Soviet era, Minsviaz was responsible for all of the telecommunications networks throughout the country, including the construction, maintenance, and operation of all television and radio broadcasting facilities, and the

⁵ For a more detailed discussion of the systemic political and economic difficulties arising from the Soviet period's development of the telecommunications system, please see "Belaya Kniga Telekomunikatsii; Rynok Komputernikh Telekomunikatsii Rossii," (Moscow: Fond Obshchestvennoe Mnenie). See also J. Patrick Lewis, "Communications Output in the USSR: A Study of the Soviet Telephone System," *Soviet Studies*, July 1976, p 406-417; "Analysis of the Soviet Ministry of Communications' Public Network and Facilities," prepared by Duyck Van Gorder, GTE Communications, 1983; William McHenry, "Computer Networks in the Soviet Scientific Community," in C. Sinclair, ed, The Status of Soviet Civil Science, (Dordrecht: Martinus Nijhoff, 1987), p. 151-171; Ivan Selin, "Communications and Computers in the Soviet Union," Signal, December, 1986.

post offices.⁶ In that regard, the Minsviaz was a typical PTT administration, controlling all of the communications resources throughout the country.

The communications architecture reflected the political structure: all the telecommunications lines led to Moscow. As Robert Campbell has put it in 1988:

The Moscow UAK (Russian for *uzly avtomaticheskoi kommuntatsii*, or automatic switching exchange) is the only transit exchange connected to all the other 14 tertiary transit exchanges. Apparently the tertiary offices all use foreign equipment, mostly the ARM or MT-20 exchanges. In addition to serving as the international gateway for telephone communications, Moscow also serves as the gateway for the telegraph and telex international connections.⁷

Because of the hierarchical communications structure and the compartmentalization of the economy and society under the communist system, the networks lacked integration and connectivity. On top of that, the service was "bad in numerous dimensions," to use Campbell's understatement.⁸

Even under central planning there were some proto-market forces at work to expand the capabilities of the Soviet communications networks. This fascinating development is detailed by Campbell:

Minsviaz received a new charter in 1968 that gave it responsibility for the whole system, and rights to check branch systems for economic justification, conformity to Minsviaz standards and compatibility for connection to the utility network. Branch systems were expected, where possible, to lease lines from Minsviaz, or where appropriate links did not exist, to finance them cooperatively with Minsviaz and other ministries, with ownership going to Minsviaz. This process has always involved a great deal of conflict and coordination is still rather incomplete. The Minsviaz case stresses the advantages of universal access, standardization, compatibility and cost saving. Minsviaz argues that the trunks in branch system are ineffectively used -- one source says that they are half as heavily used as Minsviaz lines -- and do not meet quality standards. The client ministries believe that their needs are different, that Minsviaz does not serve the effectively, that they can do the

⁶ Robert W. Campbell, The Soviet Telecommunications System, (The Hudson Institute: Indianapolis, IN, 1988) p. 12.

⁷ Ibid, p. 21.

⁸ Ibid, p. 27.

job better than Minsviaz. The jurisdictional battles are fought out in an interdepartmental coordinating council, and it is not surprising that some of the bureaucratically powerful ministries manage to get their plans approved. Minenergo, Mingaz, Minneft (oil) and the railroads, all of which can argue for special circumstances, maintain substantial independent systems. For example, the oil and gas ministries have extensive operations in areas where the Minsviaz network was not developed. Minenergo has a far flung network of facilities that it has to keep coordinated in real time. The railroads have a long tradition of operating their own telegraph and telephone system, and a distinctive combination of signaling, telegraphic and telephonic communications to handle. In all these cases, the non-Minsviaz agencies sometimes make their own equipment, order it from a domestic supplier in competition with Minsviaz, or import it. For the BAM, the railroad ministry was able to acquire a special communications system, built by a foreign firm.⁹

These competitive battles sound almost identical to the bypass arrangements made by larger firms in the developed world during the 1960s and 1970s, indicating that the facade of Soviet homogeneity belied the real struggles for resources and influence being carried out behind the scenes.¹⁰

The fragmentation of networks, even during the Soviet period, was matched by a fragmentation in the Research and Development apparatus of the Soviet system. Minsviaz itself had a very weak R&D base, with most of the resources being focused in the Scientific Research Institutes, which were connected to the USSR Academy of Sciences, and what are known as the VPK (military industrial complex) ministries, such as defense and security. In addition, much of the actual production occurred outside Russia in a number of Eastern European countries, most notably in Eastern Germany, Yugoslavia and Czechoslovakia.¹¹

There were some attempts to bring the pieces together into a unified network but, as has been the case in the developed world as well, those efforts met with little success. In the 1970s, a program called the Unified Automated System of Telecommunications was initiated to improve the overall

⁹ Campbell, p. 47-48. Also includes information from *Elektrosviaz* 1982:11, p. 27 and Antonio Macorig, "Soviet BAM Telecommunications System Rides First Class Across Siberia, *Telephony*, 22 March 1982, p. 75-77.

¹⁰ For students of the now defunct discipline of Sovietology, these facts put to rest once and for all the debate on the nature and structure of the Soviet system, with the case clearly showing the validity of the bureaucratic interest model over the totalitarian model of Karl Frederick and Zbigniew Brzezinski.

¹¹ See Campbell, p. 66-80.

performance of the Soviet telecommunications network and to bring together into an efficient whole the diverse networks that had been constructed. The results of the UACS program were limited—as of the mid-1990s, the former departmental networks still exist, and they remain poorly connected to the rest of the Russian communications network.¹²

1.2 The Rise of the Russian Republic and the Russian Telecommunications System

This fragmentation was waiting to burst into the light of day as the era of Glasnost waned and the rise of the constituent republics began in the 1990's.

The initial thrust of Soviet telecommunications reform involved trade and technology transfer. The Soviet Union sought the opportunity to gain access to higher levels of technology exchange than formerly through the GATT and bilateral agreements with various countries. Minsviaz played an important role as a contact point for foreign firms, but it was the VPK ministries and the individual research institutions that drove much of the production.¹³ In the early 1990s, there were a number of smaller equipment sales, but nothing so substantial as to indicate that the Soviet central government was contemplating the complete reconstruction of the public telephone network.¹⁴

The first wave of telecommunications transport agreements focused almost exclusively on international carriage. In 1988, IDB launched a service that used privately leased satellite circuits for video and international services. Sprint international concluded an agreement with the Soviet

¹² Ibid, p. 12.

¹³ One of the early examples of joint ventures in the equipment manufacturing sector was ItalTel, which was the investment vehicle for the Italian PTT. With the help of TsNIIS (Tsentral'nyi Nauchnoissledovatel'skii Institut Sviazi), under the leadership of Professor L. E. Verakin, ItalTel developed a new digital switch, the C-23. During this early period of foreign investment, both Alcatel and Siemens set up joint venture production facilities in the USSR. The Siemens venture announced in July 1990 was a \$95 million investment to manufacture EWSD and Soviet ESSDS switches with a Ukrainian company and the Soviet Ministry of Communications.

¹⁴ For example, Ericsson registered its first sale of MD110 digital PBX systems in July of 1990. The order was for about 4,000 lines.

Ministry of Communications to operate an electronic mail and videoconferencing service, using INTELSAT transponders and mostly focused on international usage.

While the discussions and national negotiations were taking place, a number of companies began to make contacts with local administrators and commercial concerns, especially in the larger urban centers of Moscow and St. Petersburg.

These negotiations lead to some of the first substantial foreign investments in cellular telecommunications networks throughout Russia. In November 1990, US WEST signed an agreement to take a 40% stake in a joint venture to construct Leningrad's cellular telephone network. The venture included the Leningrad City Telephone Network Production Association (LCNA) and the Leningrad Station of Technical Radio Control (LSTC), and operates today as Delta Cellular Communications.¹⁵ For Moscow, the city government and the MGTS (Moscow City Telephone Company) founded Moscow Cellular Communications with US West and Millicom.

The provision of the cellular licenses in Leningrad and Moscow in 1991 are considered by some to be a watershed event in the jostling between local and national interests in the telecommunications sector. As one commentator characterized the situation in the early stages of the development of the Moscow system:

When establishing a Moscow Cellular joint venture in Moscow, US West was told by the Ministry of Communications that there would be two standards for cellular in Russia: NMT-450 and GSM. You can imagine US West was a little surprised when Plexys, a U.S. manufacturer of cell-site equipment, was able to make a deal with a Russian defense contractor and get access to some frequencies that had been controlled by the military in the 800 mhz band for an AMPS system.

When the contract for Moscow Cellular was awarded, the company thought it had frequency approval, which was a reasonable assumption under normal circumstances. It turns out that frequency approval is a bit more complicated.

¹⁵ "Russia: A Telecom Market Survey," prepared by International Technology Consultants (Washington, DC: July 1993).

Historically, it has been controlled by the military and the KGB. There was no mechanism for civil approval of frequencies.¹⁶

These administrative and legal gaps created opportunities for different communities of interests to assert themselves, mostly following along the fault lines that were an evident part of the Soviet telecommunications system. For the construction of the country's first cellular systems, communities of interest at the local level and within the military were able to shape the introduction of new services.

The Moscow and Leningrad city governments pushed forward with their own licensing, allowing for the construction of AMPS systems over the direct objection of the Federal government. The military subcontractor referred to in the above quote, Vimple Communications, soon launched its own cellular system in Moscow using the AMPS system. The roll-out of these systems was directly facilitated by the local telephone companies, who provided both the capital and some of the critical infrastructure, and the local governments, which passed the requisite laws to assert local authority over these licensing decisions.¹⁷

Although it would be difficult to prove that companies which focused their negotiations and investment at the local levels as being more successful than those at the level of the Soviet government, the turn of events during the days of August 1991 certainly tipped the balance in their favor. The failed coup against Mikhail Gorbachev led to the demolition of the former Soviet State during the final months of the year. The resulting decentralization of authority within the Soviet Union further weakened the hold of the central state on telecommunications laws and regulations.

The Russian Ministry of Communications inherited the weaknesses of its Soviet predecessor. Vladimir Bulgak was chosen as the Minister of Communications, which was split into two portions. The Ministry of Post and Telecommunications continued to have control over the transmission and Telekom was created to manage the production and sale of telecommunications equipment.¹⁸ This

¹⁶ Dr. Barry J. Leff, "Emerging Technologies in Russia," *Cellular and Mobile International*, March/April 1993, p. 48.

¹⁷ At present, the Russian government claims the authority to license all GSM systems in the 900 mhz range, but has ceded to the larger cities and regions the right to licence AMPS systems in the 800 mhz band.

¹⁸ It is clear from the aforementioned events that the authority of the Ministry of communications in the marketplace has been dramatically undermined by the local, grass roots form of development that has

was the first step in the breakup of the Russian telecommunications sector, a process greatly accelerated by the privatization process which began soon after.

1.3 Privatization and the Fragmentation of the Russian Telecommunications System

In 1993, Russia embarked on one of the most comprehensive and dramatic privatization initiatives in recent history. Instead of selling state-owned industry to foreign investors and retaining a stake in the industries, the government chose instead to follow a pattern established by other Eastern European countries making the transition away from a socialist economy. Vouchers were distributed to the Russian people, and the vouchers were converted into shares of companies being privatized. The stated goal of the privatization program was to redistribute ownership to the Russian people and use the power of shareholder relationships to spur new investment and innovations in production.

Russia's voucher-led privatization certainly has transformed the Russian economic environment, but the effect has been uneven. For smaller industries and shops, the voucher privatization has been successful in transferring ownership to the workers and managers of small companies located mostly in the urban centers. But the privatization of the larger state-run industries has helped to establish communities of interest that might fight against further reform and liberalization. For the telecommunications industry in particular, this arrangement threatens to stifle investment and undermine the potential for applying new communications technologies to meet the goals of national development.

The "Sharization" of Russia's Private Sector

In larger companies, privatization has been mostly "sharization," with shares being collected by managers, large investment houses and government entities during the process. Following the patterns of interaction during the communist period, most of the managers have close ties to the political system at the regional and local level. In some cases, the shares have given outside owners

occurred in the past five years in Russia. The result has been a devastating weakening of the Ministry of Communications through a combination of a "brain drain" and the continuing dilution of their effective regulatory authority.

the opportunity to oust older managers and institute new forms of management. More often than not, privatization has given existing managers the opportunity to hold on to their positions and maintain their monopoly advantages, even though the long-term viability of such a position is unsustainable; some of those who have purchased shares and do not exercise a controlling interest have even found themselves "frozen out" by managers who write off ownership stakes or dilute the value of the shares owned by those outside the management ranks.

The telecommunications industry is much too large and tied into the existing political infrastructure to be immune from such difficulties. The close relationship between political and industry managers is reinforced by the money making potential of telecommunications services and the politics of any communication infrastructure. If competition is to flourish in the Russian telecommunications sector, it will have to begin by a redefinition of ownership and the goals of investment at the grass roots level.

The history of privatization in telecommunications bears the point out. Rostelekom was first spun off from the Ministry of Communications and then broken into operating units according to local geographies. Each of these local telephone companies was privatized separately from Rostelekom, which eventually became the established monopoly provider of long-distance services in the country. The Ministry of Communications officially holds shares in both Rostelekom and the individual, local telephone companies, and governments at the oblast and city level also own shares of the local telephone companies. The problem is that no one is quite sure who owns what percentage of which company.

Additionally, a number of "investors without capital" have also played a central role in the privatization process, mostly through their ability to leverage local knowledge of the telecommunications industry and infrastructure. For example, there are few, if any published figures on infrastructure investment, and no central depository of knowledge as to what and where the actual telecommunications infrastructure in Russia is. As a result, people who have that knowledge are able to offer access to strategic portions of a network, such as a switch in one city or a long-distance copper line between two cities that no one else is aware of and no one is using. The quid pro quo that comes in exchange for such knowledge is a portion of the returns from the privatization process.

Because of this weakly defined ownership structure, managers have been able to exercise a wide latitude in establishing services and using revenues. The telecommunications sector has begun to

suffer as tomorrow's investment in Russia's future are sacrificed at the altar of today's profit potential. Few speak of a broadly-based consumer market for telecommunications services. Every company concentrates on applying existing models of telecommunications services to skim the cream from the telecommunications market.

1.4 Understanding the Legacy of the Soviet and Russian Past

The present of telecommunications in Russia is wrapped into the continuing political and economic transformation of the country. Since the breakup of the Soviet Union, the former government monopoly control of all telecommunications services and equipment production has been transformed by a frenzy of local and regional activity. On the surface of it, Rostelekom, the state owned and operated long-distance telecommunications provider, and the local telephone companies that were split off from Rostelekom as part of the privatization initiative over the past two years are still the monopoly providers of telephone services. But, below the surface, a very different set of marketplace conditions has evolved.

Russia still retains a formal monopoly for long-distance and local telephone services as the basis of its public switched telephone network. But that monopoly has been undermined by an incredible growth in bypass arrangements. It would be impossible to quantify the extent of the growth or investment in such networks since the partial privatization of the telecommunications infrastructure, but more and more large institutions openly admit that they use other providers for local, long-distance and data transmission.

Many of these new providers are licensed by the Ministry of Communications, and include companies that are providing dedicated services to banks and other intensive users of telecommunications services. In addition, there are a number of unlicensed providers, including the Russian military and various government ministries, who have cannibalized older telecommunications infrastructures built during the communist period to offer both basic and specialized services.

The official monopoly is certainly an illusion. But to say that true competition is evolving in Russia would also be a mistake. Bypass arrangements can not form the basis of competition for the

telecommunications sector because they are constructed to have a narrow focus: Certain people are to have access to certain services. Interconnection is not necessary and, for that reason, infrastructures have been built in such a fashion as to make the economics and technology of interconnection difficult.

There are four different kinds of networks operating in Russia today:

- The Local Telephone Network
- Overlay Networks
- Departmental Networks
- Wireless Networks

Local Telephone Network (Public Switched Telephone Network)

As a part of the privatization program for the telecommunications industry, local telephone service was separated from long-distance services. In the process, Rostelekom was able to shed the older infrastructure of the Soviet era and hand it over to the administration of municipalities and newly created local telephone companies. Many of these companies have become the focal point for local investment. In Moscow, for example, Moscow City Telephone has taken an active role in investing in cellular and bypass networks. Although most of the infrastructure for the local companies is hopelessly outdated, innovative technological patchworks have developed that allow them to graft modern services onto the old, Soviet style network. Cellular services, in particular, rely on a close cooperation between the local telephone companies and the cellular service providers.

Overlay Networks

The term "overlay network" is used here to designate efforts by service providers to completely bypass the public switched telephone network through the use of fiber optic or digital microwave technology. The structure of the digital overlay network is to create a universe of fixed access points, usually in an urban center or among various institutions that have a need for intensive users of telecommunications service, such as banks and large industries. By linking those access points, the

service provider can ensure that the companies or people connected to the network receive above standard service, which comes at a higher price.

Most Russian overlay networks are hybrid, containing both analog and digital components. The majority are configured with digital switching points and analog connection to subscribers. Wholly digital overlay networks, most notably the digital overlay network run by the Andrew corporation, employ a combination of fiber optical transmission and international gateway facilities.¹⁹ Overlay networks first appear in Russia in the early 1980's, when companies like IDB and Sovintel began to work with the Soviet government to improve the telecommunications infrastructure of the country.²⁰

Overlay networks are not a panacea to all communications problems. Many overlay networks have not integrated their services with the public switched telephone network at the local level. As a result, many of those who subscribe to an overlay network have to use international phone calls to get access to a local line so that they can make a phone call down the street. This kind of arrangement is not only inefficient, but undermines the long-term viability of the local telephone network.

Departmental Networks

During the Soviet period, priority industries and administrative agencies invested in their own telecommunications networks. Because these institutions had priority access to financial resources, they were able to build networks that are technically superior to the public network. Departmental networks were built with technology roughly equivalent to the best in the developed world. The ministry of defense system, for example, was completely digital and employed Nokia DX 200 and the Ministry of Foreign Affairs used Alcatel S12 switches.

Today, many of those who know about and understand the whereabouts of the infrastructure of these networks are presently working to revitalize them and employ them for business use. Although many

¹⁹ *Fiber Optics Communications Line Links Moscow and St. Petersburg*. 1994, April. BBC Monitoring Service. The sections of the fiber optics network were laid in metro tunnels in each city and along the entire Oktyabrskaya railway. The system allows for the simultaneous transmission of audio, video and computerized data both within Russia and to international communications satellites.

²⁰ See "Russia: A Telecom Market Survey," written by International Technology Consultants (Washington, DC: 1993).

of these projects have surfaced on paper, very few have been launched and even fewer have met their business objectives.

Cellular/Wireless Networks

The Russian government has offered licenses to provide wireless communications services, such as paging and cellular telephone, in a number of the largest urban centers throughout the country. These networks represent the bulk of direct foreign investment in Russian telecommunications. Almost all of the cellular systems involve joint ventures, investments, or part ownership by foreign interests, the most significant example of which is the investments of US West.

Penetration rates for these services are very low, with fewer than 20,000 official subscribers in Moscow.²¹ Service providers have chosen to use a traditional marketing and pricing strategy, which only a few can afford, instead of attempting to broaden the usefulness and access to wireless services by working with lower cost applications to push penetration higher. Many purchase the service not to bypass the network but rather for the prestige of having a cellular phone. In addition, there are a number of close relationships between cellular providers and the public networks, and some cellular networks reportedly do not have to pay for access to the public network. This kind of business activity will undermine competition if such relationships are allowed to create asymmetrical access standards and costs.

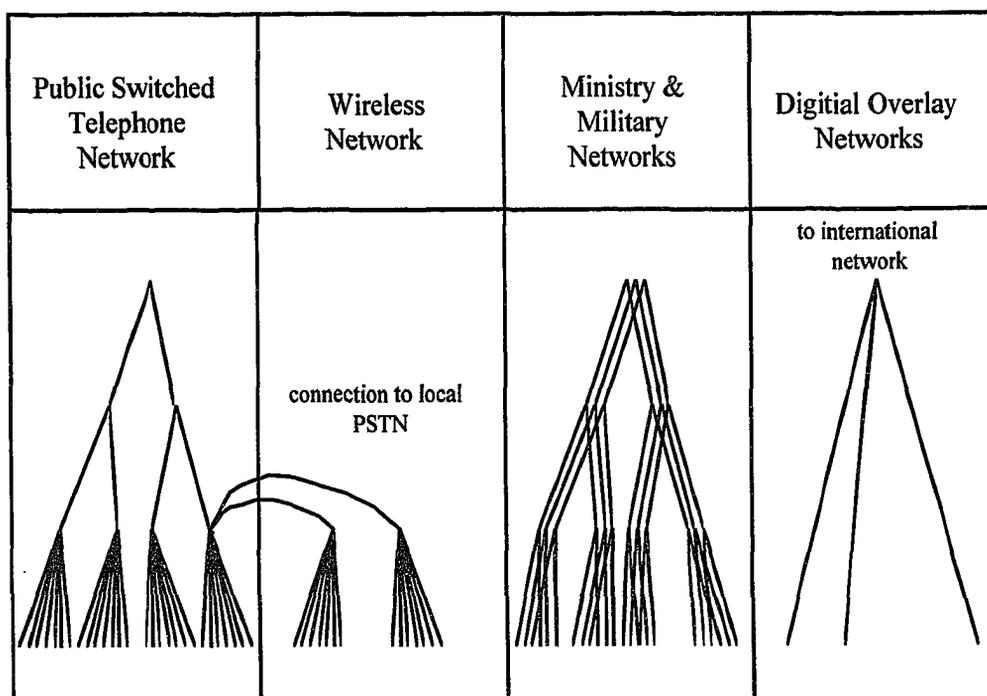
In one regard, Rostelekom is a part of each of these networks, insofar as Rostelekom facilities are required to provide services. But as bypass arrangements become more the norm, those links will become weaker and weaker. Additionally, each of these networks has focused on constructing its own infrastructure and its own platform for providing services. In that regard, it can be said that most of the providers are attempting to position themselves as smaller monopolies in a thin market.

²¹ See Carl Edgar Law, "Telecommunications in Eastern Europe and the CIS, Markets and Prospects to 2000." *Financial Times Management Reports* (London, 1995). pp. 133-137. For more information about the projections for cellular services in Russia, see Delovye Lyudi, "Cellular and Mobile Systems in Russia," *Telecommunications Supplement*, p. XIV (Moscow: April 1995). For earlier developments in cellular communications, see "Modern International Communications for Moscow," *Cellular and Mobile International*, January/February 1993.

1.6 The Need for an Open Communications Environment

The radial, centralized structure of Soviet communications networks corresponded to the flow of information and authority under that system. In a mature market economy, the communications needs of commercial and individual consumers are much more diverse, and a network with a less centralized structure makes more sense. One of the principle features of a market economy is the distributed nature of decision making. For timely, reliable decision making in a market economy, agents must be able to establish rapid, reliable communications with any other economic agent.

The following diagram illustrates in schematic form the disconnection between communications networks that exist in Russia today.



Source: Shawn O'Donnell, from "The Future of Russian Telecommunications: Towards an Open Communications Environment."

The Public Switched Telephone Network, PSTN, is somewhat more complicated than this figure suggests, with more connections between nodes at intermediate levels, but the network has a single dominant concentration point in Moscow. Wireless networks have nominally opened up competition in the local loop, but because of very high prices cellular phones are more of a luxury good than a significant component of the telecommunications system. Departmental networks consist primarily in center-periphery communications to help the administrators in Moscow manage their responsibilities. Finally, digital overlay networks offer direct connection to international networks and completely bypass the PSTN hierarchy.

Together, these networks provide adequate service to pockets subscribers, but these primarily independent networks do not constitute an feasible foundation for an advanced industrial economy operating on market principles.

Within each of these four broad categories, there are literally hundreds of service providers employing the strategy to serve its customer base. Each is using a different type of equipment. Some are analog, some digital; some use the most modern equipment from Europe and America, some use Russian or Eastern European equipment. There is no common technological or customer base to link any of the networks together, either within a category or between the categories depicted above.

At first, this might not appear to be a problem. But the future of telecommunications is in distributed networks, not isolated networks. By distributed networks, we mean the ability of a service provider to offer access to any and all applications and information available, while simultaneously using all of the portions of the network to efficiently distribute the volume of information being sent through the network. If networks do not have a common technological platform or economic framework to connect with each other, the creation of a unified, distributed network is not possible. That will severely hamper the ability of service providers and subscribers to gain access to all services available.

The result is economic inefficiency. For example, subscribers to the overlay networks often have to make an international call to get a local telephone line. Today, this may seem only an inconvenience, but when demand for applications such as electronic data interchange (EDI) increase, and the required interconnection arrangements can not be insured, the market for such services will fail to materialize. Without EDI, for example, the Russian financial community will be severely restricted

in its ability to grow and profit from the recent advances in telecommunications services and infrastructure.

To improve service to existing consumers of the Russian telecommunications industry, and to increase the availability of low-cost, high-quality service to more consumers, a coherent policy of liberalization and privatization of the telecommunications market will be required. The rest of this section suggests measures the government could consider to implement a strategic liberalization program and establish an open communications environment.

2. Overcoming Barriers and Constraints to Implementing a Strategic Liberalization Policy in Russia

As is clear from the preceding discussion, there are critical systemic difficulties that will have to be addressed in implementing a policy of strategic liberalization in Russia. This section outlines some of the most critical barriers and constraints, including:

- Monopoly characteristics particular to the Russian case;
- Licensing policies;
- Spectrum management; and,
- Financing.

In discussing each of these barriers, we will point to specific recommendations and solutions that echo our earlier discussion of strategic liberalization.

2.1 Monopoly characteristics particular to the Russian case

The present organization of the Russian telecommunications industry, though, reinforces monopoly over competition. Any time a new market opens up, there is a tendency for firms entering the market to aspire to monopoly. Each firm assumes that it will do best by controlling the entire market. When the market is large and the number of competitors is relatively small, there are incentives for competitors to divide the market among themselves and agree not to compete with each other.

Whether by design or by happenstance, this type of anti-competitive collusion appears to be occurring in Russia. This can be seen in the three kinds of monopolies that have developed in Russia over the past three years:

Monopolies by Geographic Area

Each region and locality has established its own monopoly service provider for telecommunications, and some of the local authorities (Moscow included) have even passed laws which reserve to the local government the right to renationalize the telecommunications provider if the community's interests are somehow threatened. Outside of Moscow, there is a movement towards local authorities establishing exclusive franchise for overlay and data communications services.

The difficulties with these monopolies are both administrative and technological. Relationships with different localities and carriers will vary, requiring new negotiations at each level for any company wishing to do business in Russia and gain access to telecommunications services. Additionally, the quality of the infrastructure varies widely from region to region, sometimes requiring different technological solutions for interconnection between the individual monopolies. At best, this causes economic inefficiencies and increased costs; at worst, it can cause a business venture to fail.

Monopolies by Closed Access

Quite often, service providers will simply refuse a request for interconnection from another carrier or company wishing to have access to telecommunications services. Since there is no open regulatory design that has been developed by Russia to mandate interconnection between networks, such conflicts are usually dragged through the political process in a individualized and personalized fashion; no attempt to create a broad standard for interconnection has yet been attempted by the legislature or Ministry of Communications.

Monopolies by Service

In major urban centers, there is a division of digital services by bit rate, which is the established measure for the volume of information that can be transmitted through a telecommunications network. Various carriers have staked out communications links with a particular speed, such as the standard phone line for voice (1-2 kilobits per second), voice network modems (9600 bits per second), and various higher speeds (most predominantly at 64 kilobits per second and at 2 megabits per second).

The difficulty is that, in fixing a bit rate, service providers often make it impossible for interconnection to occur with a transmission system at a lower or higher bit rate. The opportunity for "bandwidth on demand" which would allow users to flexibly choose the rate of data transmission to meet their needs, does not exist in practice.

These monopolies have built to achieve competitive advantage in niche markets or according to the regulated monopoly license provided by a local or the national government. Needless to say, there is nothing unified or open about this arrangement: Access is closed, and arrangements that bring networks together are almost non-existent.

The monopoly strategy makes sense for a single firm, but not for the society as a whole. The Ministry of Communications and the local authorities must resist the temptation to conspire in the establishment of little monopolies. Where there is an economic advantage to keeping competitors out, there are incentives to persuade the gatekeeper to close the door on later competitors.

That can not be allowed to happen. If Russia is to establish a unified and open communications environment, it can not be through the establishment and cultivation of monopolies. Such an environment will require competition and open access.

2.2 Constraints to Competition: Licensing Policies

The goal of promoting competition in the Russian telecommunications industry will be attained much more rapidly through the adoption of an effective licensing model. One common conception of licensing is the sale of exclusive franchises, and many of the licenses granted by the federal

government employ this model. This kind of license establishes a monopoly, and there are obvious incentives for corruption when monopolies can be arbitrarily created through licensing. The impact for the society as a whole is also questionable; as we have noted, the incentives monopolists face lead to small scale investments in the most profitable regions and technologies, and monopolists have no economic incentives to lower prices or service smaller customers.

The goal of licensing should not be to limit the number of firms operating in the market by creating monopolies. Rather, licensing should serve the purpose of insuring adherence to the ground rules of the Russian telecommunications regulatory authorities. The ground rules should be limited to technical standards and interconnection to competitors, but also might include proscriptions for the building of new infrastructure and the percentage of customers served over time.

If the model of licensing is a means of enforcing regulations, the value of a license is a proportional to the amount of resources the licensee is willing to invest. The result of open access through low-cost licensing is greater levels of investment, more competition among service providers, and lower cost service to a larger number of consumers.

At the same time, licenses should be flexible enough to allow service providers in one area to begin competing with licensees providing other, similar services. A provider of wireless services is a facilities-based competitor with wireline local service providers. The ability to offer “generic” wireless access on designated spectrum offers the most reasonable, and open system for ensuring facilities-based competition can emerge. But, by constraining cellular providers to specific technologies and specific kinds of service models, the government has effectively drawn a line that prevents the entry of a wireless access provider into the market for local services.

Open license policy that proactively helps to shape the market serves to direct the appropriate signals to service providers over time. But licensing is only part of the equation. Obtaining a license to compete against a dominant firm is only part of the battle to enter a market--without interconnection to the dominant service provider's network, new firms will fail to attract customers.

2.3 Spectrum Management

Before the breakup of the Soviet Union, there were no market incentives for efficient spectrum use. Since there was no competition for spectrum space with commercial users, government and military users were not rewarded for using bandwidth-conserving technologies. Today a large invested stock in spectrum-inefficient equipment impedes the transfer of spectrum to other users. At a time when there could be profitable use of the spectrum for civil and commercial uses, the military is refusing to relinquish spectrum. It would indeed be costly for government and military authorities to upgrade their equipment to more efficient technologies, but the management of spectrum could be arranged to satisfy both current and new services.

For the government agencies and military to see an incentive for relinquishing spectrum, they must be offered the opportunity to benefit from the transfer to other segments of the spectrum. The possibilities for this are numerous, but two principle incentives available are:

- Spectrum auctions for allocations for new commercial services. The proceeds from auctions would go to reimburse current spectrum users who would have to invest in new equipment to make way for new commercial services.
- The military and its industrial affiliates could benefit by manufacturing equipment for use in new commercial services. The military industry's experience in the manufacture of radio equipment could be exploited in the marketing of new wireless local loop equipment and the installation and maintenance of all sorts of communications and computational equipment. The ability of the MIC to find commercial uses for its know-how will prevent brain drain, both to foreign countries and to commercial concerns within Russia. It will also serve to maintain a sufficient and efficient industrial base to satisfy the technical needs of the Russian military in the future.

The combination of licensing, interconnection and spectrum management will give the government an opportunity to establish market mechanisms that will alter business practice. In combination, these kinds of regulations will establish a unified structure for telecommunications services, where data and traffic flows move uniformly through different service provider's networks and market entrants are given the opportunity to promote new products and services.

2.4 Financing: The Critical Barrier

Clarifying the rules of the economic game in the telecommunications sector, though, is only a first step in creating the foundation for the development of the telecommunications sector in Russia. Improving the investment environment and proactively bringing investment into the telecommunications sector are two different things. Considering the low quality and penetration rates for telecommunications services in Russia, it is clear that investment in new technology will be critical. For Russia to achieve a 35% teledensity, Russia will need at least 34 million new telephone lines at a cost of approximately \$82.6 billion.²²

Separate projections by the Organization for Economic Cooperation and Development (OECD) and the International Finance Corporation (IFC) indicate that 40-60% of this financing for new investment should come from operator revenues. Direct foreign investment should account for approximately 25-35%, with a combination of municipal debt and equity financing taking upon the rest. How can Russia get the money to build the communications networks it needs?

To date, Russia has concentrated mostly on the local generation of debt and equity financing through the privatization process. Foreign players have not been brought in to invest in and manage the wireline telecommunications infrastructure. Although some claim that the necessary investment for rebuilding the Russian telecommunications infrastructure can be generated from within, the present arrangement presents a number of difficulties.

Foreign Investment in Russia's Telecommunications Infrastructure

Foreign direct investment has been limited to specific projects and has not had the broad-based impact that would help to push penetration rates higher. According to the United Nations Economic Commission for Europe, Russia has only received \$36.5 billion dollars in long-term commitments across all sectors of the economy, a number that is less than the total for Kazakhstan.²³ This is a fraction of what is needed for the telecommunications sector alone.

²² Law, p. 23-46. Also, see The World Telecommunications Development Report 1994 (Geneva: International Telecommunications Union, 1994).

²³ "Soviet Past is Dying Hard in Kazakhstan," *Wall Street Journal*, May 9, 1995.

The only area where foreign investment has played a direct role in the construction of local telecommunications services has been with emerging communications technologies, such as cellular communications. Projects have largely been financed by foreign providers in partnership with Russian companies. But the sums required to set up a small cellular system to support only 15,000 users is a trifling sum when compared to the investment requirements for the Russian information infrastructure as a whole.

Investments in long-distance service, exemplified by the 50x50 project, also have done nothing to facilitate the penetration of local telephone services that would be required to construct a consumer market for telecommunications services. The name comes from the extent of infrastructure construction that the project was meant to fuel: 50,000 kilometers of fiber optic cable to connect 50 cities throughout Russia.²⁴

The 50x50 project has succeeded in financing the creation of three new international fiber optic cables stretching into Europe and Asia, but the promise of increased local penetration through reinvestment appears to have been an illusion. No concrete plans for further investment in the project and shared revenues from the project have appeared, and it would seem that none are forthcoming. As a model for increasing investment in the country, 50x50 also misses the point: It has given providers an excuse to invest in long distance and international linkages while ignoring the needs of consumers at the local level.

Investment levels remain low even in these long distance and specialized networks that would be most useful to intensive users of telecommunications services. One professional estimates that only \$20 million has been invested in data networks throughout Russia since 1993, a sum that pales in comparison to the amounts invested by banks and other institutions throughout the developing world during the same period of time.²⁵ It would appear that specialized networks for data transmission are not likely to fuel broad-based investment in the country's telecommunications infrastructure.

²⁴ On October 6, 1994, the Ministry of Communications signed a memorandum of understanding with US West, Deutsche Bundespost Telekom (DBT) and France Telecom after at least two years of negotiation. This project would be the world's biggest single telephone investment project, but no agreement has been reached between the partners about their contributions or share of revenue. T. Adshead, "Russian Telecommunications -- Industry Report," (Boston: Credit-Suisse-First Boston, Ltd.), November 22, 1994.

²⁵ Figures provided by the Institute for Automated Systems, Moscow.

The Use of Local Financing for Telecommunications Projects

Local financing can be an extremely difficult exercise in a tenuous economic and regulatory environment. Telecommunications is, by its very nature, a capital intensive industry, requiring the investment of hard currency and the use of foreign reserves. During periods of inflation, local prices tend to lag behind the flux in the currency, making it more difficult for local operators to use revenues to fund continuing infrastructure investments. The option of floating debt denominated in foreign currency, and thereby retaining ownership while attracting new capital for investment, runs a double risk in this environment: the company would no longer be able to generate revenues to repay the debt and investors might find the purchase of debt less than attractive when compared to the potential upside of equity financing offered by other countries and companies.

Additionally, Russia does not have a highly developed and mature enough credit market to sustain a strategy of predominantly local financing, which is a critical part of ensuring sufficient investment in infrastructure resources. If the financial community is not yet prepared to efficiently allocate resources to a broad based investment program in infrastructure resources, it is necessary to rely on foreign investment for a greater percentage of the financing.

An example from abroad is instructive in this regard. The World Bank in its 1994 World Development Report compares the sources of funding for infrastructure investment in East Asia and Latin American taken as regions. East Asia has a strong and deep credit market, anchored by Hong Kong, Japan, Singapore and the local exchanges of the growing countries throughout the region. More than 90% of infrastructure investments have been funded by internal capital sources.²⁶ In Latin America, which historically is dominated by large, state-owned and operated banks, more than half of infrastructure investments have come from abroad.

Russia has the opportunity to steer the middle road between these two extremes, balancing the evident strength of the emerging banking community with the directed resources of interested foreign investors. But to chart that middle course, Russia will need to identify strategic opportunities to push penetration rates higher and improve the possibilities for investment to have a real impact on

²⁶ 1994 World Development Report (Washington, DC and Geneva: The World Bank Group).

increasing the capacity and quality of the Russian information infrastructure. These opportunities will allow Russia to leapfrog past the existing technologies that dominate the provision of telecommunications services in developed countries. Simultaneously, they would allow local interests to continue their strong investment and interest in local telecommunications services. What follows is a case study of how Russia can strategically implement recently developed technologies and policy innovations in the telecommunications sector to meet the public policy goals outlined at the beginning of this document.

3. The Opportunities for Wireless Access in Russia

Having discussed the barriers to the implementation of a strategic liberalization scheme and suggested a number of possible remedies to clear the way for innovation and new investment, we now turn to the model of wireless access described in the earlier chapters. How would a low-cost, high penetration wireless access system work in Russia, and what are some of the economic and political factors which will determine its success?

3.1 The Cellular Model in Russia

The present pricing and business strategy for wireless access services in Russia is a direct reflection of the cellular model that has been rolled out in the United States and the developed world over the past decade. Hardware costs can stretch as high as \$2000 for a headset, with access charges quite often more than double than the cost for customers in the United States.

This is a common strategy on the part of wireless access providers in the developing world. The price strategy is targeted to increase the cash flow so that profits, when possible, can be repatriated to the countries and companies that are the source of the investment. Nevertheless, in Russia, there are conflicting reports about the profitability of the investment and the ability of certain companies to extract the revenue from wireless access operations. Specifically, it is estimated by some that the net annual revenue from the US West/MCC/Milicom cellular license in Moscow are more than the total investment in infrastructure made by the participating companies, but that the Western partners have not seen any of that return to date.

The impact of that strategy can be seen in some of the preliminary customer research that has come out of Russia. Preliminary research from one of the cellular carriers in St. Petersburg indicates that the peak time for transmission on the system is from midnight to 2 am, which would indicate that certain kinds of business appropriate to that time of the evening have been driving usage and revenues for wireless services.²⁷ This is certainly not the replacement of the landline telephone and the increase of competition of which wireless access is capable.

If investors have been unable to achieve a return on their investment, and the long-term goal of increased penetration can not be achieved through the implementation of the cellular model in Russia, a better course has to be charted. This better course needs to redefine wireless access in Russia away from the cellular model and towards the model of strategic liberalization which we have outlined in the opening chapters of this thesis. Over the next few sections, we will map out some of the strategic business and policy decisions which will help to redefine the market for wireless access services in Russia.

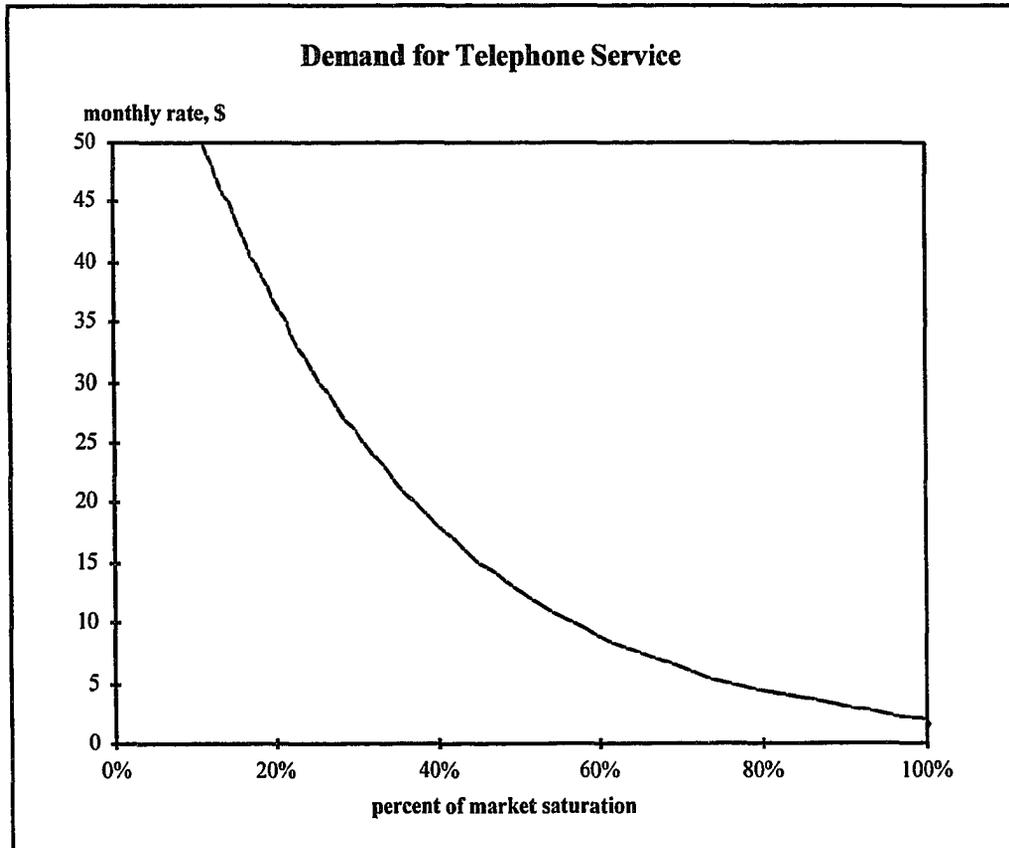
3.2 The Economics and Business Policies for Wireless Access in Russia

At the heart of the redefinition of wireless access in Russia is a reduction in the cost of providing the services. Administrative, sales and marketing costs can be reduced through the outsourcing of functions of the wireless network, such as billing systems and sales forces for retail sales. Capital costs, which include the cost of switching, the cell site which receives and transmits information back and forth to the subscriber, and communication between the cell and the public network, assume a network functionality that includes mobility. The more networks are constructed to facilitate mobility, the more complicated the system becomes and the more expensive the capital costs are to construct the network. By implementing a wireless access solution that involves fixed access points, it will be possible to bring down the capital costs substantially.

This is the goal of wireless local loop: Bringing down costs and increasing local penetration of services through appropriate wireless access technologies. The following chart presents a rough

²⁷ Interview with Carl Pietrzak, Operations Manager -- Russia, Motorola. April, 1995.

projection of how the demand for telephone services can be met through low-cost wireless access applications.



This demand curve approximates the penetration of wireless local loop applications in Russia, and have been constructed from a combination of economic data and business projections of the possible costs for wireless local loop services. Although the price of such applications is not expected to drop to the extent that we show on the chart, the demand projections at the given price do reflect a solid

approximation of the present distribution of wealth in the country and the percentage of income that a typical family would spend on access to telecommunications services.²⁸

Even at the higher price levels, wireless local loop applications clearly break through the service penetration barrier of 15% that presently exists in Russia. Through the application of this technology, Russia can establish the foundation for a broadly based consumer market, contrary to the arguments of many who claim that no such market can exist in the foreseeable future.

Price is not the only advantage of strategically implementing wireless local loop to facilitate the penetration of services. It is much easier to scale investments in wireless technology to the needs of a specific market or market segment than it is for wireline telecommunications. This factor provides an even stronger business rationale for the strategic implementation of a wireless local loop architecture.

As we discussed in the second chapter, an investment in wireline technology is extremely capital intensive. Not only is it necessary to connect each of the individual points on the network with a dedicated line that can stretch from 20 to 100 meters in length, but it is also necessary to put into place a trunking system that can carry all of the traffic from each of the individual subscribers. Calculating demand becomes a very precise science, and a very important one as well. Overbuilding causes financial loss that can not be recovered, and underbuilding can seriously hamper the ability of the network to provide quality service and expand to handle new traffic and subscribers.

Wireless technology is built on a scalable architecture that can be expanded and contracted much more easily to meet shifts in the demand for telecommunications services. For example, if a new subscriber base emerges in a different portion of a city or region that is serviced by wireless access, it is not necessary to rebuild the system and wire the new territory. All that is necessary is the establishment of a new cell site that can support the new subscribers.

For Russia, this kind of flexibility will be critical. As a economy in transition, it is likely that there will be strong increases in demand, often in geographical areas which might not appear to be a high priority for business investment at the present time. For example, as demand increases in highly

²⁸ These estimates have been made through a combination of statistical data derived from the 1994 and 1995 World Development Report and qualitative research conducted by the author and the Public Opinion Foundation through April and May of 1995.

populated urban areas with a higher demand for telecommunications services, cell division will enhance the capacity of the network. For a wireline network, the only option would be to rebuild the trunk lines and construct new drops from the trunk line to the homes.

Rebuilding trunk and drop lines would be extraordinarily expensive and difficult. First, the sheer lack of capable people needed to complete the task makes the execution of such a strategy almost an impossibility. Further, continuing difficulties on the definition of land rights and titles would make any such work a serious business risk; one day, the line is on a plot of land owned by the company or rented by the company, the next day the land may be in completely different hands.

As a strategic business decision, wireless access is much safer and much more capable of meeting changing demand conditions. In that regard, the appropriate business decision for any new or existing provider is to begin the transition to wireless local loop architectures in the provision of basic telephone services throughout the country.

3.3 The Public Policy of Wireless Access in Russia

Some of the critical pieces of the public policy puzzle have already been discussed in our section on barriers to the reform of the telecommunications markets in Russia. Even so, there are two specific public policy issues which will be critical to the establishment of a competitive framework for wireless access services in Russia: Spectrum management and interconnection with the public switched telephone network.

Spectrum Reform for Wireless Access

In order to provide wireless local loop services, Russia must address the larger problem of spectrum management. As we have discussed, spectrum management has become bifurcated, with localities pushing the AMPS standard for cellular service at 800 MHz and the federal government licensing GSM. The Russian military still controls large swaths of spectrum, and, in some cases, has already begun to use the spectrum they have under their control for commercial purposes. Russia is in desperate need of a law to help regulate control of and use of the spectrum, but the law needs to be open and flexible enough to ensure that innovative, new services like wireless local loop can be

offered. Recently the Duma has been attempting to reform spectrum control, but resistance from the beneficiaries of the current system have blocked change.²⁹

The only answer to this difficulty is for Russia to establish an independent spectrum commission and empower the commission to monitor the use of the spectrum by service providers and create regulations for licensing and the resolution of conflicts. Regulations should be executed and enforced by the Ministry of Communications, rather than made by the Ministry.

One of the first responsibilities of the independent commission should be to arrange for the auction of licenses in the 1800 mhz to 2200 mhz range which will be used for the provision of PCS services in most developing countries. Since equipment has been developed for this frequency band, it will be easier for service providers to get access to a number of equipment manufacturers that are prepared to support the construction of wireless infrastructures. The proceeds for this auction should not be expected to be very large, especially considering that no telecommunications company has shown an interest in some of the licenses for the 800 and 900 mhz bands in the more isolated regions of Russia. Nevertheless, it is likely that licenses for Moscow and other large cities would receive a fair value in an auction proceeding, or that national licenses would receive real attention from local and international investors.

Interconnection for Wireless Access Service Provision

The transformation of the telecommunications industry from a wireline to a wireless infrastructure will not happen overnight. For that reason, it will be critical for the Russian government establish standard practices for the connection of wireless and wireline telecommunications infrastructures. At present, the Russian government in general, and the Ministry of Communications in particular, have done more to hamper the interconnection between network systems than they have done to facilitate it.

The technologies required for the interconnection of wireless systems into the public switched telephone network and other wireline networks have become entangled in the politics of

²⁹ Report by Charles Arndt, Office of Science Technology and Environment, U.S. Embassy, Moscow. April 1995.

infrastructure investment in Russia. Service providers have been innovative in developing mechanisms for linking together the most modern telecommunications equipment with the older technologies of the Soviet telecommunications infrastructure. The Russian government has chosen to view these innovations as an impediment to their ability to coerce foreign service providers to introduce the most modern communications technologies. The Ministry recently mandated that intermediary standards can not be used to connect cellular services to the public switched telephone network, a decision that contributes to the fragmentation of the market by hampering the ability of wireless access providers to develop mechanisms to quickly increase capacity and meet demand.³⁰

The public policy problem is also one of incentives. As we have already mentioned, there are many different kinds of monopolies in Russia, and there are presently no incentives to facilitate the interconnection of networks, be they wireline or wireless systems. The government must adopt a set of "sticks and carrots" to incent companies to connect their networks together over time.

The "sticks" used by developed countries would be appropriate to the Russian case, insofar as they can be enforced by the Ministry of Communications. Legal sanctions against companies who do not open their infrastructure for traffic from other providers will be critical, and clearing the way for appropriate legal challenges will play a critical role in establishing sanctions against recalcitrant providers.

The "carrots" are somewhat harder to identify, but will be more critical in the long term. First, the Ministry must take the public position against the continuation of the restricted monopoly system and provide clear business advantages for the integration and interconnection of networks. Those arguments will be based on economies of scope and the ability of each of these networks to achieve a broader base of customers over time, thus increasing the possibility of improved revenues and infrastructure value. More concretely, the Ministry and members of the legislative branch could advocate specific tax advantages for telecommunications providers that carry the traffic of other providers, thus offering a clear financial argument for interconnection.

³⁰ Specifically, the Ministry of Communications has outlawed a signalling technology developed by a Yugoslav company which allows the advanced signalling systems of cellular systems to communicate with the Soviet signalling system to connect and complete calls. The MoC has made this decision to compel wireless access providers to invest in SS-7 compatible switches to support the public switched telephone network, even though the access providers are not responsible for investment in and maintenance of the public switched telephone network.

3.4 Bringing Strategic Business Decisions and Good Public Policy Together: Strategic Liberalization for Russia

The proscriptions of strategic liberalization which appear at the end of the third chapter of this thesis would positively affect the development of the Russian telecommunications environment. As Russia works through the issues detailed above, government and business managers will have the opportunity to work together on a number of fronts to enhance the country's ability to increase service penetration and improve the environment for telecommunications competition throughout the country.

- Increasing institutional flexibility and decreasing the costs of provision by outsourcing marketing, sales and billing functions.

There are presently a number of partnerships to fuel small business activity throughout Russia, most of which has been funded by foreign sources in corporation with the Russian government. It will be possible for the Ministry of Communications to advocate that some funding and training be used to create small businesses that can undertake the marketing and sales functions, thereby decreasing the overall cost of service provision. In addition, the World Bank and other institutions can use their network of subcontractors and affiliated lending institutions to emphasize this opportunity and establish connections between the service providers and the emerging support sector for wireless access.

- Decreasing network maintenance costs by creating incentives for the co-location of facilities

The most straightforward means of establishing these incentives is to emphasize how the co-location of facilities has a positive impact on the balance sheet for wireless access providers. Clearly, the strongest argument for the co-location of facilities is that it keeps costs down, but in a highly competitive environment, many companies choose to forgo cost savings for the security of holding their own facilities. The result is the creation of a bottleneck, especially for wireless access; there are only so many appropriately positioned cell sites, and if they are occupied, it would be difficult for new entrants in the marketplace.

The bluntest public policy instrument is to mandate the co-location of facilities in specific circumstances, and look to translate successful models throughout the country as evidence of the business utility of co-location. As the Duma considers additional telecommunications legislation and the establishment of bodies for spectrum management, this kind of mandate would be an appropriate addition to the reform package.

- Preferential treatment for technological innovators

To increase service penetration and decrease the costs of providing telecommunications services, Russia will have to place itself at the forefront of technological innovation by becoming a laboratory for and source of new breakthroughs. Innovators should therefore have preferential treatment with regard to resource and license allocation where possible.

The critical difficulty in this proscription is the identification of the technological innovation and the establishment of an appropriate benefit for the innovator. As the American case has showed, this process is inherently political and can create impressions of favoritism and patronage.

Russia will have one advantage, though: The experience of other countries where wireless access has already achieved relatively high rates of penetration. If the Federal Communications Commission, for example, determines that a real technological breakthrough has occurred, it will be possible for Russia's Ministry of Communications to follow the Commission's lead and motivate the innovator to bring the product to Russia. This kind of activity will be critical to Russia's ability to become an early adopter of innovative technology, and can help to depoliticize the activity somewhat. Nevertheless, specific procedures for the review of domestic products and their classification will be critical to fostering the innovation among local producers in Russia's telecommunications sector.

4. Conclusions: Making the Grass Roots Development Model Work in Russia

We began the chapter with an metaphor to describe what has been a model for telecommunications development driven at the local level, and have spent much of the chapter reflecting on the difficulties engendered by such a model. The fragmentation of the telecommunications infrastructure, the lack of local investment, and the establishment and entrenchment of individual monopolies seriously threaten the future viability of the telecommunications infrastructure.

But our emphasis on the negative elements of Russia's recent development hides what could be turned into a very formidable strength. Most of the existing models of telecommunications development are "top-down," based on investment by large, state-owned or highly regulated, private monopoly service providers. The only "bottom-up" model we have been able to identify is the United States after the expiration of the Bell patent before the creation of the Bell System and the Kingsbury commitment.

Russia has the potential of becoming the second major example of "bottom up" telecommunications development. If the highly advanced pockets of telecommunications investment can be brought together through the coordination of influential groups within Russia (the banking community in particular), there is a real opportunity to establish a unified communications infrastructure that is more responsive to the long-term needs of customers. With local and regional investment driving the increased penetration, it will be possible to create a federation of telecommunications networks in Russia that achieve the goals of strategic liberalization that we have outlined.

In Russia, strategic liberalization can facilitate the integration of networks through establishing a common framework for investment and increased penetration. With different companies building wireless access networks and connecting them together to meet the increased demand, a consumer and mass market for telecommunications services will slowly develop. More importantly, the foundation for a competitive market will ground the future development of the sector. The result will be access competition, similar to the access competition which drove increased penetration in the US from 1871 to 1913. So the fragmentation of the Russian infrastructure can be turned into an advantage, perhaps allowing it to leapfrog to a new stage of telecommunications development on par with its competitors in the developed world. The troika driving Russia could not only avoid the ditch, but perhaps even overtake the other riders off in the distance.

Chapter 8

Defining the Procedural Entente: Strategic Liberalization in Brazil¹

From the perspective of national development, some of the problems that Brazil faces are common to many developing countries. Disparity of wealth between population groups, a newly urbanized citizenry facing overcrowding, overpopulation and poverty. The size of the country, and the extensive (though often inaccessible) resources of Amazonia also set it apart, making Brazil a leader in the Americas by example alone. "As Brazil goes," President Richard Nixon once put it, "so goes Latin America."

But Brazil has lagged behind in the region where it is thought to be a bellweather. While Chile, Argentina, Venezuela and other countries have moved forward in the liberalization and deregulation of the telecommunications sector, Brazil has clung steadfastly to the state-owned and operated company, Telebras, that has run the country's telecommunications networks since 1972.

The overarching difficulty that Brazil faces in the telecommunications sector mirrors the stage of the country's development: Uneven pockets of success reside within a overbureaucratized, undercapitalized and overburdened public telecommunications infrastructure. There is also the reality that, as is the case for many state-owned and operated PTOs, the political structure has guided the development of the sector to match certain institutional objectives that have little to do with rational economic decisionmaking. Nothing short of a revolution in telecommunications policy could turn Brazil's present telecommunications infrastructure into a network to support national development.

¹ A great deal of the information included in this chapter appears in "Brazilian Telecommunications in Transition: A New Strategy for Competitiveness," Lee McKnight, W. Russell Neuman, Jose Ferro and Antonio Botelho. (Medford, MA: Unpublished manuscript on file at the Edward R. Murrow Center of the Fletcher School of Law and Diplomacy). The author contributed to the primary research and the drafting of material included in the report and has based this chapter on the conclusions and much of the information presented in the report.

Such a miracle may be within reach; if not the entire miracle, then perhaps a number of small strategic miracles that could lead to a broader trend within Brazil's telecommunications infrastructure. If any improvement is to be made, though, it will be made in the Brazilian fashion, summed up more than a decade and a half ago by Peter McDonough, in his seminal work on the Brazilian elite structure, Power and Ideology in Brazil.

The key question is not whether any one of the major ideological currents among the elites can dominate the others -- whether, for example, the economists can gain sustained hegemony. Instead, it concerns the degree to which elites with profoundly discrepant priorities about the challenges facing Brazil, and themselves, manage to put up with one another. Such a compact is not identical to a consensus on specific issues, for the very concept of legitimacy involves the manner in which elites live with one another in the chronic absence of agreement about important policy questions. Neither, by postulate, is it reducible to the particular interests of disparate groups. It refers to a procedural *entente* rather than to a consensus on specific issues.²

As governments shifted from authoritarianism to democratic and back over the past century of Brazilian development, the need to define and implement a procedural entente has been critical. It is in defining the right "entente" that Brazil is able to move ahead in the developmental process.

The particular type of compact that stood at the foundation of Brazil's telecommunications policy over the past two decades has failed to improve the telecommunications infrastructure of the country. In fact, as our discussion will outline in detail, the compact has undermined the viability of the network, leaving it even further behind the quality and capacity of the developed world than is the case in many neighboring countries.

A new kind of compact needs to be defined, based on the principles of strategic liberalization. This chapter outlines how Brazil can use strategic liberalization as part of a broader policy during a period of liberalization that is likely to commence with the passage of legislation to reform the sector. The section begins with a brief outline of Brazil's early telecommunications history and identifies the pattern of underinvestment which has undermined the development of the sector. We then discuss

² Peter McDonough, Power and Ideology in Brazil (Princeton, NJ: Princeton University Press, 1981), p. 46
McDonough footnotes in this passage Richard Hyman's "Pluralism, Procedural Consensus, and Collective Bargaining," *The British Journal of Industrial Relations* 16 (1978): 16-40.

the history of wireless communications in Brazil and identify the specific opportunities to use wireless access and strategic liberalization to enhance the quality of competition in telecommunications.

1. The History of Brazilian Telecommunications

The telegraph brought the first communications revolution to Brazil during the second half of the 19th century. The focus on E. Bradford Burns' description of the first push for telegraphy in Brazil says a great deal about the development of the telephone and other communications capabilities that were to follow.

The first line connected the imperial palace at São Cristóvão, on the outskirts of the capital, to the military headquarters at Campo Santa Ana in the capital. By 1857, Petropolis, the cool summer capital in the mountains behind Rio de Janeiro, communicated telegraphically with Rio de Janeiro. The outbreak of the Paraguayan war initiated a flurry of activity to string lines southward to the theater of action. In a record time of six months a telegraph line connected the southern provinces to the court.³

One of the clear realities in the history of development throughout Latin America has been the unmistakable influence of the military on the allocation of resources. Since the proclamation of the Brazilian Republic in 1889, the Brazilian Military has taken direct control of the major functions of government only once in 1964, but held it until 1985.⁴ Even so, the military has always been a

³ E. Bradford Burns, A History of Brazil, Third Edition (New York: Columbia University Press, 1993), p. 154-155.

⁴ Luciano Martin, "The 'Liberalization' of Authoritarian Rule in Brazil," from Transitions from Authoritarian Rule, Guillermo O'Donnell, Philippe C. Schmitter and Laurence Whitehead, eds. (Baltimore and London: The Johns Hopkins University Press, 1986), p. 76-81 in particular. See also, Ronald M. Schneider, "Order and Progress:" A Political History of Brazil (Boulder, CO: Westview Press, 1991.). On page 11, Schneider writes:

The military figures involved in these events [the 1922 campaign of the Military Club against the government, the military's role in the Vargas regime and his ouster in 1945, among others] had been participants, not just observers, throughout the recurring crises from

critical interest group in the Brazilian content, claiming its share of resources and power as the nation developed.

The obvious importance of the military's influence in the telecommunications sector is underscored by the above passage: The first telegraph connection was a military application, only then did it grow into a commercial service. By 1855, the telegraph network covered 20,000 kilometers of lines and in 1886, the first long-distance line connecting Rio de Janeiro to the southernmost state capital, Porto Alegre was installed (again because of the needs of the military). The parallel of telecommunications development and military interest is especially pronounced in the 1960s and 1970s, defining, in part, the procedural entente that defines Brazil's present stage of telecommunications development.

Another part of the existing "telecommunications entente" in Brazil is the importance of international linkages over local ones. His description of the development of the first international telegraph link also foreshadows some of our discussion:

The progressive Visconde de Mauá formed a company with an English partner to lay a submarine cable from Europe to Brazil. The idea of not only direct but instantaneous communication with Europe titillated the Brazilian imagination. A grand festival inaugurated that line. Seated before a special machine in the National Library on June 23, 1874, Pedro II dictated the first message to be cabled to Europe by telegraph long before it could similarly communicate with other parts of its own empire. The next stage in international communications was to establish telegraph contact with the Plata neighbors. The lines reached Montevideo in 1879 and Buenos Aires in 1883.⁵

1922 on. Hence they felt a sense of responsibility for the outcome of these episodes and second-guessed themselves concerning the sins of omission; a valid comprehension of their perceptions in this regard is at least as essential for understanding the sharp regime change of 1964 as is an analysis of developments within the political system itself. Moreover, when the political system underwent fundamental change, so did the military institution insofar as it functioned as a component of the political system.

Other books on the role of the military in Brazil's political system include Henry Hunt Keith and Robert A. Hayes, eds., Perspectives on Armed Politics in Brazil (Tempe: Arizona State University Press, 1976).

⁵ E. Bradford Burns, A History of Brazil, Third Edition (New York: Columbia University Press, 1993), p. 155.

Brazil's historical link to Portugal was very much the focus of Brazil's relationship to the world towards the end of the 19th Century. For a brief period of time before the collapse of the monarchy, Brazil was the home to the Portuguese monarch after the Regent (and later King) John VI was forced to leave his home country during the period of French intervention in Spain and Portugal.⁶ Even after the Brazilian monarch split from the Portuguese dominion later in the century, the close connection between Brazil the colony and Europe the colonizers was reflected in the organization and penetration of the telegraph and telephone. That legacy still exists today, with international connections often easier to make than local ones. This is, in great part, because the present telecommunications structure rewards those kinds of investments more so than investments in services in markets that could become broadly competitive.

Finally, there is Brazil's heritage as a country of some indigenous technological innovation and a market of interest to multinational companies. This factor was reflected in the first decades of the 20th century and the introduction of various telephone and radio systems throughout the country.

The growth of the Brazilian economy in the first decades of the twentieth century and the expansion of government activities created a budding market for professional equipment, which was attended in the early thirties by at least a dozen national manufacturers, including Standard Electric S.A. (SESA) and the Companhia Marconi Brasileria. SESA was controlled by ITT, which also controlled the International Standard Electric Corporation (ISE), charged with the technical support to the automatic switching exchanges of the ITT European group in Brazil. Other major firms commercializing communications equipment in Brazil included Ericsson, established in 1891 to commercialize telephone exchange equipment and the Companhia Brasileria de Electricidade, controlled by Siemens, which in 1913 installed several radiotelegraphic stations at Army forts.⁷

Because of the potential size of the market and its distance from other major commercial centers, the local telecommunications equipment manufacturing base grew in the early decades of the 20th

⁶ John VI was escorted from Portugal by Britain, which benefited greatly from its Brazilian relationship to establish a strong sphere of influence in South America, later battling the United States in the war of 1812 in part because of its design to reassert trading prerogatives throughout the Western hemisphere. See John H. Crow, The Epic of Latin America, (Berkeley: University of California Press, 1992, Fourth Edition). This story appears on p. 518-519.

⁷ Neuman, McKnight, et. al, p. 31-32.

century through to the post-war era. This strength and tradition of telecommunications equipment manufacturing is reflected in the operating activities of Telebrás, Brazil's national telecommunications operator, during the last twenty years.

In many ways, these three factors formed the basis of the "telecommunications entente" of telecommunications development in Brazil. The influence of the military, the need for international communications and linkages, and the goal of establishing an local equipment and technology manufacturing base brought a variety of economic, social and political interests together. The embodiment of that consensus is Telebras, the state-owned and operated public telecommunications operator.

1.1 Early Developments and the Founding of Telebras

The state did not take control of the telegraph or telecommunications infrastructure until late in its development. During the 1940's and 1950's, a number of multinational firms played a dominant role in the provision of wireless and wireline communications services, including telegraphy and telephony. The Companhia Telefônica Brasileira (CTB), which was controlled by a Canadian holding company, serviced around 70% of the 1.5 million telephones in the country in 1968 and carried about 80% of the telephone traffic. The CTB also was the main supplier of equipment for that network.⁸ Western Telegraph and Telephone, along with Cable & Wireless of Great Britain, dominated the market for telegraph services until the late 1940's, when the government began to increase its control over the sector through direct regulation. Concessions were given to four international carriers, all of which expired between 1970 and 1973, not to be renewed by the government.⁹

Unlike the American case, where lack of centralized control and private ownership of the telecommunications networks produced access competition, Brazil's somewhat chaotic map for telecommunications development did not lead to increased service penetration, at least when compared to the rest of the world.

⁸ Michael Hodbdy, *Telecommunications in Developing Countries*, p. 88.

⁹ The four concessionaires were Radional/ITT, SUDAM/Alcatel, Radiobrás, and Italcable.

In 1957, Brazil's telephone density was a third of the world's average (1.3 per 100 inhabitants versus 3.7). In 1960, Brazil had 1 million telephones for a population of 70 million, with 2/3 of the equipment and traffic concentrated in the southern states of Rio de Janeiro and São Paulo, the industrial center of Brazil.¹⁰

This underdevelopment of the telecommunications structure was a reflection of the pervasive economic difficulties of the country. After a booming decade of growth in the 1950's, increased dissatisfaction with the economic performance of the democratic regime and the political confusion wrought by the quick succession of democratic leaders, the authority of the government disintegrated.¹¹ The military coup of 1964 ushered in an era of increasing assertion of central (and military) prerogatives, a fact reflected in the next era of Brazilian telecommunications development.

As the 1960's progressed, the Brazilian military government began to assert authority over the various pieces of the Brazilian economy and society, instituting a system of authoritarian control that would last through the 1970's. The assertion of central control included the reorganization of the country's information and telecommunications networks and the creation of a single, government owned telecommunications operator: Telebrás.

The first step to establishing a central authority for telecommunications operations and development was made in 1962, with the passage of Brazil's telecommunications code. "The Code granted the state a monopoly in the operation and regulation of telecommunications activities," and established a National Telecommunications Council (CONTEL) to reduce market fragmentation and rationalize equipment supplies.¹²

Soon after the completion of the military coup, the Brazilian Telecommunications Enterprise (Embratel) was created. The initial objectives of the company closely mirrored the military's desire to assert central control over the fragmented political and economic system.¹³ Embratel took charge

¹⁰ Ibid, p. 33.

¹¹ Burns, p. 381-444. The inability of the democratic process to produce a clear successor to the Presidency in the 1960 elections and the polarization of the country after the 1962 congressional elections led to military action. See also Schneider, p. 224-237.

¹² Neuman, McKnight, et al., p. 33.

¹³ This interpretation of events is strongly stated in the neo-dependency writings of the past few years, as typified in an article by Anamaria Fadul and Joseph Strabhaar in "Communications, Culture and Informatics

of the national and international trunk operations and the development of linkages with the farthest reaches of the country. A Ministry of Communications was established in 1967 as part of a broader government reorganization that marked the military's entrenchment in the government and the opening of a period of political cohesion and terror. As part of a Ministry of Communications rationalization effort, the Brazilian government acquired the largest foreign telephone concessionaire, the CTB, and began to take direct control of most of the telephone companies in the country.

In 1972, the government established Telebrás as a public enterprise "to plan and manage, financially and technically, the development of the [telecommunications] system."¹⁴ Through a series of purchases and mergers, Telebrás gained majority control of the country's telephone and telecommunications networks, reducing the total number of major networks to 37. Subsidiary firms were established to serve the commercial and government interests of a given state, and the federal structure of Brazil was such that state authorities were able to maintain the management control of the state enterprises.¹⁵ But because Telebrás was given a monopoly on the purchase of telecommunications equipment, it had the ability to dictate the technology policy and infrastructure development of the state companies.

in Brazil: The Current Challenges," in Gerald Sussman and John Lent eds., Transnational Communications: Wiring the Third World (London: Sage Publications, 1991). On page 216, they write:

After the 1964 coup, the military thought of communication as an important element also in national security. Two aspects of national security for the military were creating an infrastructure and controlling the image or concept of the nation. The military invested heavily in telecommunications, both in telephony and microwave/satellite links for broadcast networks. The country needed a communications system capable of integrating those elements, to provide a channel through which to portray an image of Brazil that would support the economic model the military wanted. In short, the policy of the time was to provide infrastructure and access, while perpetuating state ideological control, which created major conflicts within opposition political forces.

The position of these authors is, quite likely, overstated. But it would be difficult to deny that the expansion of the telecommunications and media networks closely corresponded with the institutional goals of the newly established military leaders, which was an essential part of the "telecommunications entente" that developed in Brazil and defined telecommunications development for more than two decades.

¹⁴ Ibid, p. 34 The government owned 80% of the enterprise, with Bradesco, Brazil's largest private bank, AT&T and Bell Canada as minority private shareholders.

¹⁵ In many cases, state governments also were granted partial ownership of the local subsidiaries that served the telecommunications needs of their region.

As part of this power to purchase equipment, and in executing its mandate to develop a national telecommunications research and development strategy, Telebrás founded the "Centro de Pesquisas e Desenvolvimento" (the Center for Research and Development, CPqD) in 1976. CPqD was responsible for the development of technology and the training of Telebrás personnel so as to ensure the quality of the telecommunications network. As such, it became the national center for technology research and development, and approximately Telebrás R&D activities through CPqD have accounted for over 90% of all Brazilian telecommunications research. It also became an example for the world during the 1970s and 1980s as countries looked to develop centralized strategies for national development.

With the consolidation of the telecommunications sector complete and the structure set for the development of the sector, Telebras and the Brazilian government set about implementing a centralized investment and growth strategy. The centerpiece was the Second National Development Plan, within which a goal of a 200% increase in the number of telephones in use by the end of the 1970's. Spending on telecommunications investments went from just over \$500 million in 1973 to more than \$1.5 billion in 1976, all of which were funded by a central government flush with cash and new international loans.

The strategy for research and development followed the pattern of infrastructure investment in telecommunications technology.

One can identify a three-pronged approach to building up the technological and industrial base of the country: First, the setting up of a major new government-owned center in digital technology; second, to 'persuade' the MNCs to transfer the ownership to Brazilian capital and to increase the level of manufacturing and technological facilities within the country; third, to sponsor the development of new Brazilian companies to manufacture equipment and develop technology.¹⁶

The classic strategy of import substitution was put into place, and CPqD became the fulcrum for partnerships between multinational and local firms to supply the infrastructure for telecommunications development. The Ministry of Communications saved percentages of the market

¹⁶ Hobday, p. 114.

for different kinds of technology for local companies, while the remaining percentage could be manufactured locally by the multinationals.¹⁷ Even so, the multinationals were compelled to lease from CPqD the technological specifications so that they could produce the equipment, thereby further fueling the allocation of resources for the research center.

The result was a re-establishment of foreign presence in Brazil according to the new parameters.

The rapid growth in public telecommunications investment and Telebras standardization policies prompted foreign firms active in the Brazilian market to set up Brazilian manufacturing operations such as Siemens (1970), Philips (1974), Ericsson (1955) SESA (ITT) (1967), and NEC (1968). In the period between 1971 and 1974, investments in telecommunications infrastructure reached \$588 million and Telebras orders for about 1 million lines were divided between Ericsson, SESA (ITT) and Plessey.¹⁸

Each of those companies established an association with Brazilian financial groups in order to become a "nationalized" part of the telecommunications sector.¹⁹ The sector as a whole grew through this process of centralization and rationalization, with the equipment manufacturing capacity of Brazil's economy increasing to 1.3 billion by the end of the 1980's. Most of this technology

¹⁷ Neuman, McKnight, et. al., p 36.

¹⁸ Ibid, p. 37

¹⁹ Capallaro, Jorge José V. "Historia da Indústria de Equipamentos de Telecomunicações no Brasil," in Lins de Barros, Henry British, eds, Historia da Indústria de Telecomunicações no Brasil, (Historia Geral das Telecomunicações no Brasil -- Cadernos da TELECOM I) (Rio de Janeiro: Associação Brasileira de Telecomunicação -- TELECOM. Neuman, McKnight et. al argue that the "association between Ericsson and Matec, controlled by the industrial holding Montiro Aranha, was the only one that effectively provided for the transfer of digital technology to a Brazilian associate." ITT, for example, eventually sold out its subsidiary to Brasilinvest along with a transfer agreement for its crossbar technology, but not electronic digital technology. Ericsson has gone on to play a critical role in the manufacture of the Tropic family of exchanges, which became the backbone for the development of Brazil's telecommunications network in the modern age. Ericsson was also partially responsible for the fiber deployment in the São Paulo region, an event which made Brazil the first developing country with a deployed fiber communications capability. As Neuman, McKnight et al point out, though, "the Brazilian telecommunications equipment market is relatively open when compared to those of developed nations such as Japan (with almost 100% domestic equipment), France (86%) or even Italy (65%)." p. 42.

supported advanced digital transmission, and superseded the old analog transmission systems of the previous era.

Hobday describes this as the real victory of the centralized development model and import substitution strategy. "If we contrast the UK with Brazil," he writes, "the ease of transition to digital technology and the leapfrogging of various intermediate forms of telecommunications technology is striking." Hobday points to the development and deployment of the digital Tropicico switching system through the Telebras system as a direct transition from an analog to digital structure, while Britain used a variety of smaller steps to begin the process of transition during the 1960's. The result, when looking from his vantage point in the mid-1980s, was a Brazilian infrastructure with a higher penetration of digital technology than most other developing countries.

Nevertheless, these successes masked a broader failure in the telecommunications development strategy, one that became more obvious as the 1980's progressed. The failure occurred because this procedural entente of centralizing power and rationalizing systems did not produce the sustained growth of the telecommunications system. Quite the contrary, it set the preconditions for the erosion of the financial and technological integrity of the Telebras system.

1.2 The Failure of the First Brazilian Procedural Entente

At its core, the problem with the centralized system for the development of the telecommunications networks was that it depended almost exclusively on the vicissitudes of national economic prosperity. A succession of economic problems, including the two world oil crises and bouts of serious inflation, undermined the macroeconomic stability of the Brazilian economy. The impact on state run firms in general was significant:

State enterprise investment outlays had already begun to drop in 1982, a year before the generalized decline in Brazil's investment ratio became evident. This decrease, from 6.1 percent of GDP in 1981 to 3.8 percent in 1984, reflected in a variety of factors, including the following: The acute shortage of foreign exchange; constraints on foreign and domestic borrowing; falling revenues because of price controls and because of weak demand for selected goods and services produced by the public sector (for example, steel and electric energy); and numerous import

restrictions and prohibitions. The decline in private sector outlays was also steep, as the investment ratio (excluding the state enterprises) dropped from a 14.6 percent average of GDP in the 1981-82 period to 10.8 percent in 1984.²⁰

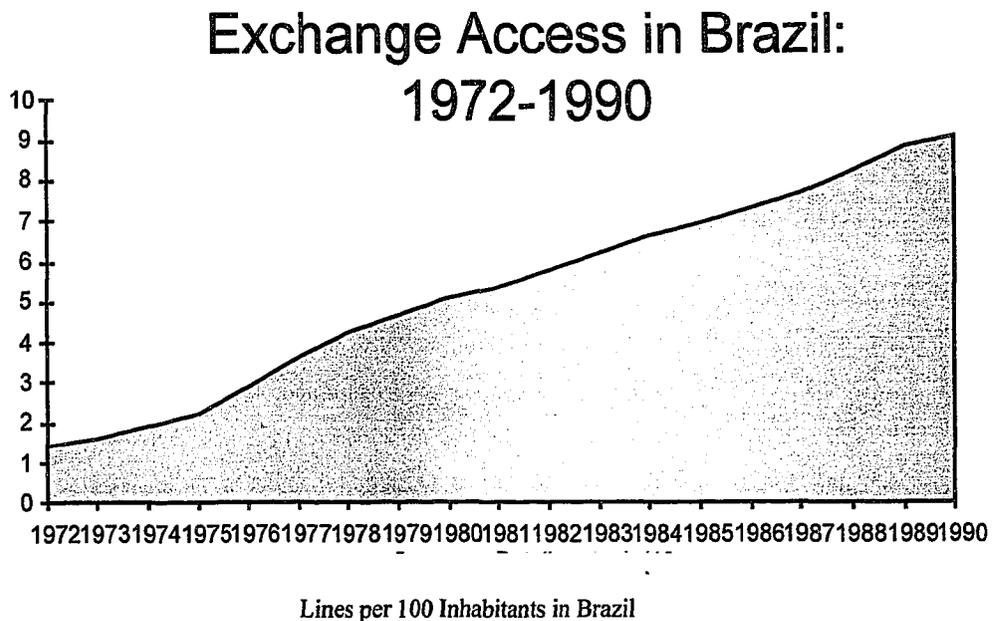
The decrease in consumption caused an economic contraction, one that affected the telecommunications infrastructure very seriously. The nature of the impact was particular to the telecommunications sector and the problems it engendered are, in many ways, peculiar to the Brazilian case. To put it simply, the attempt by the center to hold onto the procedural entente that guided the development of the telecommunications networks through the period after 1964 increased the damage done to the sector.

The next few pages offer statistical information which shows, in detail, the impact of the Brazilian economic contraction on the telecommunications sector. What the statistics show is that investment in the telecommunications infrastructure was not sustained because of structural and institutional deficiencies in the public sector.

²⁰ James Dinsmoor, Brazil: Responses to the Debt Crisis, Impact on Savings, Investment and Growth (Washington, DC: Inter American Development Bank, 1990), p. 5

Line Growth Remains Constant

The number of telephone exchange access lines increased at a consistent rate during the period between 1972 and 1990, as is indicated in the chart below. From a total of about 1.4 million, the number increased by almost a factor of 8 to a little more than 8 million lines during the 18 year period. The increase was accomplished by government mandate, with targets for expansion set mostly by the political agenda of further expansion and centralization. On the surface, these numbers would seem to indicate a successful strategy for the development of the sector, with increasing capability and access for the citizens of the country.



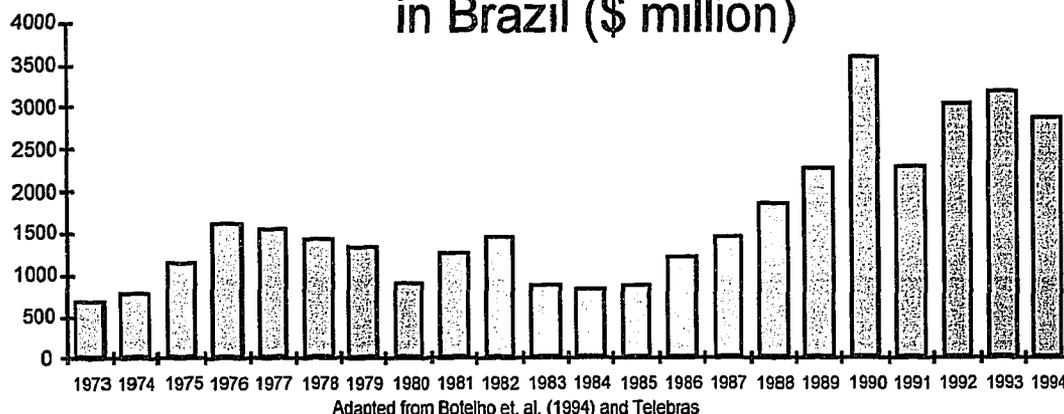
Source: Telebrás; Neuman, McKnight et. al.

The Uneven Investment Pattern

But even as the number of lines increased at a steady pace, the money available to construct and support those lines was decreasing during the 1970's and into the 1980's. The chart below shows the level of investment in the Brazilian telecommunications infrastructure during the same period of 1973 to 1990. The vertical bars show the total investment in millions of dollars.

As the Telebras system consolidated in the mid to late 1970's, there was an increase in investment, but the total investment decreased dramatically from 1.7 billion dollars in 1976 down to about 1 billion dollars in 1980. Investment did not reach the 1976 level again until more than a decade later, as the Brazilian economy made the transition back from dictatorship to democracy. In other words, there were more lines to operate and maintain with less money, which was a recipe for a deterioration of the system.

Telecommunications Investment in Brazil (\$ million)

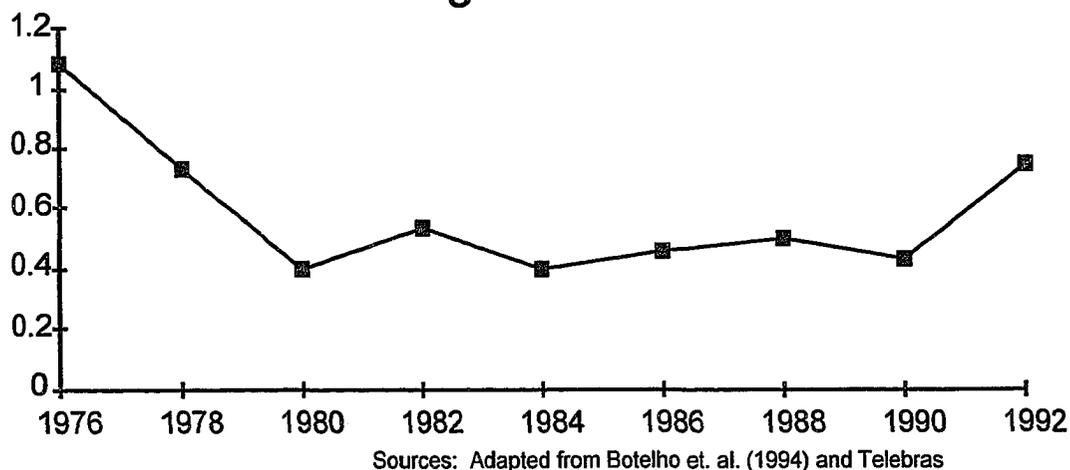


The Decline of the Telecommunications Sector

Considering the decrease in the gross consumption of the government throughout the 1980's, it might be assumed that all of the public and private enterprises shrunk at approximately the same rate. The chart below clearly indicates that the telecommunications sector, relative to other sectors as a total share of GDP, decreased dramatically during this period of contraction.

The chart shows the level of telecommunications investment in Brazil as a share of GDP between the years of 1976 and 1992. In 1976, at the high point of telecommunications investment in absolute terms (see previous chart), the sector was responsible for a little more than 1% of GNP. That number drops to about .5% of GDP through the entirety of the 1980's. Other sectors of the Brazilian economy were able to gain access to a greater percentage of resources relative to the telecommunications sector, even while the level of telecommunications investment measured as a percentage of GNP in most other countries increased dramatically during the 1980's.

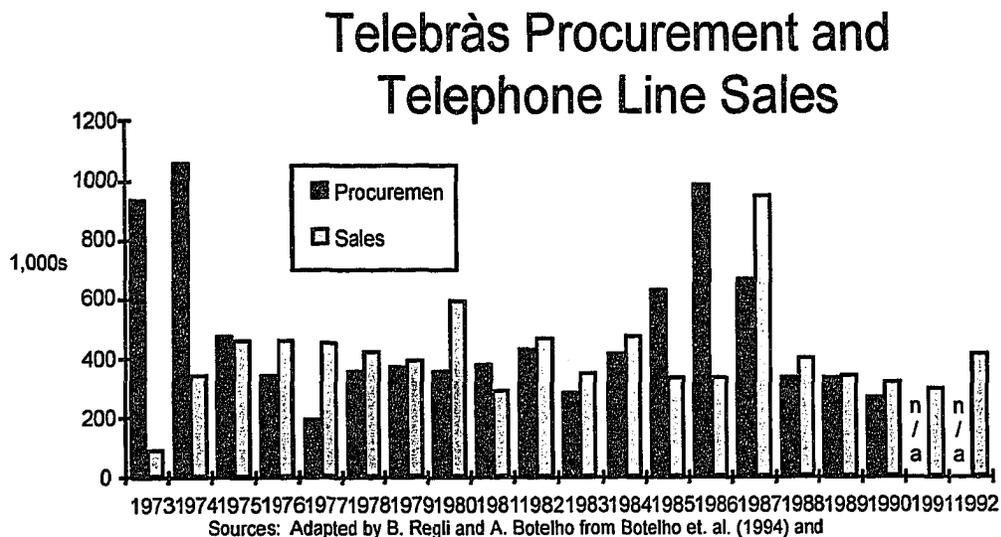
Telecommunications Investment as Percentage of GDP in Brazil



Demand for Telecommunications Services Increase

Even as the economic downturn forced a contraction of resources for Telebras, the demand for telecommunications services continued unabated. Instead of turning away customers, Telebras made sales and instituted a system whereby subscribers would pay for the construction of the access line.²¹ The problem is that actual procurement of lines lagged behind sales for most of the period between 1975 and 1984, as the chart below shows. The horizontal bars compare the levels of line procurement and sales from 1973 through to 1992.

The result of this policy of selling lines before they were built is evident in the chart. The center could not handle the demand. A huge backlog of customers were not being serviced by the lines they had already "purchased," and the ability of the network to maintain the same quality of service was seriously hampered.

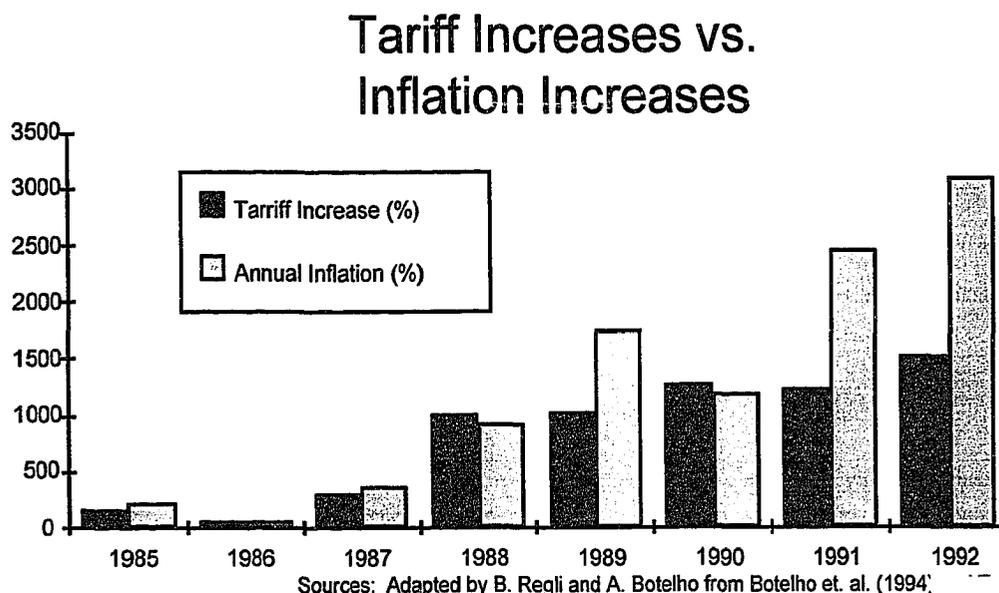


²¹ Telebras put in place a system whereby subscribers would make a contribution of equity capital in advance of receiving services. The result was that many made the investment and waited for months or years to receive their telephone line. For more information, see Saunders et al, *Telecommunications and Economic Development*, p. 279.

The Politics of Pricing

With prices spinning out of control, the political pressure was great to maintain a low cost of service for subscribers throughout the country. The chart that appears at the bottom of the page shows that Brazil's government fell prey to what is a common story in telecommunications development: Increases in prices lagged well below increases in inflation, thereby eroding the real return on telecommunications investment.

The chart compares the annual tariff increase allowed by the government since 1985 with the annual inflation rate. In five of the eight years, the tariff increase was substantially lower than the increase in annual inflation. In total, during the 1980s, telecommunications tariffs declined by 80% percent when adjusted to ever rising inflation.



It comes down to basic business economics. If the telecommunications operator's revenues can not keep up with inflation, there is a tremendous disincentive to invest, thereby undermining the capabilities and maintenance of the telecommunications network. By 1990, there was an estimated \$2.4 billion dollar gap in the Telebras budget and that the funds necessary to deliver the 1.2 million terminals already sold but not yet delivered was unavailable. "In less than a decade," Neuman and

McKnight write in their report, "the government subtracted about \$7 billion dollars from Telebras' investment capability."²²

But the way in which Brazil brought itself into this difficult situation is closely tied to the progression of authoritarian politics and the transition to the government of Jose Sarney in the late 1980s.

After the institutional consolidation of the seventies, the Telebras system fell prey to the politics of the democratic transition of the early eighties, which increased the power of state governments and the Congress. Little by little, the professional management and technical staff of Telebras, already threatened by short term financial management, became victims of widespread clientelism, with high levels of inefficiency and mounting bureaucratization (traditional public service agencies). This pressure on Telebras intensified after 1985, when the Sarney government replaced top level professional management by political appointees, part of a larger game of political maneuvering. The stagnation and decline of the Telebras system in the eighties was part of a larger deterioration of the existing governmental regime and policy framework, and the attendant difficulties of fashioning a functional democratic system, with effective checks and balances, out of the ashes of the discredited military/authoritarian system.²³

The system that protected Telebras through import substitution and centralization was now undermining its ability to act and function as a provider of telecommunications services. Part of the problem was that the centralization of telecommunications providers reduced the opportunities for independent and private investment. There were no alternate institutions in place that could pick up where Telebras left off and continue to develop the networks and infrastructure.

The initial deployment of fiber and digital technology had put Brazil ahead of other developing countries, but the penetration of those kinds of capabilities ere limited.

According to the Brazilian census of 1980, the total number of terminals in the rural sector amounted to only 75,000. In 1983, this figure stood at little more than 90,000, or, put another way, only 1% of rural households possessed a telephone.

²² Neuman, McKnight, et. al, p. 47 The International Telecommunications Union estimates that Telebras requires at least \$6.5 billion dollars a year to maintain its telecommunications network. See the statistical appendix of the 1994 World Telecommunications Development Report.

²³ Neuman, McKnight, et. al, p. 44.

This extremely poor level of telephone coverage reflects, on one hand, the investment restrictions imposed by the government and, on the other hand, the much deeper poverty of the rural areas in relation to the main industrial centers.²⁴

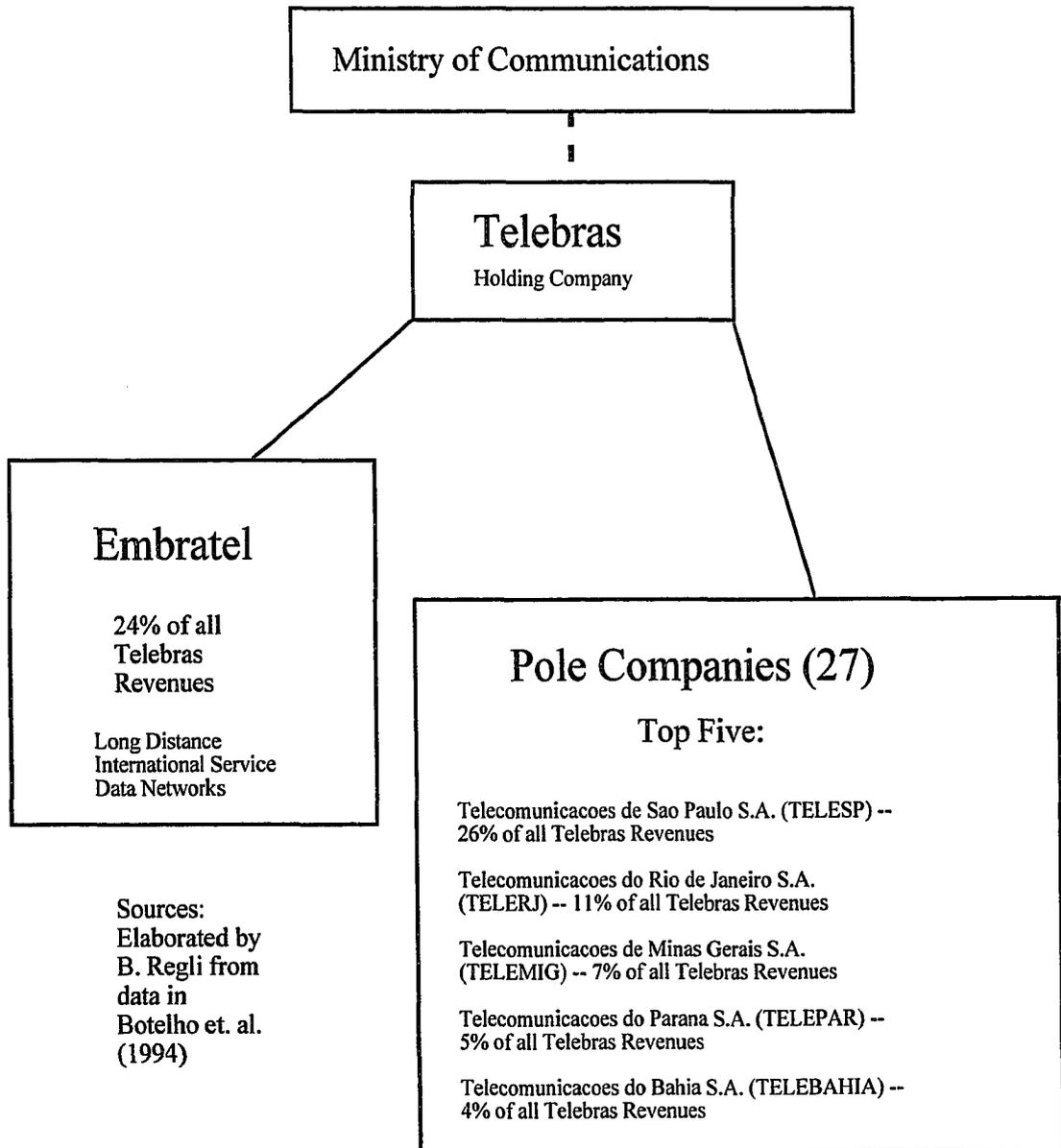
There were still problems at the periphery, even after the relative substantial investment of the early to mid 1970's. The erosion of financial resources during the 1980's did not help matters much, and severely hampered Telebras' ability to meet a critical long-term objective: Providing telecommunications services to the entire country.

1.3 The Structure of Brazil's Telecommunications Sector

The structural basis for Brazil's telecommunications entente from the past two decade appears on the next page. Telebras has been put in place as the coordinative and structural unity that the military government required in the 1960's and 1970's, but the decentralization of the system has left a number of gaps in the system to satisfy the local interests of various governments and groups.

²⁴ Hobday, p. 106.

Brazilian Telecommunications System (SBT) Structure



The core of local autonomy is housed in the pole companies, which are organized within each of Brazil's state. As the chart shows, the top five pole companies account for more than 53% of all revenues. The largest, TELESP (Telecomunicações de São Paulo S.A.), is responsible for more than a quarter of Telebras revenues. Embratel tends to be less autonomous than the individual pole companies, but that is not because of a less significant role in producing Telebras revenues; Embratel is presently responsible for 24% of all Telebras revenues.

The tension between those institutions can be seen in the constitutional wrangling that has taken place since the transition to democratic government in the late 1980's. The 1988 constitution entrenched the above structure in the new democratic law.

The 1988 Constitution, in its chapter entitled "On the Organization of the State," makes explicit the exclusive competence of the Union. In regard to public telecommunications services, paragraph 11 states that "the Union directly or through authorization or concession to an enterprise under state share holding control, the telephone, the telegraphic, and data transmission services and other public telecommunications services, insured the provision of information services by private law entities through the public network of communication." In paragraph 12, [the constitution] states that companies can "explore directly or through authorization, concession or permission, broadcasting services, sound and image services and other telecommunications services."²⁵

One reading of the above extracts would indicate that a monopoly system is in place and that the public network controls the provision of all telecommunications services. On the other hand, there is enough room to formally recognize competition, but it is clear that a great deal of competition would not be allowed. In one regard, the passages reflect the tension between the centralized control of Telebras and the regional autonomy of the pole companies who, in many cases, have begun to go their own way in providing services and building infrastructure to meet demand.²⁶

²⁵ Neuman, McKnight, et al, p. 58

²⁶ As Neuman, McKnight et al write on page 61 in their report:

The regional pole companies have begun to develop new business as a result of their newly-found institutional freedom. For example, Telepar, the Paraná state telecommunications operating company, is investing its own funds to set up new transmission lines, promote data communications services, and renovate the state telecommunications system. These large state operating companies are also busy setting up their own packet switching and data

The Collor administration, which took office amid much fanfare in 1990 and left in disgrace before the end of its term, spent a great deal of its legislative energy on proposing alterations to the 1988 Constitution. This is also true with regard to the telecommunications market. As the government began to roll out its privatization program, congressional interests were able to point to the Constitution to protect sensitive public sector companies, Telebras included. The Collor administration did open the telecommunications market to limited competition in paging, cellular, cable television, infrastructure provision and private data networks as part of the presidential decree entitled, "The Regulation of Limited Services" in July of 1991. But it was impossible to go further in liberalization of the telecommunications because of the proscription of the Constitution.

The Collor administration quickly fell into a cycle of corruption allegations and political gridlock. After Collor's resignation in the midst of charges of serious corruption, interim president Itamar Franco took up the mantle of constitutional reform. More than 16,000 separate reform proposals were made, many of which would have directly or indirectly affected the government's role in the telecommunications industry. But very little was done; of the 113 congressional sessions scheduled to tackle the reform proposals, only 71 took place, in great part because of persistent boycotts and protest by congressional leaders.²⁷ Needless to say, this period strained the already difficult relationship between the government and senior executives at Telebras, who were facing consistent political pressure to increase infrastructure investment even when the political process was unable to offer the company the money required to complete those investments. In 1994, Telebras president Adyr Silva publicly complained that the company would have to spend 2.5 billion dollars "just to

communications local networks. Telesp, the São Paulo state telecommunications pole company, has fought for radical changes in the data communication policy, giving Embratel the monopoly for data services. Telesp wishes Embratel to become a mere wholesale service provider, or carrier's carrier, to local state telephone companies, which would market services directly to customers within their regional areas of influence. Telesp argues that under the current system, Embratel keeps the lion's share of operational revenues.

²⁷ "Brazil: Constitutional Flop," *Business Latin America*, June 20, 1994. One specific constitutional alteration suggested was the divestiture of all government holdings in a number of state-owned and operated companies, Telebras among them.

fulfill President Franco's requirement to expand private and public telephone lines. This amount alone almost absorbs the total of 2.9 billion dollars allocated for Telebrás this year [1994]."²⁸

The hard fought presidential campaign that took place against the backdrop of this caretaker presidency pitted a leader with a long tradition of labor support, Luis Ignacio da Silva, and a former government finance minister, Fernando Henrique Cardoso. Cardoso began the campaign far behind da Silva but was buoyed by his successful anti-inflation campaign, which played a critical role in the re-stabilization of the Brazilian economy in 1994. His victory in the first round was considered by many commentators an opportunity for the further liberalization of the telecommunications market; his support for the stillborn privatization program of his predecessor would definitely transform the telecommunications sector.²⁹

In June of 1995, the Brazilian government began to take the difficult steps towards privatization and liberalization. The lower house of the Brazilian congress voted 357 to 136 to approve a constitutional revision to open up the telecommunications market. The provision removes the Telebras monopoly in the marketplace and gives the government the latitude to privatize the company, should it choose to do so.³⁰

The road to privatization, though, is far from set. A number of proposals have been put on the table for the restructuring of the company in advance of any attempt to privatize the company. At the core is a difficult conflict concerning the relationship between the holding company and the individual pole companies. An initial proposal would reduce the number of subsidiary companies to seven, giving some of the larger pole companies, such as TELESP of São Paulo, control over smaller entities in neighboring territories.³¹ Some see this as a wolf in sheep's clothing, an attempt by Telebras to assert authority over the pole companies by streamlining the structure of the company. Considering the importance of the pole companies as revenue generators and administrators, Telebras will have a difficult time establishing firm control of the system in advance of privatization.

²⁸ "Government Tightens its Control Over State Enterprises," BBC Summary of World Broadcasts, July 5, 1994.

²⁹ Please see *Privatization International*, December 1994 report on Cardoso's early commitment of privatization and sector reform.

³⁰ "Brazil Gets Set to Hang Up on Telecom Monopoly," *Journal of Commerce*, June 8, 1995.

³¹ "Brazil May Merge State Telecom Companies," *Reuters*, January 16, 1995.

1.4 The Telecommunications Entente of Brazil

The initial tensions surrounding the privatization of Telebras and the liberalization of the market show both the strengths and weaknesses of the telecommunications entente that has defined the development of Brazilian telecommunications sector since the military coup of 1964. Like the authoritarian system imposed by the Brazilian military, the Telebras structure imposed on the telecommunications networks sustained itself for a period of time by limiting the tension between local and national policy making. The telecommunications entente of Brazil was that the center would provide the advantages of research, development and investment and the local companies would be able to maintain a reasonable level of autonomy.

But technology and global economic change has undermined the entente, a fact clear in the investment patterns of the Brazilian government in the past decade. Such a centralized, top down model for investment and telecommunications management can not provide for the telecommunications needs of the country. The lack of performance, in that regard, undermined the entente, and now forces the local, national and various economic interests to begin to carve out new relationships.

The details of the liberalization and privatization program changes as this thesis is being written, but it is certain that even if Telebras were to be privatized today and the most liberal telecommunications regime in the world were put in place the next day, the significant patterns of corporate behavior would not immediately change. If Brazilian politics continue to form, what will develop is less a set of rigorously applied rules as a set of norms and dynamics that spell out another procedural entente to satisfy the perceived needs of development for the next generation of social change.

Our goal is not to predict the nature of the entente that will develop from this present time of change, but rather suggest the ways in which strategic liberalization, as a strategy that links corporate and government interests, can contribute to the achievement of the ultimate goal of telecommunications development: Increased service penetration and improved quality of service. By introducing a new dynamic of extensive competition and investment in wireless access services, Brazil can focus resources on a appropriate technology which can become the backbone for future sector development.

The next section discusses the history of wireless access technology in Brazil, focusing on some of the country's efforts to link the huge expanse of the country through microwave systems, satellites, radio, and other forms of wireless communications. We also discuss the recent introduction of cellular systems in the country and map their potential development over time. We then turn to the proscriptions of strategic liberalization and identify possible opportunities to drive the penetration of wireless services as part of a broader strategy of sector liberalization.

2. Wireless Communications in Brazil

The history of wireless communications in Brazil is marked by the adoption of existing models of wireless and a lack of innovation on the part of wireless access providers. In the realm of satellite and cellular, Brazil has chosen to follow the well worn path of the developed world, instead of focusing on how cellular access could be used to push levels of penetration higher throughout all the regions and economic strata of the country.

Wireless access began, as it did in most developing countries, with the introduction of radio communications. The first shortwave transmitters were installed in Brazil during the late 1920s by Radiobras, a wholly owned subsidiary of RCA International of Paris. Fifteen radio stations were built during this initial period of growth, "creating incentives for the emergence of a local radio industry."³²

Although the Brazilian radio and broadcast television services would grow to be one of the largest in the developing world, other forms of radio access were late in being introduced throughout Brazil. The first use of wireless access involved satellite and microwave applications in the 1960's and 1970's, with ESMR and cellular following in the 1980's.

³² Neuman, McKnight, et al, p. 31

2.1 Satellite Telecommunications: Information Solutions for a Large Country

Like many countries attempting to overcome the problems of geographic dispersion and diversity, Brazil turned to satellite to bridge gaps which would have been uneconomical to link through traditional wireline architectures. But satellite technology has only had a limited impact on the telecommunications development of the country. Satellite has done more to enhance access for transnational communications than increasing penetration of access services. In that regard, satellite has yet to contribute in a broadly positive fashion to the telecommunications development of the country.

In Brazil and throughout the world, INTELSAT was the main initial influence shaping the introduction of satellite technology. In fact, Brazil was the first country to become a signatory of the treaty that brought INTELSAT into existence.³³ Embratel did not begin leasing INTELSAT transponders for long-distance use until 1978, choosing initially to employ point to point microwave in an attempt to reach the outer edges of the country. But the satellites were needed to reach into the vast Amazonia region, which became more and more the focus of resource extraction and economic opportunity during the waning days of the military government.³⁴

Embratel soon decided on a bolder strategy; the construction and launch of its own satellite network. The \$210 million dollar program culminated in the launching of Brazilsat I and II in 1985 and 1986 respectively. Embratel rented the satellite's transponders to various intensive users of telecommunications services, and the pattern of usage was what would be expected: "The main beneficiaries of satellite technology were commercial television...and transnational corporations."³⁵

That was not because of a lack of proposed social uses for satellite technologies. For example, a transponder from Brazil's domestic satellite service was proposed as the national transmission

³³ As described in the second and third chapter, INTELSAT is an intergovernmental organization which provides "comprehensive and affordable satellite communications to the world." For more information about INTELSAT's present state of development, see the *International Telecommunications Union's World Telecommunications Development Report, 1994*, box 4.5.

³⁴ "Mass Media, Culture and Communication in Brazil: The Heritage of Dependency," in Gerald Sussman and John Lent eds., *Transnational Communications: Wiring the Third World* (London: Sage Publications, 1991), p. 205.

³⁵ *Ibid.*, p. 206.

backbone for the Ministry of Education's FUNTEVE network in 1986, but the use of the satellite "would have increased the network's transmission costs by a factor of ten."³⁶ Even though two more satellites were planned for launch in the late 1980's, the civilian government reduced the funding for the telecommunications infrastructure, and the Brazilian satellite development program was one of the first to be cut back. It has failed in its broader social purpose: Improving access of information resources to all of the people within the country.

The pattern of international usage and highly priced applications has continued through a pattern of smaller and medium sized investments in satellite access. Telebrás, through its Embratel subsidiary, has continued to link up to a number of proposed international telecommunications ventures that employ satellite technologies. They include a partnership with two separate consortia³⁷ and another with Bell Atlantic.

From the perspective of creating an indigenous market for satellite equipment and services, Brazil did not achieve any lasting achievements for the development of the telecommunications sector. Brazilsat relied heavily on contributions of finance and technology from American satellite firms. Even with the strength and resources of a CPqD, it took Brazil "about 20 years to implement indigenized adoption of [satellite technology] for domestic uses," well behind the quick adoption rates of other developing countries.³⁸ The equipment brought into the country to support VSAT networks and data communications is predominantly from countries in the developed world. Generally, they are focusing on developing the market among local industrial groups with the resources and interest to fund this kind of telecommunications investment.

2.2 Cellular and SMR: The Development of the Commercial Sector

The development of satellite access in Brazil followed the established pattern seen in many developing countries. The same can be said of cellular and Specialized Mobile Radio (SMR). Both

³⁶ Saunders, Warford and Wellenius, Telecommunications and Economic Development, p. 268.

³⁷ The first consortium consists of Bradesci, Globo, Monteiro Aranha, Olbrecht Engineering and Matra of France; the second includes Itamaraty, Splice Telecom, and Daimler-Benz.

³⁸ "Mexico's Morelos Satellite: Reaching for Autonomy," in Gerald Sussman and John Lent eds., Transnational Communications: Wiring the Third World (London: Sage Publications, 1991), p. 160. It took Mexico only 5 years after the initial involvement with INTELSAT to launch its own communications satellite.

kinds of services developed in response to the models already established in the United States and other areas of the developed world, and have been constructed more to serve the needs of the well-to-do few than the broader market demand for telecommunications services.

Because of the great distances for travel and transportation throughout the country, one of the first wireless applications for mobile telephony was a emergency service that worked much in the same fashion as a fleet dispatch service. Transport companies were provided a service through the Telebras system that allowed their drivers to access the national phone network from anywhere on the road, using a very high frequency, manually switched radio telephone system.³⁹ This early version of Specialized Mobile Radio (SMR) has become commercialized in recent years, with companies such as Comcast taking a position in the development of this market after licenses for SMR services were granted in 1993 and 1994. But it has not been turned into a broadly available wireless access service, in great part because SMR as a whole has not been able to establish itself as a direct competitor to cellular in the developed world, much less a lower cost wireless access system with higher penetration potential.

The most notable story of wireless access in Brazil over the past two years has been the story of cellular telephony. The story lies not so much in the growth of cellular telephony as the political wrangling behind the definition of the markets and the eventual structure of licensing. Considering the global boom in cellular services and wireless access, the debate over key questions took on special significance: Who would control the licensing procedure? Would licenses cover national or regional areas? Would Telebras or the pole companies have the direct responsibility over the operation of the licenses?

The final result was the following:

The market is divided into two bands, following the model adopted in many other countries. Band A will be allocated to the local pole operating companies and Band B will be assigned to the private sector. In the private service competition, Telebras makes a technical pre-selection, and the local pole company makes the final decision based on financial criteria. Foreign firm participation is limited to 49% of the shares, although supply and installation of the system can be contracted out. To this end, joint ventures have been established between foreign technology providers

³⁹ Saunders, Warford and Wellenius, Telecommunications and Economic Development, p. 25.

and Brazilian service providers, including some of Brazil's largest industrial and financial groups.⁴⁰

This results reflects the continuing tension between the local and national operators, and the fraying telecommunications entente that has linked them together.

The shared selection process, along with the need for partnerships, slowed the introduction of cellular communications systems by opening a whole range of possible political wrangling. The technical preselection was to be based on the ability of the companies bidding on the license to provide a system similar to the AMPS analog standard in use in the United States.⁴¹ The partnerships of choice generally brought together equipment producers with local investors. Considering the deep tradition of conflict between the various equipment producers, and the close links between certain companies and the political system, conflicts were bound to arise.

One of the more interesting conflicts pitted Ericsson and Motorola against NEC do Brazil. Even though Ericsson had a long established relationship with Telesp of S, o Paulo, NEC was chosen as the partner for the company in the construction of the cellular system. Ericsson and Motorola immediately took NEC and Telesp to court, claiming that NEC could not in fact provide the IS41B equipment required for the construction of the system. The companies eventually won a court injunction which delayed the official licensing of the system by some weeks, but eventually the challenge was dropped.⁴²

In 1993, the first cellular suestem came on line in the city of S, o Paulo. Access fees for initial hookup were \$2000, with the air time costing an average of 40 cents a minute and the terminal costs between \$550 and \$3,000 dollars. Clearly, the pricing reflected a traiditional cellular strategy of offering high mobility at a high cost to consumers. Considering the per capita income of the country is only \$2,770 per year, it is hard to imagine that many Brazilian citizens would be able to afford these new services.

⁴⁰ Neuman, McKnight, p. 65-66.

⁴¹ Johnathan R. Tarlin, "The Global Phenomenon: Global Cellular Communications Markets" *Cellular Marketing*, February 1994.

⁴² "Cellular Phone Service Inauguration," International Trade Data Bank, US Embassy report of August 20, 1993. The Ameircan Embassy was called upon to verify that NEC had never participated in trials to verify its ability to produce the equipment.

Even with the steep prices, Telebras estimated that there would be 600,000 cellular phones in operation by 1994 and a potential market of 1 million terminals by 1995. An investment requirement of 1.5 billion was estimated, 500 million of which would be for network equipment.⁴³ A more recent estimate puts the total number of subscribers at 721,000, while an estimated 1.5 million people are on waiting lists for cellular phones.⁴⁴

2.3 Breaking Free of the System: Unleashing the Power of Wireless Access?

Considering the pricing strategies, the political conflicts and the still open question of the privatization of Telebras, it would appear that the establishment of a strategy to push the penetration of wireless services is a long way away. The extended battle for the licensing of cellular systems and the potential for open conflict between the pole companies and Telebras over control of certain strategic assets brings to the center the critical question of the Brazilian case: What institution can carry strategic liberalization forward?

Part of the answer to that question comes from the document written by Neuman and McKnight. Their suggestion is the division of Telebras into two companies, one with the responsibility of providing competitive services and the second with the responsibility of meeting the goal of universal service. The first carrier, which they designate as Telebras I, would be taxed in equal proportion to other telecommunications providers to subsidize the work of Telebras II as it develops a strategy for increasing the quality and penetration of services.

Using that proposal as a starting point, it would appear that the structure of cellular licenses offers an opportunity to move forward. If the local pole companies are eventually spun off from the Telebras system, they will also have the opportunity to offer the traditional cellular services while maintaining their existing capabilities in providing local services. The new Telebras can be offered the opportunity to develop the strategic liberalization program through wireless access in unused parts of the spectrum, namely the PCS bands of 1.8 to 2.2 ghz.

⁴³ "Brazil Increases Cellular Lines," *The Wall Street Journal*, February 2, 1994. Also Neuman, McKnight, et al, p. 65.

⁴⁴ "The Last Frontier," *Business Week*, September 18, 1995. p. 104.

The construction of a new wireless network with the goal of increasing penetration and moving Brazil towards the possibility of universal access would also "catch a wave" of development critical to sustaining the viability of such a national effort. The growth of cellular may bring together a fusion of wireless technologies by driving the demand for satellite access. A recent investment by Telebahia in its satellite network has been made for the purposes of increasing its existing satellite communications capability to help open up new cellular service areas.⁴⁵ This is in addition to the pole company's investment in VSAT technologies to support fax, voice and data communications throughout the region. This kind of capability to link region with region, either through satellite access or Embratel's existing facilities, is the critical technological link to establishing a national strategy for strategic liberalization.

This institutional arrangement provides the flexibility required to meet two divergent goals: Rebalancing the authority and resources of the pole companies vis-a-vis the center while creating a framework for the achievement of a critical national goal. It also takes advantage of the convergence of technologies and forms of wireless access so that Brazil can move forward quickly in establishing a market for both institutions and other participants in the telecommunications sector. The section that follows further elaborates on this opportunity by returning to the broader framework of strategic liberalization outlined in the earlier chapters of this thesis.

3. Strategic Liberalization for Brazil

In a country with little history of meeting local telephone needs, directing and targeting resources through an appropriately designated institution (or institutions) is critical. In the Russian case, local and city interests are driving the course of telecommunications development. The problem was bringing local efforts together in a fashion that would lead to the construction of a unified communications environment throughout the country. The issue in Brazil is how to shake loose the resources and centralized structure so that it acts a bit more like the Russian case, with local needs being met within a framework that is broadly acceptable to all market participants.

⁴⁵ "Satellite Technology Management Receives \$1 Million Brazilian Telephone Company Expansion Contract," *Business Wire*, January 5, 1995.

The tension between local and national interests will not be resolved, but it will be better managed if both the center and the localities are allowed to play a meaningful role in the development of a strategic portion of the telecommunications market, namely wireless communications. Taking our initial framework of strategic liberalization as a starting point, there are three specific proscriptions which may be applicable to the Brazilian case as the country moves forward in the consideration of further liberalization in the telecommunications sector. In particular:

- Further spectrum allocations for both competitive cellular and PCS style services, along with national spectrum allocation for a "universal service" telecommunications provider;
- The establishment of institutions that can perform the functions of billing and administration for incumbent and emerging wireless market players; and,
- The development of a procedure for incenting local and international technological innovation;

3.1 Licensing: PCS and Universal Service Bandwidth

The licensing of cellular providers has already gone forward, with the beauty contest between various bidders resolved not by competitive auction but by the choice of the local telephone companies. An auction for further spectrum would be a proscription that follows logically from the proscriptions that we have set out, but, considering the nature of the Brazilian case, it might not be advisable. Part of the difficulty for Brazil is to reduce the amount of central involvement in the system and to provide opportunities for competition to emerge where it does not presently exist. An auction would only serve to further reinforce the authority of the center over the periphery, and, unlike in the United States, the telecommunications sector can not afford to see the proceeds of any auction siphoned off into the federal treasury to pay for the national debt.

Opportunities to learn from and benefit from the investment throughout the world in PCS equipment should not be ignored, though. Clearly, a cellular duopoly is not enough competition to lower prices in the United States, so it should not be expected to do so in Brazil. Assuming that the regulatory function is completely decoupled from the telecommunications providers during this round of liberalization and deregulation, it would be best for the established regulatory agency to follow the

pattern already set down, licensing two PCS providers in each region with the caveat that neither of the existing cellular players can be licensed for PCS.

The critical innovation would be to set aside a sufficient amount of spectrum (30 to 50 mhz in the 1.8 to 2 ghz band) to take advantage of fixed wireless local loop applications. One fixed wireless license should be granted to the operating company charged with improving the level of penetration within the country. The goal should be to make the entire country accessible to wireless local loop access, with fixed stations in any home that can afford the subscription fee. The government should create an open competition for the technology that would be used to build that network and choose the system that is able to provide the fixed wireless service at the lowest per subscriber cost.

Brazil would establish a new model for universal service, one that is much more likely to be the future of universal service than the concept of wiring each and every home and building, that of "universal service bandwidth." With a wireless access point an option for each and every person throughout the country, the potential for universal service would be, in effect, achieved. The question would be the modification of existing economic relationships to increase the resource base of the poorest in the country.

Over time, the fixed wireless system would compete directly with the cellular and PCS systems in place, but that competition would take years to develop. By that time, the market should be healthy enough to support a range of providers who can choose to combine different kinds of wireless access to meet the needs of various subscriber groups. At that point, Brazil will have achieved the goal of decentralizing investment and operational capabilities (through cellular and PCS) while simultaneously meeting the needs of national integration and universal service (through fixed wireless local loop).

3.2 Building New Institutional Relationships: Strategic Liberalization and International Lending and Investment

The government of Brazil will remain responsible for cultivating international lending associations and international investors looking to find uses for capital abroad. The Mexican government's activities leading up to the NAFTA agreement's passage through the US House of Representatives

still stands as one of the best examples of how a government can highlight the favorable portions of its economic program to the long-term benefit of the country as a whole. Brazil will need to take a page from Mexico's book as it moves forward, and strategic liberalization can become a critical part of that effort.

One of the proscriptions of the strategic liberalization strategy was the outsourcing of certain functions, such as billing and marketing where possible and appropriate, to bring down the total cost to each individual customer. The Brazilian government were to start a program to construct subsidized institutions that could provide these function to the cellular systems under development throughout the country. Profitability for these kinds of functions are highly correlated with economies of scale, and secure billing systems in particular are one of the biggest stumbling blocks for foreign investors entering the market for cellular and wireless services.

Investment in this kind of institution can have two ready justifications. To international lending institutions, such as the World Bank and the International Monetary Fund, the construction of such an institution has a directly positive impact on sector development; it brings costs down and improves the opportunities for service provision. For investors, it is an opportunity to ensure that their investment is under the supervision of a billing system that meets with the standards of those in developed countries.

When such an institution takes its place in the market and begins to serve incumbent cellular providers, it will be in a position to provide the same services to the new fixed wireless system that can be constructed to achieve the goals of universal service. The cost to the universal service provider can be set lower than the price for cellular providers until such time as the two forms of wireless access can be seen to be in direct competition with each other.

This kind of innovative positioning of the country's sector development has the dual advantage of meeting the ideological requirements of foreign capital while simultaneously meeting a real marketplace need critical for the development of the telecommunications sector. This moves beyond the argument that has traditionally been taken to the financial community from the developing world; this is more than just liberalization and privatization. This is creating institutions that meet both the political needs of development and the economic needs of corporate growth and sector expansion.

3.3 Rebuilding the Basis for Technological Innovation

The strategy of import substitution clearly failed Brazil in its efforts to grow and expand local technology and equipment production. The recent downsizing of CPqD is a testament to the inability of a protected, centralized procurement and research system to establish a sustainable structure for telecommunications development.

In addition, the crumbling of the centralized authoritarian system now needs to be reflected in the pattern of investment in telecommunications and technology research. Research and development of new technology appropriate to the needs of the Brazilian marketplace needs to be rolled out to the places where it will be used: the local markets.

Brazil can address this issue by borrowing from the pioneer's preference innovation developed by the FCC. Again, although fraught with difficulty, Brazil can put into place a system similar to the one suggested in the chapter on the British system -- Brazil can position itself as a testbed for the global telecommunications infrastructure. One example would be the competition for the right to construct (or even operate) the universal service license. There is presently much talk about wireless local loops as low-cost access for telecommunications services throughout the world but, admittedly, there has been little action. Most equipment producers and service providers would much rather serve the customers who can pay more. This kind of contest would force companies throughout the world to focus on the issue of low-cost access in a way that they have yet to do, and few companies would turn away the opportunity to serve one of the largest markets in Latin America, should the opportunity present itself.

Similar kinds of competitions can be structured for critical elements of infrastructure provision. From "beauty contests" to the construction of working trials that can be used in Brazil and throughout the world, there are a number of opportunities to position the country as more than a laggard in an increasingly dynamic region. Such a process would help Brazil regain the initiative in equipment and technological production, an initiative that has been lost since the collapse of the import substitution strategy of the 1970's and 1980's.

4. Conclusions

Brazil is certain to be a bellwether of Latin American development. In great part, it has an opportunity to learn from the mistakes of others, but its legacy of central control will be a real burden as it tries to move forward. The advantage of wireless access, especially as it relates to the Brazilian case, is that its flexibility and potential for targeted kinds of services make it a good opportunity for local and international investment. But Brazil can not afford to let the cellular and PCS models exist without any competing service opportunity.

By allowing the local companies to move forward with the existing systems, Brazil can allow them to meet their interests and assert their authority over local telecommunications development. But by establishing a new model for cellular service to compete with PCS and cellular systems, Brazil puts into place a foundation for future competition and universal service. The balancing of interests are a requisite part of the new telecommunications entente that must emerge as Brazil considers the next stage of development; with the locals running cellular and the nationals meeting universal service requirements, there is enough of a compromise. And compromise is at the foundation of the kind of telecommunications miracle Brazil needs.

Conclusion

Welcome to the Jungle

At the end of his book, Wireless Access and the Local Telephone Network, George Calhoun compares the future market for wireless access to a jungle. The abundant energy and a wide variety of wireless "species" and "features" will proliferate, producing biodiversity on the order of a tropical ecosystem. His metaphor is likely to be a very apt description of the future, with mutations and new discoveries becomng around each hillside and river we encounter.

But we can take the metaphor one step further than Calhoun did. The rainforest is a resource. People draw on that resource for the purposes of development. Given the right conditions, the ecosystem can thrive and provide a richness for those who protect the sustainability of the forest. But what are the right conditions for this particular rainforest known as the telecommunications sector?

Throughout this thesis, we have borrowed the language of sustainable development, pioneered by the environmental economists and policymakers as a process for leveraging existing resources while simultaneously protecting them for future use. The art is balance. We need to give back to the forest what we take out, or eventually the forest will no longer exist. In many ways, sustainable development for the telecommunications sector means the same thing as for a tree in a tropical rainforest; given a sufficient amount of sunlight and water (investment), the appropriate soil (regulation), a community to feed from and compete with (the market), the tree (telecommunications company) should grow and thrive.

But then humans come along and mess it all up. Slash and burn policies take away from the viability of institutions. New technologies are put on the shelf by companies who profit from existing technologies. Regulators, afraid of losing their jobs to the give and take of market competition, fence off territory and restrict activity. Thinking globally and acting locally takes on a whole new meaning as public and private sector institutions pull resources from the vast ecosystem that is beginning to thrive in our midst.

It is the human factor that we need to account for in establishing an appropriate policy to ensure the sustainable development of the telecommunications sector. That is why the work of Putnam and the other social scientists we referred to in the first chapter are so important to the ongoing discussion of

telecommunications policy. Institutions shape history and history is shaped by institutions. The ability of institutions to perform depends on their ability to be shaped by history while simultaneously directing social and economic energy to goals that are commonly defined as good for a community.

In this thesis, we have defined the common good as the political and economic development of any community or country, bringing resources and capabilities into the hands of those who need them and can use them. At the end of the day, there can be no more compelling common good than this. With all of our theorizing, all of our projections and commentaries, if we are not doing something for the people who should be enfranchised by the institutions of the private and public sector, then the common good is not being served.

So let us take a last look at the forests which we have described and the sustainability of institutions in each of those ecosystems. In this final section of comparisons and contrasts, we will assess the relative merit of the policy approaches to the telecommunications sector detailed in the first section, and point to the outlines of sustainability in the global ecosystem of our world's information infrastructure.

The Coastal Redwood Forests of the United States

When you travel through the coastal redwood forests of the American northwest, you get the feeling that the trees above you could stretch up to infinity. But when you look down, you see the vast diversity of underbrush, the ferns and smaller trees that live and thrive along with the big trees. So many fires have swept through these areas as the seasons change that there are clear signs of renewal, stages of development, and the hardening of the bark of the trees that have survived.

The telecommunications ecosystem of the United States has a number of big redwoods like AT&T and the baby bells, but also thousands upon thousands of companies that spread out under the shade of these giants. The variety of institutions in this telecommunications ecosystem are a reflection of the wildly diverse history of economic development in the United States. The local and regional emphasis of early telecommunications development marks the landscape; the raging fires of new technologies and economic change has cleared the underbrush on more than one occasion, leaving the ground fertile for the quick rebirth of new forms and species.

If there is any clear trend in the social science research we have reviewed in regard to the United States, it is the fact that any telecommunications development strategy needs to be adapted to the decentralized confusion that shapes the political structure. Local interests need to be at the heart of the development strategy, or else the performance and sustainability of the institutions will remain in doubt.

Our analysis of the telecommunications environment in the United States has revealed a pattern of corporate interest in sustaining the high prices of cellular service, rather than rolling out lower cost alternatives in a more competitive environment. This kind of activity is consistent with oligopolistic competitors in a highly concentrated market; even though there are a number of institutions playing critical roles in the development of the sector, it is clear that the “big trees” are defining the nature of the forest.

The sustainability of the American telecommunications sector is therefore threatened by the continued concentration of power and capability within the bigger players in the market. What is needed is a good fire, which removes some of the branches and leaves the underbrush exposed to the light and soil it needs to grow and prosper.

This is where strategic liberalization shows itself to be a policy for sustainable development. By creating a torrent of small and medium sized institutions that can compete directly for telecommunications services in the local market, it will be possible to reestablish a pattern of access competition. Wireless access can form the technological foundation for service provision, pushing the existing providers to reinvent themselves yet again and bring the cost of services down through direct competition.

The analysis also shows where the thinking of the techno-libertarians falls short. It is not a strategy for sustainable development, but rather a scorched earth policy that allows those companies with access to the technology to drive it through the system with little regard for the social consequences. Although there is some evidence that the technology of the digital age supports greater horizontal linkages over vertical linkages, it is also clear that the existing media and bureaucratic structures remain vertically integrated. As such, they have less interest in the underbrush and more interest in their efforts to reach for the heavens.

Sustaining the environment of the coastal redwood ecosystem requires a little revolution. Thomas Jefferson thought it was a good thing for American government, every now and then, and the same holds true for its telecommunications sector. What our research tells us is that the best way to start a revolution that can support sustainable development is to implement a policy of strategic liberalization.

The Oak Trees of Great Britain

One of the biggest environmental issues in Great Britain today is the preservation of oak trees. As one of the few indigenous species of trees remaining in Great Britain, and one of the most long-lived of any in the world, concerns have been voiced about the development of certain areas where the oldest oak trees reside. There is also the connection to Britain's spiritual past; the druidic sects prevalent in England thought of the oak as having a special vitality and mystical place in the world.

Britain's telecommunications firms are certainly under less threat than the oak trees in certain regions of the country, yet protection is certainly a critical concern reflected in the policy of the last hundred years. The traditional strength and stability of British Telecom as a state-run telecommunications provider was valued like "the family silver." to protect it from intrusion, Britain established an insulation from competition similar to all of the countries in the developed world.

But the protection was particular to the British case, in great part because of the nature of the public and private sector relationship in the country. The interplay of social, political and economic groups occurred on open ground, providing a vivid context for ideological debate. This relatively open system for discourse infused a sense of urgency and possibility during the 1970s and 1980s, as the Thatcherite regime turned to privatization as the critical linchpin in a strategy of telecommunications development.

But the implementation of a competition policy has been able to take the country only so far. Now, there is a different kind of consensus that will be required, one that involves British engagement with other global telecommunications players, especially in Europe. Britain most definitely is one of the global leaders in increasing the level of competition in the telecommunications market, but, because

of the limited scale of possible services in the country, a framework needs to be set which can be exported -- helping the country maintain its competitive advantage in the area of service provision.

Strategic liberalization is a unique opportunity for Britain, insofar as it ties into and attacks the particular difficulties which have arisen in the market for wireless access services in the country. If wireless access is to be a true, broadly based competitor against wireline access providers, it will be necessary to break through the levels which separate the service provider from the customer.

In this context, the market subsidization philosophy can do little to advance the goals of development through the telecommunications sector. The problems of universal service will be transformed into universal access, and the question will no longer be whether people can get access to basic services, but rather how accessible can enhanced services be in an environment of increased competition. The only way to push that agenda forward is to ensure investment pushes down the cost of these services so that those who choose to access them get the greatest value from them.

The oak trees of England's telecommunications marketplace are worth preserving, but others need to be grown in the fertile grounds of competition that can be found in Great Britain. Strategic liberalization here is a policy of planting and pruning which will help sustain that vibrant orchard.

Russia: The White Birch Trees

Moscow and its environs are filled with small clumps of white birch trees. In parks, near the apartment residences of the urban communities, out in the fieldlands, stretching over the Eurasian plains, the white birches mark the landscape with some color in the trying post-communist grey of economic and social transition.

The birch is a symbol of vitality and fertility in the Slavic traditions. It is for good reason that Russians take care of their birch trees, but they rarely constitute an entire forest. Good things in Russia come in bits and pieces, apparently disconnected and separated at the surface, even though connected at the roots.

The same can be said for the present stage of Russian economic and political development. The social history of Russia shows a strained relationship between institutions and the environment. Quite often, Sustaining institutions in this environment requires a focus on the roots and the locations of the institutions, with the hope that establishing successes in a number of places, a broader, positive trend will emerge.

The most hopeful scenario for telecommunications development would reflect such a pattern: Separate localities working independently to use the resources at their disposal to construct networks that serve the telecommunications and information needs of their people, yet simultaneously coordinating their efforts to establish an open communications environment. Telecommunications institutions can only be sustainable at the local level, at least for right now -- these are the institutions which are reaching the customers and enhancing the resource base of the Russian people.

That's where strategic liberalization has a particularly important role for Russia's telecommunications development. The small to medium sized institutions which have begun to grow in the regions of Russia will not be able to sustain developed-world levels of investment and institutional support. They will have to respond to difficult weather conditions, and certainly there will be a few cold winters in the coming years to test the capabilities and resolve of the companies that develop. The use of wireless technologies among service providers, and the specific policies which Russia could implement to improve investment opportunities in wireless access, may make the difference between a healthy telecommunications sector and one that dies stillbourne in the next century.

This is a condition in which the perspective of those in the regulatory mainstream does not apply. Those who focus almost exclusively on the nature of the regulatory institutions and the macroeconomic policies are missing the forest for the trees; it is the micropolitical and microeconomic impact which is most critical in the Russian case. If the regions do not produce strong shoots of growth and development, nothing on the national level will be sustainable and simultaneously achieve the objectives of development we have set out as our criterion for performance.

With a policy of strategic liberalization in place, Russia will be able to sustain regional telecommunications development by providing an appropriate technological foundation and a sufficient financial base. Perhaps, the birch trees will be able to spread and grow even stronger, forming a chain of vitality that lifts Russia up and into the future.

Brazil: The Mahogany Trees of the Amazon Rainforest

One of the most valuable resources of the Brazilian Amazon rainforest are the mahogany trees. They are often the focus for private sector investments in the logging industry; those who do not follow sustainable harvesting policies often rip down large portions of the forest, extracting from the resources only the mahogany and other valuable trees while discarding the rest.

In many ways, the procedural entente of the military period in the history of Brazil's telecommunications development is like this logging policy: The valuable resources have been extracted at the expense of the whole forest. Money and resources drawn out of the Telebras holding company during the 1970's and 1980's diminished some of the positive effects of centralization, while exacerbating some of the inherent difficulties in this kind of development exercise.

The history of Brazil tells us that the effective implementation of public policy requires a procedural consensus among key actors in the public and private sector. The telecommunications development of the country will depend on establishing a framework for common action and investment so that the country can move forward through the privatization stage and into a new environment more amenable to sustainable telecommunications development.

Strategic liberalization is appropriate for the Brazilian case insofar as it begins with an asset whose patterns of ownership and development have yet to be established. The fact that wireless access is a relatively new phenomenon gives it an advantage over other kinds of telecommunications development: The nature and purpose of service provision remains an open question, and new kinds of institutions can be built to support the development of wireless access.

The policies laid out in this thesis can provide the beginnings for an ongoing discussion about the role of wireless access in an evolving marketplace, offering enough support for a very different kind of institution in the Brazilian telecommunications marketplace. Service institutions based on wireless access will be able to make competitive inroads where other providers can not, while simultaneously establishing a new focus for investment and infrastructure construction critical to the modern age.

Many policy analysts in the cultural and technological protection camp would disagree with one of the fundamental principles of strategic liberalization as a model of telecommunications development. They would claim that the openness to market investment and resource allocation puts at risk some of the country's most valuable assets, transferring the role of the unscrupulous logger from the state to the private sector. Such an argument, though, ignores the value that would be brought into the environment if an open marketplace were established. There are certainly difficulties inherent in the opening of any markets so closely protected by government regulation, but the benefits in terms of technological diffusion and innovation are likely to outweigh the costs.

Sustaining the value of the whole jungle is the critical point of a strategic liberalization strategy. By focusing the energy and resources of the world on the national market of Brazil, the country will have a much better opportunity to leverage the country's telecommunications development to meet the overall objectives of economic growth and political modernization.

Telecommunications Biodiversity and the Sustainability of the Global Information Infrastructure

As always, an examination of case studies and the specific learnings that can be derived from them leaves an analyst looking at the trees, not the forest. It is time to move back from the individual examples and ask what is perhaps the most compelling issue for telecommunications development over the course of the next generation: How will competition affect the evolution of the global telecommunications marketplace? And, more critically for our purposes, what does the policy of strategic liberalization mean for this global market?

Change and Continuity in Telecommunications Development

In each of the environments we have examined, one of the constants has been the immense difficulties for corporate institutions as they struggle with technological change. The range of adaptations is enormous, and the strategies undertaken to ensure institutional sustainability during this increasingly unsure environment are as numerous as the companies involved in the industry.

Telecommunications development policies will have to reinforce institutional flexibility by tying performance to alterations in the social and technological environment.

Surprisingly, we have found many similarities in the transformation of private and public sector institutions in the telecommunications industry. We have identified a kind of path dependency, where certain kinds of telecommunications development have become institutionally entrenched, even while social and technological facts are conspiring to make them irrelevant. The dominant institutions of the telecommunications sector have benefited from the existing arrangements.

Nevertheless, even with these advantages, the institutions are revolutionizing themselves. The privatizations in the UK and throughout the world are one such example; corporate downsizing in all of the telecommunications companies in the US are another. Brazil is moving towards privatization and more regional influence. The political and economic developments in Russia are supporting the establishment of strong local centers for the most viable institutions of the country's telecommunications sector. These changes are occurring because of the force of history and the promise of what lies ahead. Institutions are changing to take advantage of the opportunities of technological and social change as they appear.

Many of the similarities in institutional transformation can be ascribed to the global nature of the sources of change. Awareness of new technologies is quickly diffused among the dominant players in the telecommunications industry. The end of the cold war and the acceptance of the free-market models for development have radically transformed the intellectual platform on which policy decisions are made. An increasingly information-hungry market is asking for more access, cheaper, faster and better. The institutions responsible for providing and regulating the provision of services will have to keep up with the demands of technologies and marketplaces.

But the differences in institutional transformation are substantial. These differences can be ascribed to political and social factors individual to each environment, which can cause variances between existing institutions and possible paths for developmental change. Perhaps just as significantly, the pace of technological change is uneven, and it is doubtful that any one institution can incorporate all of the technological innovations of the telecommunications, information and computer industries.

These patterns of continuity and change are familiar to social scientists examining the sources of institutional change in a comparative context. For those who attempt to define actionable and

effective policy through such an analytic framework, the key has always been institutional flexibility. As we discussed in some depth in our first chapter, the new opportunities for participation and modernization require a new kind of public policy for all sectors of the economy, especially those directly involved in infrastructure provision. By establishing a policy that allows for institutional flexibility, participation by a broad variety of groups and interests becomes more likely -- and more sustainable.

For the telecommunications industry, flexibility should result in a wide diversity of companies, serving a range of markets and peoples throughout the world. We need a global telecommunications infrastructure policy to promote the diversity of telecommunications institutions. By ensuring that there are a variety of infrastructures, corporate strategies and business approaches, we can best ensure the health and wellbeing of this increasingly rich environment.

The Impact of Global Relationships on Telecommunications Development

This need for flexibility takes on particular importance as we begin to gaze into our hazy crystal ball and begin to recognize the consequences of any competitive policy. As the world begins to move beyond nation-states and social institutions reflect communities defined more by interest and affinity than national borders, the importance of sustaining a global information infrastructure can not be understated. As a link that will bring people together (and divide people from each other), the architecture of the world's communications infrastructure will define, in great part, how our global economy and political system works.

These individual telecommunications ecosystems are learning to coexist with each other, uneasily at first. But, like today's world of commerce, they will be increasingly interdependent and "infect" each other with their particular traits and patterns. As always, the dynamics of developed world systems are likely to weigh down heavily on the developing world as it struggles to make due with the limited resources it has. The need for balance has never been more apparent in the global environment of telecommunications development.

Even during this period of globalization, localities will become more and more critical as technology (in the hands of some but not all) is used as a device to reinforce local interests over what have been dominant centers of authority. This kind of development can be seen in the modern corporation,

where decision-making is increasingly decentralized, and even in the public sector, where local political institutions (and, in some cases, military institutions) are beginning to reassert their power vis-a-vis the nation-state that has governed them for so long. This process is being defined by the communications networks being put in place today, and the institutions which arise will be reinforced by the centers of gravity that emerge from the nexus of technology and institutional power.

But the existing institutions of the global information infrastructure are national in scope and purpose. As has been clear from the preceding discussion, nation-states have acquired the control technology of the telephone and the telegraph and put it to use in the purposes of aggregating the authority of the center. British Telecom, Telebras, MinSvias, even AT&T, though it was in private hands, were very much in the service of the nation states that protected them.

This difficult balance between local needs and international markets adds complexity to what is already a difficult issue: How can the diversity of telecommunications providers be sustained on a global scale? This is very important for developing countries with weaker institutions in the telecommunications sector. Certainly, the national telecommunications providers of most developed world countries will be able to address local needs, but if diversity is only diversity for the rich countries, then too much will be lost in the process.

Strategic Liberalization: Sustaining and Directing Telecommunications Diversity in the Global Environment

Wireless access is not just another opportunity; it is much more revolutionary for the global context than many would perceive. The opportunities for political and economic participation are radically changed through wireless access. Through a program of strategic liberalization, multiple service architectures for the provision of services can be established and sustained. Over time, those platforms will become global, reaching out to people and offering a new kind of seamless communications.

The introduction of new technologies will certainly have an impact on economic modernization, changing social and political organization in course. Wireless access will lend a different character to modernization, one that is more likely to address some of the critical problems of investment and access better than other kinds of telecommunications technologies. Public policy needs to focus on

directing the energies and investment of those who will be building the infrastructure and institutions of the future; by providing general parameters in the form of regulation and rewards for those who are willing to risk, policy institutions can bring some formidable resources to bear in defining the future of the global information infrastructure.

But for strategic liberalization to become a protector of the global diversity in the telecommunications sector, there will need to be a global consensus on a new model for the provision of wireless access services. A continued emphasis on privatization without liberalization will take its toll on the viability and sustainability of new institutions employing wireless access for competitive advantage. The expansive growth rates of the developed world are already beginning to slow as service reaches saturation among high-end users, such as corporate executives and upper income families. New species will only evolve if the environment allows them to grow and prosper.

This is where global relationships will be critical to ensuring wireless access and telecommunications investment are linked to the goals of national development, not just corporate profits. Institutions like the World Bank and the International Telecommunications Union have to engage the institutions of the public and private sector in this issue, establishing new service models for wireless access and other forms of telecommunications service. Without strong advocates for strategic liberalization in the global telecommunications marketplace, the implementation of this model in individual countries will be limited.

Establishing this advocacy role will be perhaps the most difficult proscription of the strategic liberalization policy we have outlined, simply because it will not be popular with a number of the constituencies within the public and private sector institutions we have put under the analytical microscope.

The regulators and politicians will look at the evident inconveniences. In the past, the telecommunications sector has been marked by its stability and rock-solid financial and political footing. That will change as new institutions offering wireless services begin to compete directly with the landline platform in place today. The opening round has begun in the UK, and as PCS licensees come on line in the United States, the push to invade the local loop will heat up. In Brazil and Russia, wireless is already seen as a bypass, and further development of the sector (especially through fixed wireless local loop applications) are likely to explode the existing wireline monopoly.

Many corporate institutions have co-opted wireless access to deliver a different kind of product to consumers, based on the cellular service model. As we have made clear, wireless access can be much more than a phone on the move, but, for many of these institutions, such a service model would eat into their margins, already under pressure because of increased competition for landline access. Many will look at this policy proscription and not recognize the need to invest in long-term profitability rather than short-term returns.

The environment is likely to be far from stable. Much in the same way as an ecosystem goes through cycles of creation and destruction, so too will the global telecommunications sector. Companies will collapse. They will go out of business and cease to serve customers. Such a scenario is possible in any of the case study countries we have examined. An RBOC falters under the weight of competition as wireless access companies (especially AT&T in the opening rounds of the battle) cut prices to the bone to establish a firm subscriber base. Mercury's wireless operation folds because of increased competition and its wireline operation languishes until the company loses its relevance and others take its place from a resurgent European continent. Rosstelekom is pushed out of the business of providing service because local phone companies no longer have to deal with the company. Embratel loses its market share as pole companies conspire against the center. All of these are serious possibilities and need to be considered as the future course of telecommunications development is charted.

Wireless service providers are going to be the most fragile institutions in the opening rounds of competition, simply because the barriers to entry can be dropped quickly and new networks can come on line just as fast. Because of the success of auctions, governments are likely to put more and more spectrum up for grabs, adding the number of players until the market for spectrum itself goes bust.

Are we prepared for this? In a truly competitive market, where a variety of players offer services through a variety of platforms, nothing would happen in terms of service. Another provider would pick up the subscribers, or a new entrant would attempt to take the opportunity to gain a market position. We will have to live with a global information infrastructure that fails, on occasion. Like the computers that will manage the networks, parts of it will have to be "rebooted," but the loss of one institution will create new opportunities in the process of "creative destruction."

Wireless access, in very critical ways, is much more amenable to creative destruction. Its scalability, price and flexibility give it advantages over the lumbering wireline networks of each of the countries

we have examined. When combined with specific policies, we have seen that wireless access presents the best hope for the development of stronger national information infrastructures through competition. On a global scale, wireless access is likely to provide international players more flexibility and capability to compete and meet customer needs.

Conclusions

Of the emerging opportunities for corporate and public managers in the telecommunications sector, wireless access directly and positively affects the ability of communities to harness the capabilities they need to move forward on the path to development. And, considering the future trends of competition and globalization in the telecommunications industry, the problem of access is best solved by a technology that gives institutions the flexibility to serve, to profit and to fail, if need be, through the process of creative destruction that marks modern development.

If the future of wireless access and the global telecommunications sector is a jungle, then strategic liberalization is a map to lead us to that jungle, allowing us to plant seeds along the way to further its growth and allow us to harness the rich value of the jungle's diversity. Welcome to the jungle indeed; a global infrastructure of companies rising and falling, of species mutating and altering before our very eyes, of people struggling with the new opportunities for development and moving on with their lives. The jungle of the telecommunications future may not be so bright and magical as we would initially hope. But at least we can try to ensure the goals of development are securely tied to the growth and expansion of telecommunications infrastructures in the world's developing and developed countries.

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