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TELECOMMUNICATION DEVELOPMENT PROBLEMS
OF THE 1980S

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July 1984
CP-84-33

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FOREWORD

Telecommunications are almost the ideal subject when studying the impacts of innovations. They are a long established branch of industry and services, with strong new innovations tunneling through many intercompany, interindustry, and even international barriers and frontiers. They also have strong societal impacts and may streamline the way-of-life. Telecommunications have strong interindustry relations and are becoming an important component of modern state infrastructure.

All this presents a decision maker or policy designer on a national and/or international level with puzzling problems and alternatives.

This paper by Dr. Wallenstein, based on a lecture at IIASA, depicts some of the factors that play a major role in coping with the problems of telecommunications development on national and international levels. His observations are based on long experience in practice, both in a private telecommunications firm and in international bodies working in this field.

The concise treatment of the topic can be a good introduction into the policy problems of telecommunications.

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CONTENTS

INTRODUCTION	1
1. WHAT'S NEW IN TELECOMMUNICATION TO CAUSE POLICY PROBLEMS?	2
1.1. Offerings of New and "Enhanced" Services	2
1.2. Restructuring of the Telecommunication Networks	2
1.3. Technological Advances for Replacement of Network Systems	2
1.4. Broadcasting-Satellite Service	2
2. DIVERGENT TRENDS OF DEVELOPMENT	3
2.1. Developing Countries' Emphasis	3
2.2. Contrasting Outlook for Industrialized Countries	3
2.3. Technological Drive Behind It All	3
3. DILEMMAS AND CONTRADICTIONS	4
3.1. Dilemma of ITU Funding	4
3.2. Dilemma for the Industrialized Community of Countries	4
3.3. Pervading Paradoxes of Telecommunication Development	5
3.4. Dilemmas and Paradoxes Peculiar to New Services	6
4. SELECTIVE CONCLUSIONS	6
4.1. Summary	6
4.2. Market-Oriented Conclusions	7
4.3. Five World Markets	7
4.4. Supporting Statistics for Developing Country's Outlook	8



TELECOMMUNICATION DEVELOPMENT PROBLEMS
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INTRODUCTION

Telecommunication services have presented problems for policy makers since they were first introduced. In the United Kingdom, questionable practices of competing telegraph companies brought about government's takeover in the late 1860s. Extension of the telegraphs across national borders raised international policy issues that triggered founding of the International Telecommunication Union (ITU) in 1865. Since then, every technical innovation and every administrative expansion of service offerings has created policy problems at the national and international levels.

An environment of policy questions has become so much routine that decision makers in industry and government tend to roll along with the punches of one policy issue after another. Yet now, in the 1980s, a confluence of technological, socioeconomic, and political developments amplifies both the magnitude and complexity of policy problems. There are no easy, definitive answers. Most questions linger on for years, as searches for solution of one problem become interrelated with those for solution of others.

Uncertainty about future policy can have several adverse effects. It may retard introduction of innovations. It may confuse potential service users to the point where they lose interest in what is offered to them. Thirdly, it may force developing countries to choose from an untidy menu of systems offered, without clear policy guidance as to their status among world standards.

A survey of the current policy problems, dilemmas, and divergent concerns to industrialized or developing countries, is presented in this paper. The survey is arranged in three concisely written points, followed by selective conclusions.

1. WHAT'S NEW IN TELECOMMUNICATION TO CAUSE POLICY PROBLEMS?

1.1. Offerings of New and "Enhanced" Services

- o Interactive VIDEOTEX;
- o Broadcasting mode TELETEXT (Videotext in Germany);
- o TELETEX, and a variety of office-automation related services;
- o Customer terminal and interface equipment, offered by many competing suppliers, either to implement the new/enhanced services, or to "stretch" conventional telephone lines.

1.2. Restructuring of the Telecommunication Networks

- o ISDN (Integrated Services Digital Network) - CEPT Plan;
- o Multiple service providers' ISDN, flexible, evolutionary as envisaged by US policy makers;
- o INS = Information Network System, Japan's national choice.

1.3. Technological Advances for Replacement of Network Systems

- o Electronic switching;
- o High-speed data and facsimile systems;
- o Optical fibre transmission systems.

1.4. Broadcasting-Satellite Service

Discrepancy between USA's "free-for-all" for hundreds of competing channels to be received *direct off the air* by individual backyard antennas; and rest of the world's agreement to employ community reception for retransmission over national cable or line-of-sight TV distribution.

Unresolved issue of "spill-over" and intentional transborder broadcasting; "Cultural Imperialism" versus "New World Information and Communication Order."

Muted but still unresolved issue of equatorial countries' claim to sovereign rights over "their" portion of orbit.

2. DIVERGENT TRENDS OF DEVELOPMENT

2.1. Developing Countries' Emphasis

New World Information and Communication Order envisages for each developing country...

- o comprehensive upgrading of the telecommunication infrastructure;
- o eventual independence from industrialized countries' technological and operating skills and from the associated dominance of the suppliers' market;
- o and a definitive state control over diffusion of communication in its territory, with veto power over content.

2.2. Contrasting Outlook for Industrialized Countries

These countries, considered as a *genus* not as a *bloc*, approach saturation of demand for conventional telecommunication services. In countries as far apart as France and Japan, telecommunication manufacturing and service workers face lay-offs unless something new is added. Need for telephone related equipment and support service is tapering off. Entrepreneurial push is for "new and enhanced" services, or at least new terminal equipment.

Innovations clamor for a market, for sure; but displaced workers are also clamoring for a "gainful occupation." So, the phenomenon as a whole is like the poet's notion of young love: "Halb zog sie ihn, halb sank er hin."

2.3. Technological Drive Behind It All

Both the industrialized and developing countries' expectations are driven by technology. The basic telephone service equipment and complete systems sought by developing countries should be "the latest", i.e., what the industrialized laboratories are developing for innovative and replacing purposes as explained above.

So, it's in the hopes of sharing technological progress that the unequal partners meet. Fortunately, they can do that in the framework

of long established international organizations: ITU in the field of telecommunication; ISO/IEC, as well as the younger IFIP, for the interfacing fields of general electronics, computers, and office equipment.

3. DILEMMAS AND CONTRADICTIONS

3.1. Dilemma of ITU Funding

The developing countries have developed one thing: a strong political voice, speaking *en bloc*. They have exerted pressure on the modest ITU financial pool, diverting ever more of it to direct assistance with building of their national or subregional networks.

At the same time, a high level of technological standardization activity strains the ITU resources. These activities include detailed implementations of ISDN, which affect transmission and switching systems, as well as development of flexible terminal interfaces. Further under study are developments of entirely new networks or network backbone systems, e.g., Optical Fiber. On the administrative standards side, there is the work on new services and on expanded data networks.

The ITU's radio branch (CCIR and IFRB) is very busy with introduction of BSS (Broadcasting-Satellite Service), which poses its own, peculiar political and commercial policy dilemmas.

All technologically focused work will, in time, also benefit the developing countries, if for no other reason than that none of these countries wants to accept "appropriate technology". In fact the same Bloc voice has demanded royalty free licensing of innovations, as atonement for past inequalities and voluntary contribution towards the "New Order".

So, what happens is a squeeze on ITU. Less funds, fewer coordinating manhours for standardizing functions; more funds, more expert time spent to help developing countries put their networks together.

3.2. Dilemma for the Industrialized Community of Countries

Bedrock of past "harmonization" of worldwide telecommunication development, with ITU as the catalyzing center, has been the profitability of voluntary agreement. I have likened the process to a *Positive Sum Game*.

*A weakened ITU drives the collaborating-yet-competing forces towards meetings under the aegis of other forums. Western Europe has its CEPT, where detailed regional agreements are hammered out, partly as a unified market challenge to a feared US product penetration; partly because the ITU is just too unwieldy a forum. Japan seeks as much leadership influence in Asia. The USA and Canada, each going their own way in domestic development, are relying much on professional and industry associations to bring about standards as they, respectively, would like to see adopted. Still, all continue to meet goodnatureedly under ITU aegis, but with the difference that minds are made up *before the meeting.**

Thus, an inevitably hungry context for shares of world market is accentuated by stiffening of positions on new standards. The ITU's technical committees often can only record the multiple standards; the objective of a single worldwide standard is a vanishing dream.

All the while, most of the industrialized countries' industries aim to be in good graces with the developing countries. So, in practice, they renege on the positive-sum game spirit when it comes to lining up orders from the third world.

In response, a few articulate, technically competent spokesmen within the ITU framework, for developing countries' interests, demand ever more handbooks and tutorial help in other form, as impartial sources of information. Yet these sources can only be created by, again, voluntary contributions from the same competitors that offer the confusing diversity of solutions in the first place.

3.3. Pervading Paradoxes of Telecommunication Development

Innovation Versus Compatibility: How to Reconcile the Two?

Long-distance transmission improves fast and becomes cheaper with time, while costs in the local service area may be rising; yet what value is topnotch and cheap long distance connection if the local ends are technologically left behind, in poor state of repair, and causing disproportionately high cost?

Statistical averaging versus precise standards: a classic paradox for telecommunication design and maintenance. Telephone systems are engineered to statistical probabilities and performance averages, as

necessary to cope with a fluid situation in random access networks, with very wide swings in traffic load. On the other hand, individual items of equipment must be designed, and often also maintained, to within small fractions of a decibel of departure from the norm, if large numbers of them connected in tandem must still assure troublefree message transmission end to end.

These three paradoxes require decision making, and the decision in a given case may depend on the national priorities, economic pressures, and competitive market position.

3.4. Dilemmas and Paradoxes Peculiar to New Services

Interactive Videotex promises numerous gains for education, social integration of disabled people, business and manufacturing improvements, and the like. Yet greatest immediate potential seems to lie in video games, offbeat private indulgences that are amusement rather than study, and idle playing around for "information of all and any kind."

To provide these new, visual services, many countries have chosen to build up a national cable distribution plant. Yet the long term outlook favors optical fibres. Thus, much of the new investment will have to be replaced or overbuilt at a date too close in for good amortization.

The most dramatic impact on a nations' educational level could be made by planned, large-scale introduction of a combination of Videotex and Satellite Broadcasting. Yet the developing countries most in need cannot afford this enormous investment, nor do they have the advanced human and material resources to make proper use of the new systems.

4. SELECTIVE CONCLUSIONS

4.1. Summary

In point (1) the major innovations in service offerings and technological trends have been outlined. Point (2) highlights conceptual and situational differences between industrialized and developing countries. Point (3) focuses on dilemmas; rivalries among industrialized countries on one hand, confrontational demands made by developing countries, usually en bloc, on the other. Differences in development status entail different choices and priorities. Competitive rivalries entail different market strategies for the same choices.

4.2. Market-Oriented Conclusions

Among the world's leading, competing suppliers of telecommunication systems, it has become customary to speak of a "world market" in terms of x-billion dollars. This large figure is then broken down into world regions or regional blocs, and individual countries. In some such presentations, there is also a projection of market demands for several, major equipment lines, e.g., telephone switching, transmission systems, satellite earth stations. However, these market projections overgeneralize a complex world and fail to highlight the trend of innovative service and subscriber equipment.

This paper's focus on different choices for different stages of development opens up interesting conclusions regarding major world market sectors. Selective conclusions, supported by four figures, are discussed in the following.

4.3. Five World Markets (Figure 1)

The industrialized world offers *two* major markets. One is for replacement and improvement in the established plant associated with basic telephone, telex, telegraph and data services. This is a very large market all by itself, given the large base of equipment already in plant. The USA alone offers enormous potential for worldwide competition, the only country where government's deregulation has opened the market unequivocally.

Another, separate market is for the new services and equipments. This market will experience very high growth rates, but it is also likely to be more competitive everywhere, not only in the USA. It is an innovation-focused market that may be observed with envy by the more advanced developing countries, yet few if any of them have the business and societal infrastructure justifying these innovations. Above all, the basic services must be provided first, as is shown by the central circle's overlap of the developing world.

The few developing countries that have made steady headway in telecommunications have wisely concentrated on the big cities and their interconnection. Table 1 shows how Brazil and Mexico have gradually been able to diminish emphasis on the big cities, thus building up telecommunication with and among points of the hinterland *after* the big cities paved the way and paid for basic investments.

The remaining two, quite distinctly separate markets in the developing world are also shown in Figure 1. Special projects for a minimum of rural area service have become feasible and fashionable. The impetus comes from two, mutually aiding sources. One source is the UN General Assembly and UNESCO, issuing resolutions and declarations. These trigger the ITU, speaking ex-cathedra on telecommunication development, to become a source of assistance, including helpful engineering handbooks, specially planned systems for economic application in rural areas, regional seminars, dispatch of experts, and coordination of country projects.

The other source feeding special rural projects comes from entrepreneurial designers and manufacturers who see a market here for custom engineering, which the big suppliers may not be able to satisfy.

By contrast, the one-of-a-kind valuta-rich country's national project represents an atypical market, open only to the leading suppliers.

4.4. Supporting Statistics for Developing Country's Outlook

Table 2 and Figure 2 illustrate the wide gap separating the industrialized and developing countries. As Table 2 shows, even the saturation level of basic services tells not an end but rather an expansion of telecommunication development. A large, profitable base provides incentives for improvements and augmented services. The developing countries do not have such a base.

The reason for the basic discrepancy is illustrated in Figure 2. While such statistical representations have been published frequently, here is a new emphasis. Prove-in of the typical network and equipment cost for one additional telephone is here shown in terms of per-capita GPN required. For the least-developed countries, for example, the GNP of 10 people would be required. The US, Sweden, Japan (*inter alia*) can get by with one-quarter of a person's GNP.

Table 1. Example of two atypical developing countries, both pursuing an aggressive, free-market type telephone development policy (in '000 telephones).

Year	Whole Country	Capital	% of total
	<i>Brazil</i>	<i>Rio de Janeiro & Sao Paulo</i>	
1965	1,263	649	51.3
1976	3,371	1,530	45.3
1981	7,389	2,600	35.0
	<i>Mexico</i>	<i>Mexico City</i>	
1965	725	385	53.0
1974	2,222	1,013	46
1981	5,083	2,059	40.5

Developing countries' best strategy: concentration on big cities; only later disperse available funds and qualified manpower to serve smaller towns and, lastly, rural hinterland.

Table 2. Comparative growth of revenue, construction budget, and revenue in the world's largest, mature telephone service provider system (AT&T, USA).

Parameter (units)	Year							Average annual growth rate (%)
	1974	1975	1976	1978	1980	1981	1982	
Operating revenues (billion dollars)	26.7	29	32.2	42	50.8	58	65	11.7
Construction budget (billion dollars)	10.2	9.5	10.2	14	17.5	18.3	19.1	8.2
Revenue per telephone (dollars)	226		253	307	350	395	436	8.6
Telephones in service (millions)	118		126	137	145.9	146.8	149	2.9

The table shows how revenues grow faster than new dollar investment and much faster than the number of telephones served. This performance is difficult, if not impossible to match in developing countries.

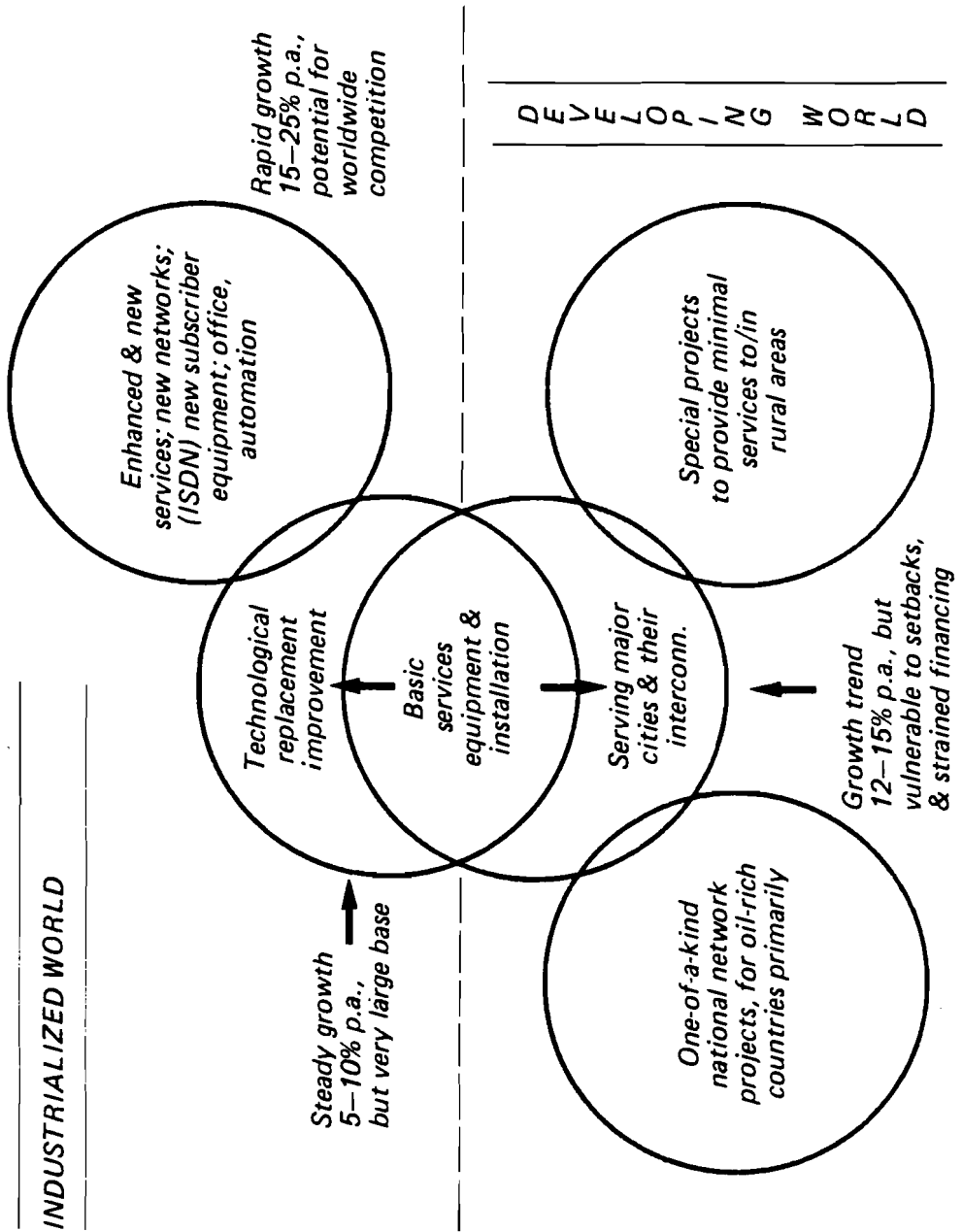


Figure 1. Five Telecommunication Markets for 5 stages of development

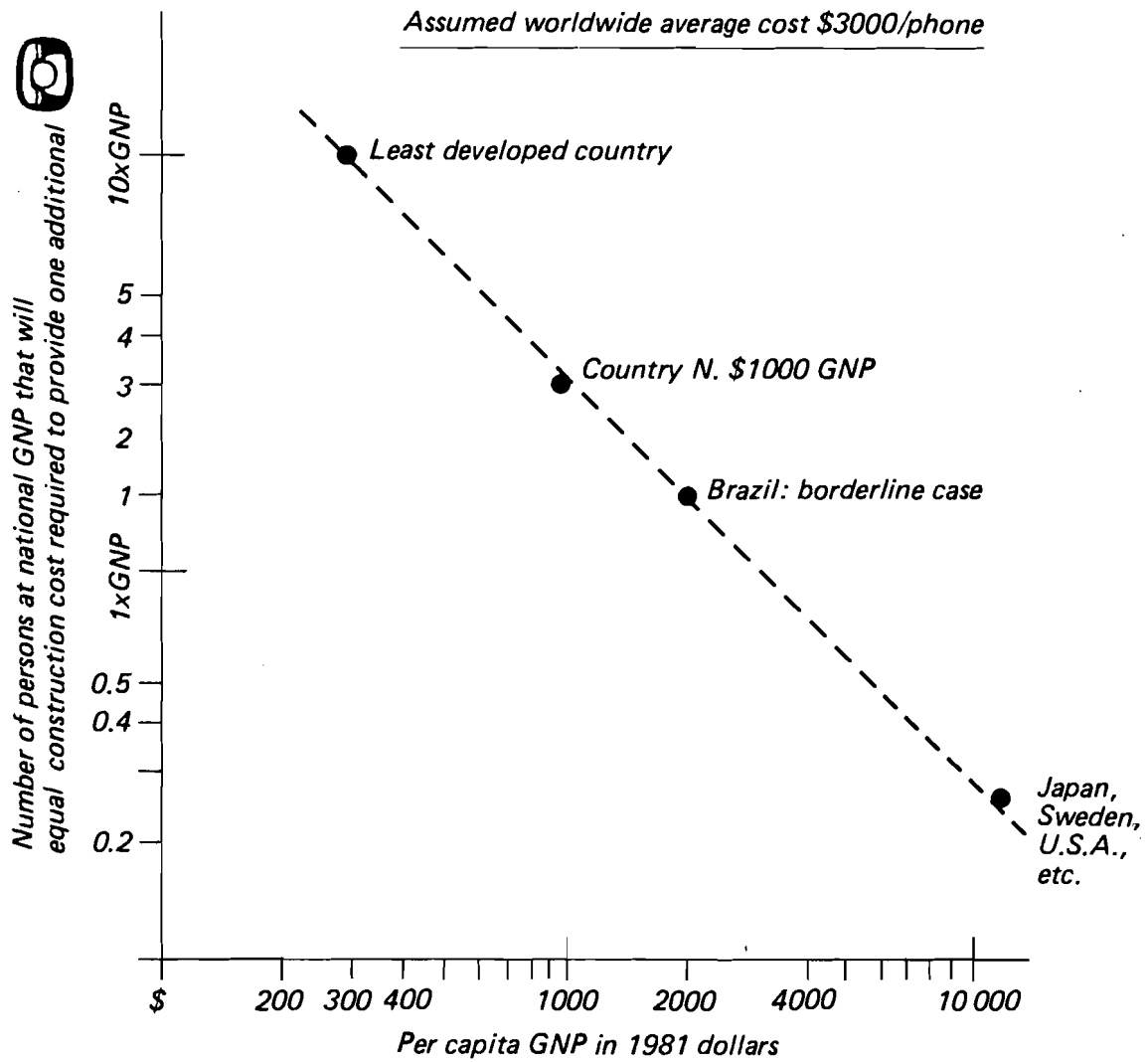


Figure 2. New Telephone Construction Cost in terms of "heads of GNP"