

DEMAND FOR RURAL COMMUNICATION
SERVICES IN CANADA -
A LITERATURE REVIEW

Interim Report No. 1

Submitted to:

Mr. Alain de Fontenay
Scientific Authority
Study on Demand for Rural Communication Services
Department of Communication
Ottawa, Canada

Submitted by:

Prof. R. de Camprieu
Faculty of Management Sciences
University of Ottawa
and
Prof. J. C. Bourgeois
School of Commerce
Carleton University

Contract OSU-78-00256
06SU.36100-8-9529
5417-2-4

January 8, 1979

QUEEN
P
92
.C2
D43
1979
v.1

P
92
C2
D43a
1979
v.1

②
DEMAND FOR RURAL COMMUNICATION
SERVICES IN CANADA/-
A LITERATURE REVIEW

Industry Canada
LIBRARY
JUL 23 1998
BIBLIOTHÈQUE
Industrie Canada

Interim Report No. 1

~~COMMUNICATIONS CANADA
MAY 25 1984
LIBRARY - BIBLIOTHÈQUE~~

Submitted to:

Mr. Alain de Fontenay
Scientific Authority
Study on Demand for Rural Communication Services
Department of Communication
Ottawa, Canada

Submitted by:

①
Prof. R. de Camprieu /
Faculty of Management Sciences
University of Ottawa
and
Prof. J. C. Bourgeois
School of Commerce
Carleton University

Contract OSU-78-00256
06SU.36100-8-9529
5417-2-4

January 8, 1979

P
92
C2
D43e
1979
vil

DD 4538148
DL 4538175

TABLE OF CONTENTS

	page
1. INTRODUCTION	1
2. TELEVISION	6
Off-air Delivery of Television Services	6
Coverage	6
Level of choice	8
Behavioural data	13
Forecasts	20
Cable Delivery of Television Services	22
Coverage	22
Behavioural data	22
Forecasts	24
New Modes of Delivery and New Services	25
New Modes of Delivery	25
New services	26
3. RADIO	27
Coverage	27
Behavioural data	30
Penetration	30
Attitudes, Behaviour and Needs	30
Forecasts	32
4. MOBILE RADIO SERVICES	33
Technological Data	33
Behavioural data	33
Needs	33
Decision making processes	35
Distribution of users	36
Attitudes and Behaviours	36
5. TELEPHONE	39
Status of Telephony	39
Present Status	39
New Developments	44
NUSI Plan	44
Flat Rate	47
New Technology	49
Impact of Telephone Development	51

Quality of Service Indicators (Q.S.I.'s)	55
Non-Urban Rate Structure	59
Tariff Determination	59
Construction charges	61
User Profile	64
Demographic and Socio-Economic Traits	64
User Needs and Problems	71
User Demand	78
Determinants of Demand	78
Forecasting Techniques	82
6. CONCLUSION	84
BIBLIOGRAPHY	89
Appendix	page
A. STEPS TAKEN TO OBTAIN DOCUMENTATION FOR THE LITERATURE REVIEW	95
B. QUALITY OF SERVICE INDICATORS	99
C. CRTC - BELL DATA BASES	105

LIST OF TABLES

Table	page
1. Television Non-coverage by Province, 1975	7
2. Television Coverage, 1975	9
3. Availability of TV in Rural Canada	11
4. Availability of English-Language Canadian TV in Rural Canada	12
5. Availability of French-Language Canadian TV in Rural Canada	14
6. Availability of American TV in Rural Canada	15
7. Questions and Scales from the Market Facts 1976 Study	18
8. Percent of Households in Each Region	21
9. Population within Cable TV Coverage Areas by Province	23
10. Radio Coverage	28
11. Percentage Coverage Figures by Language Group and Service	29
12. Households with FM Receivers and Radio Equipped Automobiles	31
13. Selected Characteristics of the Service Categories .	34
14. Indicators of Benefits to be derived from Improved Telephone Services to Rural Areas	56
14. (continued)	57
15. Tariff Determination	62
16. Demographic and Socio-Economic Variables vs Long Distance Expenditures	66
17. Comparative Analysis of Predictor Variables	68

18.	Economic and Demographic Determinants of Telephone Availability	70
19.	Problems in Fulfilling Telephone Communication Needs	77
20.	Determinants of Long-Term Telephone Usage	81
21.	Forecasting Techniques in the Estimation of Telephone Demand	83

LIST OF FIGURES

Figure		page
1.	Classification of Users by Industrial Classification and Service Categories	37
2.	% Residence Telephones - 4 or more vs 1 or 2 Parties/Line	41
3.	Multi-Party Line Fills	42
4.	NUSI Evaluation System Functional Outline	46
5.	Rural Telephone Exchange	63
6.	Framework of Need/Problem Analysis	73

1. INTRODUCTION

Much attention has been paid to rural living in the present decade. It is recognized that excessive rural outmigration drains the countryside of its economic strength and social viability while straining the capacities of metropolitan centers. It is generally assumed that "in every land, the metropolitan areas attract people from the rural areas because they offer opportunities for higher income, a greater variety and a wider choice in modes of living and a way of life that is more stimulating, more enlightened and more conducive to innovation" (National Academy of Sciences, 1969, p. 80)¹. Therefore, a balanced national growth policy would require that services and opportunities be more equitably shared between metropolitan and rural areas. The U.S. Rural Development Act, 1972, for instance, wants "to make rural America a better place to live and work". This requires, in the first instance a certain parity of opportunities and services as between metropolitan and rural areas. The basic issue is therefore one of life style; in terms of the present research, it can be expressed as follows: how

¹There is statistical evidence however that the pendulum in population and buying power has started to swing back from urban to rural America (Media Decisions, 1976).

do telecommunication services relate to the quality of life in rural areas? Communication services, to the extent they nullify distance can contribute to the bridging of the gaps among disparate elements of our society. Telecommunications can facilitate the provision of health, education, social and entertainment services to sparsely settled areas without adverse effects on the beneficial aspects of rural life (Office of Telecommunications Policy, 1975). In Canada similar concerns have been expressed (Canadian Council on Rural Development, 1973) and the long term service objective of the Department of Communication for rural areas has been couched in the following fashion:

1. The availability throughout rural Canada of telecommunications services with
 - a) continuous 24 hours per day availability;
 - b) demand access to unlimited addresses;
 - c) a quality of performance approximating urban standards.

2. The availability throughout rural Canada of radio and television services (in both official languages when required) with a quality of performance approximating that available in urban areas (Inter-Branch Working Group on Rural Communications, 1976, pp. 2-3).

The problem, however, is compounded by diseconomies associated with the provision of those services in rural areas. Sophisticated technological innovations offer real but expensive solutions and when the alternatives are confronted the following query invariably surfaces: what do the consumers want in the first place? (Broadcasting, 1977).

The identification of the needs of rural people and of the existing facilities to satisfy them has been proposed as a part of Phase II of the rural program (Inter-Branch Working Group on Rural Communications, 1976). In this context, the overall objective of this project has been stated as follows: "To survey the needs of rural domestic and business subscribers for existing and proposed communication services and to forecast short and long term demand for these services". Two studies have already been conducted with respect to the methodology to be used in such a project. The Sherbrooke study (Allaire, et al., 1977) proposed a methodology to "assess communication needs and ability to pay" while the York study (Copeland, 1978) faced a greater challenge: "outline a strategy for estimating the demand for telecommunication services". Both reports have one characteristic in common: they present no evidence that a literature review was conducted. It is well recognized though that such a review, early in the research process can save considerable time, efforts, and money. More specifically, a literature review serves several functions:

1. in many cases, the research question(s) can be answered based on past work,
2. past efforts may provide hypotheses for testing in the current study,
3. techniques and procedures may be discovered which prove useful in designing the current research,
4. sources of usable secondary data may be uncovered which lessen the need to collect generally more expensive primary data.

For these reasons, it was deemed essential to review the literature dealing with:

1. the needs of rural households and rural businesses with respect to communication services;
2. Short term and long term forecasts of domestic and business demand for telecommunications services.

Only informations relevant to needs and demand forecasting of telecommunication services in rural areas will be reported here. Therefore, this is not a general review of the literature; rather, it is a task specific review. Furthermore, the report itself will be topic oriented rather than

source oriented (when the same information is found at different places, it will be reported only once)².

Perhaps, before proceeding further a definition of "rural" should be prescribed so that all following discussions will be put in the proper context. Rural includes all residents of villages or areas with a population of less than 2500 and with a population density of more than 1 but less than 1000 persons per square mile (Richardson, 1978a, b). The rural population may further be sub-divided into rural-farm and rural non-farm. In the first case, the group represents the agricultural base of Canada, it is that population living in dwellings located on farms. The rural non-farm population are the remaining rural residents.

The report has been structured in terms of the major types of telecommunication services: television, radio, mobile radio, and telephony.

²The detailed procedure which was followed to gather the relevant material is given in appendix 1.

2. TELEVISION

Today, Canadian television services are delivered either off-air or by cable. One section will be devoted to each mode of delivery. In a third section, issues related to plausible technological innovations will be reported.

2.1 OFF-AIR DELIVERY OF TELEVISION SERVICES

2.1.1 Coverage

From CRTC and CBC Annual Reports, it has been estimated that in 1975, 2% of the Canadian population (460,000 people) lie outside the coverage contours of a TV station (Inter-Branch Working Group, 1976, p. 50; Billowes, 1977, p. 8). Nevertheless, there exist substantial provincial differences (see table 1).

Differences in terms of coverage in each official language have also been reported (see table 2). However, it is estimated that, after completion of CBC's accelerated coverage plan (that is by 1980), less than 1% of each official language group will not have access to the signals of a TV station operating in their own language. It can be assumed that coverage will be worse for people living in remote areas. Since they account for 1.1% of total population in 1971 (Richardson and Brown, 1978, p. 14), it can be taken for granted that, if the deadlines are respected, virtually

TABLE 1

Television Non-coverage by Province, 1975

Province	% not covered
Newfoundland	6.6
Prince Edward Island	7.0
Nova Scotia	0.0
New Brunswick	0.2
Quebec	0.1
Ontario	0.4
Manitoba	3.2
Saskatchewan	8.4
British Columbia	4.1
Yukon Territory	18.8
Northwest Territories	43.4
Canada	2.0

Source: Inter-Branch Working Group on Rural Communications, 1976, p. 51.

all rural households will, by 1980, have access to TV signals in the official language group to which they belong.

By way of comparison, in the United States, as of 1973, 1.2 million households (1.5% of all households) received no adequate TV service at all (Bortz, Spongberg, & Venditti, 1973, p. 8).

2.1.2 Level of choice

Several studies have considered the issue of the level of choice (or number of program schedules) available to the Canadian public (Billowes, 1977; Bureau of Management Consulting, 1977; Telecommunications Research Group, 1978; Cormack & Mougeot, 1978; Cormack, 1978).

Simon Fraser University's study is the most relevant here. The purpose was to ascertain the number of people in rural areas who could receive different numbers of TV network services, depending on where they lived. The methodological approach consisted in correlating 1976 census data on population numbers in rural areas with the theoretical limits of TV reception (which had been established by the Bureau of Management Consulting Studies (1977, 1 & 2). The results have been summarized in a tabular form by Cormack (1978) (see tables 3, 4, 5 and 6).

TABLE 2
Television Coverage, 1975

Total	98% of population
CBC English TV	92% of population
CBC French TV	69% of population
CTV	77% of Total population
	93% of English Speaking population
TVA	94% of Quebec households

Source: C.A.Billowes, 1977, p. 8.

The information provided on level of choice in the Simon Fraser study is broken down by census division. As such it is a valuable secondary data, for the level of satisfaction with T.V. services is likely to be dependent upon the actual level of choice.

After completion of CBC's accelerated coverage plan, about 25% of the population in small towns and rural areas will have no choice of station in their own language (Inter-Branch Working Group, 1976, pp. 50-51). By way of comparison, 1.5% of rural households in the United States have no access to any channel, 9% receive service on fewer than three channels, and 34.1% on fewer than five channels (Bortz, et al., 1973).

A similar study was conducted by Cormack and Mougeot (1978) in a metropolitan context. Cormack (1978) comparing the results of the two studies was able to quantify the "metropolitan-rural TV gap"; the following is a self-explanatory excerpt of his introductory memorandum.

1. The people in Canada's largest cities have, on average, access to 3.3 times more distinctly different channels of TV than those in rural Canada;
2. The people in rural Canada have, on average, access to 8.75 fewer channels of distinctly different TV than those in Canada's largest cities (3.85 vs 12.6);

TABLE 3

Availability of TV in Rural Canada

Province	No. of Average No. Rural People Available	Percentage of Rural People Having Access to 0, 1, ..., 14 Distinctly Different Stations														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
B.C.	576,348	7.0	14.6	27.0	5.6	4.8	10.7	2.6	4.3	6.2	4.4	8.2	4.7	-	-	-
Alberta	499,214	6.6	13.5	27.1	28.9	21.1	0.4	0.3	1.4	0.5	-	-	-	-	-	-
Saskatchewan	449,903	10.1	33.1	48.4	8.4	-	-	-	-	-	-	-	-	-	-	-
Manitoba	333,915	7.4	14.1	33.4	4.3	34	1.1	3.8	-	-	-	1.7	-	-	-	-
Ontario	1,674,050	1.1	5.8	9.7	16.8	15.5	9.1	8	10.4	5.1	4.1	6.2	3.6	.1	1.6	2.9
Quebec	1,492,390	1.4	16.3	19.1	7.4	18.9	14.3	4	4.9	6.9	4.9	.3	.9	.4	.3	-
N.B.	357,966	.5	4.2	40.2	34.0	0.03	9.0	2.9	1.7	6.7	.8	-	-	-	-	-
N.S.	382,643	.6	2.7	49.4	35.4	-	0.6	0.5	2.9	6.6	1.1	-	-	-	-	-
P.E.I.	86,972	6.6	5.6	63.3	13.1	-	-	-	11.4	-	-	-	-	-	-	-
Nfld.	278,367	4.6	23.2	60.0	4.4	-	0.2	6.8	0.8	-	-	-	-	-	-	-
Canada	6,131,768	3.3	12.8	26.5	14.7	12.9	7.7	4.2	5.0	4.5	2.9	2.7	1.6	0.1	0.5	0.8

Source: G.D.Cormack, 1978, p. 8.

TABLE 4

Availability of English-Language Canadian TV in Rural Canada

Province	No. of Rural People	Average number of distinctly different channels available	Percentage of rural people having access to 0, 1, . . . , 14 distinctly different channels														
			0	1	2	3	4	5	6	7	8	9	10	11	12		
B.C.	576,348	2.5	7.3	16.8	33.2	16.8	17.1	6.1	2.8	-	-	-	-	-	-	-	-
ALTA.	499,214	2.2	7.2	15.4	28.7	47.7	1.0	.01	-	-	-	-	-	-	-	-	-
SASK	449,903	1.5	10.2	33.4	56.4	-	-	-	-	-	-	-	-	-	-	-	-
MAN	333,915	2.1	7.7	15.6	36.0	38.3	0.6	1.7	-	-	-	-	-	-	-	-	-
ONT	1,674,050	3.6	1.2	8.3	23.2	22.6	14.8	14.2	11.6	1.3	2.9	-	-	-	-	-	-
QUE	1,492,390	1.1	35.1	22.6	38.2	1.8	2.4	-	-	-	-	-	-	-	-	-	-
NB	357,966	1.8	2.0	34.5	54.8	3.1	5.6	-	-	-	-	-	-	-	-	-	-
NS	382,643	2.2	0.7	4.0	84.0	2.3	7.9	1.1	-	-	-	-	-	-	-	-	-
PEI	86,972	2.0	7.1	9.8	71.6	-	11.4	-	-	-	-	-	-	-	-	-	-
Nfld.	278,367	1.8	4.6	23.7	63.9	1.0	6.8	-	-	-	-	-	-	-	-	-	-
CANADA	6,131,768	2.2	11.8	17.4	39.6	14.5	7.6	4.6	3.4	0.4	0.8	-	-	-	-	-	-

Source: G. D. Cormack, 1978, p. 9.

3. 10.7% of rural Canadians live within CATV franchised areas vs some 90% for residents of the large cities.

The following table provides language and source breakdown for the "TV gap".

Type of Channels	Average Number of Distinctly Different Channels Available		"TV Gap"
	In Rural Canada	In CMA's	
English-Canadian	2.2	5.8	2.6 times
French-Canadian	0.9	2.5	2.8 "
U.S.	0.7	4.4	6.3 "
Total	3.85	12.6	3.3 "

(G.D.Cormack, Memorandum August 28, 1978)

The following statement summarizes the issue:

the gap between the quantity and quality of service in the major urban centers and the rest of Canada has been increasing and the trend is towards a continual widening of the gap. (Billowes, 1977, p. 21)

2.1.3 Behavioural data

What needs are satisfied by television services? What do people know about television services? What kind of attitudes do they hold? How are decisions about television services made? What behavioural pattern or habits are associ-

TABLE 5

Availability of French-Language Canadian TV in Rural Canada

Province	No. of Rural People	Average No. of Stations Available	Percentage of Rural People Having Access to 0, 1, ..., 14 Distinctly Different Stations														
			0	1	2	3	4	5	6	7	8	9	10				
B.C.	567,348	0.3	74.0	26.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Alberta	499,214	0.3	70.9	29.0	-	-	-	-	-	-	-	-	-	-	-	-	-
Saskatchewan	449,903	0.1	91.3	8.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Manitoba	333,915	0.5	53.5	46.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Ontario	1,674,050	0.8	26.0	68.9	3.3	1.8	-	-	-	-	-	-	-	-	-	-	-
Quebec	1,492,390	2.2	2.0	24.4	34.5	32.4	3.8	2.2	0.6	-	-	-	-	-	-	-	-
New Brunswick	357,966	0.8	22.1	76.9	1.0	-	-	-	-	-	-	-	-	-	-	-	-
Nova Scotia	382,643	0.5	51.7	48.3	-	-	-	-	-	-	-	-	-	-	-	-	-
P.E.I.	86,972	0.3	70.2	29.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Nfld.	278,367	0.1	94.4	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Canada	6,131,768	0.9	39.8	41.0	9.4	8.4	0.9	0.5	0.2	-	-	-	-	-	-	-	-

Source: G.D.Cormack, 1978, p. 6.

TABLE 6

Availability of American TV in Rural Canada

Province	No. of Rural People	Average No. of Stations Available	Percentage of Rural People Having Access to 0, 1, 14 Distinctly Different Stations														
			0	1	2	3	4	5	6	7	8	9	10	11	12		
B.C.	576,348	1.5	45.8	23.8	0.8	6.6	10.3	12.7	-	-	-	-	-	-	-	-	-
Alberta	499,214	.1	97.7	-	0.5	-	1.8	-	-	-	-	-	-	-	-	-	-
Saskatchewan	499,903	0	99.9	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Manitoba	333,915	.2	93.7	0.6	4.0	1.7	-	-	-	-	-	-	-	-	-	-	-
Ontario	1,674,050	1.1	69.5	3.1	6.9	5.8	3.9	5.8	2.5	2.4	-	-	-	-	-	-	-
Quebec	1,492,390	.7	74.6	4.4	5.9	8.7	6.4	-	-	-	-	-	-	-	-	-	-
New Brunswick	357,966	.7	78.9	-	1.1	15.3	4.7	-	-	-	-	-	-	-	-	-	-
Nova Scotia	382,643	.3	88.2	-	2.3	9.4	-	-	-	-	-	-	-	-	-	-	-
P.E.I.	86,972	.2	88.6	-	11.4	-	-	-	-	-	-	-	-	-	-	-	-
Nfld.	278,367	.2	92.2	-	7.0	0.8	-	-	-	-	-	-	-	-	-	-	-
Canada	6,131,768	.7	77.4	4.2	4.3	5.8	4.1	2.8	0.7	0.7	-	-	-	-	-	-	-

Source: G.D.Cormack, 1978, p. 7.

ated with telecommunication services? The literature was surveyed to discover answers to questions of that kind.

1. Needs.

Surprisingly, very little has been found on the subject. In a survey conducted by Market Facts (1976) on Canadians' attitudes towards advertising on television some relevant data has been collected; unfortunately, at the data processing and analysis stages, the rural category was merged with higher density areas. It seems however that the data set could be reprocessed to isolate the rural category. The questions as well as the scales relevant to this section are described on table 7 .

A Harris poll in 1973 revealed that, besides being almost universally adopted as an entertainment medium, TV is relied upon by 65% of the US households as their principal source of information about government and politics. It is not clear however, what "rural" means in this study (Office of Telecommunication Policy, 1975). The dichotomy "information" versus "entertainment" is often referred to in the literature although little empirical evidence is reported. It appears

that these concepts are rather vague; an analysis of the audience of various types of TV programs (public affairs, comedy shows, musical variety, serial/soap opera, police/detective, quiz and contests, westerns, national, international, local news, sports, drama, movies, children's program, cartoons, consumer programs, etc.) could be revealing. Market Facts (1976) did collect similar information but again, responses from rural people have not been analysed as such.

In the Sherbrooke proposal, evoked earlier, it is specified that "needs" should be understood as "utilisation needs" not "psychological". However, the questionnaire does not deal with television as such. A similar observation can be made with respect to Copeland's proposal.

Billowes (1977) makes mention of the role of TV as an education medium. The panel on urban communication (1969) argues that, although the effectiveness of instructional TV has been proven by hundreds of experiments for a wide range of subject matters, it has achieved little real acceptance by the American community. The low rate of innovation can be explained by factors such as:

TABLE 7

Questions and Scales from the Market Facts 1976 Study

what respondent does most when he	watch TV	listen to radio	go to a movie	look at paper or magazine	talk on tele-phone
-----------------------------------	----------	-----------------	---------------	---------------------------	--------------------

wants to relax
wants to be entertained
has nothing else to do
wants information on world events

agree - disagree scale

TV is a cheap form of entertainment
TV viewing is good for family evening together
Expect less from TV than paid entertainment
TV viewing now replaces conversation in home
TV occupy kids and I'm free for other things
Too much TV viewing is bad for children
TV keeps me company when I'm home alone
Feel guilty to watch TV

- a) poor quality of programming;
- b) absence of feedback from the student to the instructor;
- c) passivity of student.

2. Knowledge, attitudes and decision making processes

It has been suggested that rural residents cannot, and presumably do not, expect urban level services, but that they are well aware that they are falling ever further behind the cities (Billowes, 1977, pp. 24-25). It has also been suggested that there might be a reluctance to tune to UHF stations because of the extra learning required (operation of two-stage tuner, special antennas, etc.) (Inter-Branch Working Group, 1976, p. 52). Complaints originating from rural areas seem to center around two main themes: poor reception, insufficient level of choice (Inter-Branch Working Group, 1976, p. 57).

3. Behaviours

The Market Facts (1973) questionnaire contains useful questions about viewership (number and type of TV sets owned, location of the set in the home,

whether the TV set is connected to an antenna or a cable, whether a special converter is hooked up to the set, number of days that TV is watched, etc.). Unfortunately the level of aggregation of the analysis does not permit to infer any rural pattern.

There is evidence that an individual's TV viewing time is supply limited up to about the four channel level. Thereafter, the addition of further channels make little difference to the amount of viewing (Billowes, 1977, p. 25).

Penetration (percentage of people owning a TV set) is known at the national and provincial level (see table 8) but no disaggregation has been found at the rural level. Ownership of colour TV sets has been found to increase with family income (Canadian Facts, 1976).

2.1.4 Forecasts

Forecasting demand for off-air television services in rural area does not seem to be an issue in the literature, probably because supply is the critical factor. It is surprising, however that no forecasts of colour TV penetration in rural areas was found. Private research on the subject probably exists but no source could be identified.

TABLE 8

Percent of Households in Each Region

	Total	Canada	Atlan	Quebec	Ontario	Prair	B.C.
	3,109	(258)	(832)	(1,179)	(298)	(342)	
	100%	100%	100%	100%	100%	100%	100%
Ownership of Colour							
Own one or more colour sets	56	50	53	57	59	60	
Do not own a colour set	44	50	47	43	41	40	
Ownership of Black and White							
Own one or more black and white sets	68	73	74	67	64	60	
Do not own a black and white set	32	27	26	33	37	41	

Source: Canadian Facts Co. Limited, 1976, p. 5.

2.2 CABLE DELIVERY OF TELEVISION SERVICES

2.2.1 Coverage

The Simon Fraser study on TV network coverage in rural Canada also contains data on cable TV coverage (see table 9). The results are broken down by census division, and therefore this secondary information can be used to interpret the results of a need survey.

On average, in 1976, only 10.7% of rural Canadian households had access to CATV. By contrast, the figure for urban households is 82% (Cormack, 1978, p. 5).

2.2.2 Behavioural data

1. Needs. In its 1976 National Survey, Canadian Facts investigated the reasons given for subscribing to cable services. Respondents mentioned (by decreasing order of frequency):
 - a) receiving more channels
 - b) better reception in general
 - c) better quality of picture
 - d) was available free in the apartment
 - e) aerial not allowed.
2. Cognitions, attitudes, decision making processes.
The Canadian Facts study (1976) reports that the

TABLE 9

Population within Cable TV Coverage Areas by Province

PROV	TOTAL POP	CABLE TV COVERAGE	CABLE TV COVERAGE AS % OF TOTAL POP
B.C.	576348	179348	31.1
ALTA	499214	14067	2.8
SASK	449903	406	0.1
MAN	333915	7787	2.3
ONT	1674050	185078	11.1
QUE	1492390	151716	10.2
N.B.	357966	41090	11.5
N.S.	382643	45020	11.8
PEI	86972	9921	11.4
NFLD	278367	21756	7.8
TOTALS	6131768	655898	10.7

Source: Telecommunications Research Group,
1978, p. 61.

majority of subscribers express satisfaction with the service provided by their cable company. As a matter of fact, 84% find that they get good value for the money. Furthermore, colour TV owners are more likely to have CATV than are owners of black and white sets. No data is available at the rural level.

2.2.3 Forecasts

Several studies have attempted to estimate cable penetration in the U.S. (Park, 1970; 1971; Comanor and Mitchell, 1971; MacGowan, Noll and Peck, 1971). All used a regression approach. Essentially, regression functions were fitted using data on existing cable systems. The functions were then used to estimate cable penetration in markets where service was not yet available. The basic difference between the various investigations rests mainly with the functional form of the relationship (logit function, logistic growth curve, linear function, etc.). The predictors of cable penetration are generally found to be:

1. number of stations carried by the system
2. number of signals available locally over the air
3. price charged by the cable system for its service

4. average household income

5. proportion of household that have a colour TV.

Ultimate penetration ranges from 29 to 60 percent, and rough calculations suggest an ultimate nationwide average penetration in the order of 40 to 45 percent of households (Park, 1970).

Given the relatively high goodness of fit measures (Park, 1971, reports R^2 as high as 0.75), the approach seems to be quite satisfactory, if one makes the assumption that the markets for which estimates are sought behave in a similar fashion as those which were used to fit the functions.

2.3 NEW MODES OF DELIVERY AND NEW SERVICES

2.3.1 New Modes of Delivery

Several studies have investigated the supply aspect of new modes of delivering television services. The National Academy of Sciences (1969) reports that the results of cost comparisons derived from two distinct models show that for both models, new satellite facilities have a cost advantage over cable facilities. Another study found that the provision of at least three channels to everyone but the 150,000 households living in extremely remote areas of the United States could be obtained with an hybrid system (cable, translator and microwave radiotechnology) in the short run,

at a cost comparable to the charges for conventional cable systems in more densely populated areas (Bortz, et al., 1973). Billowes (1977) argues that in Canada no other technology seems able to compete with the satellite for the long haul multi-channel TV delivery which is the primary broadcasting problem in rural areas (pp. 53-54). A recent U.S. government study (Broadcasting, 1977) says that there is no economic information to prove that cable-telephone cross-ownership will improve the supply of broadband communication services to rural areas. Finally glass fiber technology is too recent and much remains to be done before its full potential can be predicted with any certainty (Billowes, 1977, p. 52).

Billowes (1977) argues that multichannel delivery might jeopardize the existence of small independent local stations who serve marginal markets (pp. 36-37). In this respect it would be important to assess how important local services are to rural people.

2.3.2 New services

"Pay TV" and "TV on demand" are two new services which have received some attention. Preliminary experiences in the U.S. are far from convincing as to the viability of the idea (Billowes, 1977). It seems premature to investigate this possibility for rural Canada.

3. RADIO

3.1 COVERAGE

Radio broadcasting in Canada comprises two services, monaural and stereophonic. Monaural is considered the prime back-bone service and is broadcast mainly in the MF frequency band with the AM technique. In recent years, because of saturation of the MF band, the combination VHF-FM has also been used. Stereophonic service uses the VHF-FM combination. Coverage data for 1975 are given in table 10 .

Substantial regional differences will remain after completion in 1980 of the CBC accelerated coverage plan (see table 11).

Therefore, coverage is far from being even, especially for stereophonic services. Furthermore, low lying areas need roof-top or tower mounted antennas for proper reception.

Although AM coverage has reached a very high level, it is reduced at night due to the propagation characteristics of the AM band. CBC estimates their night time coverage loss at 7.5% in the English network and 10% in the French network (Billowes, 1977, p. 16). Furthermore, during the winter months, because of late sunrise, the reception in the AM band is poor during the breakfast time peak of radio audience. Finally, some form of service is available to practically everyone and a fairly large number of people in rural

TABLE 10
Radio Coverage

CBC AM English	96% of total population
CBC FM English	61% of total population
CBC AM French	82% of total population
CBC FM French	29% of total population
Private AM English and French	98% of total population
Private FM English and French	85% of total population

Source: C.A.Billowes, 1977, p. 8.

TABLE 11

Percentage Coverage Figures by Language Group and Service

	Sunrise to Sunset	Sunset to Sunrise
Monaural Radio		
CBC - English	99	92
CBC - French	99	89
Private (1)	98	not available
More than one Canadian service (2)		
English,	98 (3)	
French	98 (3)	
Stereophonic Radio		
CBC - English	61	
Cbc - French	65	Not change
Private (1) (4)	85	after
More than one Canadian Station (2)		
English,	59 (3)	
French	50 (3)	

Notes

- (1) Percentage of total population - not by language group.
- (2) Exact figures are not available.
- (3) Assuming the private total coverage figure is valid for each language group separately.
- (4) Based on 50 v/m -

Source: Inter-Branch Working Group on Rural Communications, 1976, p. 40.

areas have a choice between several stations. The big deficiency is in the provision of FM stereo service (Billowes, 1977, p. 20).

3.2 BEHAVIOURAL DATA

3.2.1 Penetration

The term penetration refers to the percentage of people equipped to receive the service. Table 12 summarizes the situation for FM receivers.

In general, household penetration for FM receivers is higher than FM coverage. This incidentally might generate frustration. It appears that the low penetration for FM radio equipment automobile is explained by the pricing strategy of automanufacturers (Inter-Branch Working Group on Rural Communications, 1976, p. 46).

3.2.2 Attitudes, Behaviour and Needs

74% of all listening occurs between 7:30 and 18:00, and 26 % between 18:00 and 7:30. Between 7:00 and 8:00, 24% of the population is tuned in to a radio station. In the evening the figure is only about 5% (Inter-Branch Working Group on Rural Communications, 1976, p. 48). The above figures apply to the whole population; no statistics about rural listenership have been reviewed.

TABLE 12

Households with FM Receivers and Radio Equipped
Automobiles

Province	% Households with FM Radios	% Households with Radio Equipped Automobiles Households with Automobiles	% Households with FM Radio Equipped Automobiles Households with Automobiles
Canada	75	92	20
Newfound- land	42	91	7
Prince Edward Island	47	88	NA
Nov Scotia	65	91	11
New Brunswick	60	93	9
Quebec	82	94	29
Ontario	79	91	19
Manitoba	73	91	17
Saskat- chewan	59	93	8
Alberta	67	94	12
British Columbia	76	86	17

Source: Inter-Branch Working Group on Rural
Communications, 1976, p. 47.

What needs do radio services fulfill? No study on the topic was found. The Market Facts (1976) survey, referred to earlier, gathered some data on the subject, but the level of aggregation of the analysis does not allow any inference to be drawn for rural populations. It has been argued that the public attitude to radio services is less demanding than the attitude to TV services because of the nature and uses of the medium (Billowes, 1977, p. 20). It seems however, that empirical data on the expectations rural people have with respect to monaural and stereophonic services would be extremely valuable. The format to gather such informations could be much similar to that required for TV services.

3.3 FORECASTS

No models or approaches to forecast demand for new or improved services have been found in the literature. Billowes (1977) extrapolates that rural FM services will expand quickly, especially in those areas close to larger towns and cities. AM radio coverage has gone just about as far as it can (pp. 45-46).

4. MOBILE RADIO SERVICES

One comprehensive survey of mobile radio services in rural areas has been conducted; unfortunately it is limited to the prairie provinces (Schindelka, 1977). This part of the review relies heavily on this report.

4.1 TECHNOLOGICAL DATA

The categories of services investigated by Schindelka (1977) have been summarized in table 13 .

4.2 BEHAVIOURAL DATA

4.2.1 Needs

The categories of needs met by mobile radio services are:

1. safety
2. efficiency
3. convenience

The underlying need is a need for interaction which itself is created by movement. The fundamental causes of movement are the creation of place and time utilities (Schindelka, 1977, pp. 18-21).

75% of GRS users stated business as their primary purpose for operating the set (50% had agricultural needs and 25% transportation or communication needs). Personal calls were of secondary incidence, but were more frequently reported

TABLE 13

Selected Characteristics of the Service Categories

Definitions of the Categories of Mobile Radio Service

System: A mobile radio system consists of at least one fixed base station and at least one mobile radio unit capable of communicating with each other. Radios on different systems do not communicate with each other.

GRS: General Radio Service. GRS is the Canadian version of the American CB or Citizen's Band category. The user owns and operates his system on one or more of the channels allotted to this service.

Private: A private system is one in which the equipment is owned by a business enterprise and operated by its employees. It is licensed for operation on a specific channel(s) in the mobile radio band.

GLMRS: General Land Mobile Radio Service. This is a service offered by the telephone companies as an extension of their normal telephone service. It consists of a radio-telephone installed in a vehicle which can operate on one or more channels in a specific area. The terms General Mobile, Public Mobile, Radio-telephone and Mobile Telephone are all used to describe this type of service.

RCCMRS: Radio Common Carrier Mobile Radio Service. This service is distinguished by the rental of a repeater station operating on two frequencies - one sending and one receiving - to many users. The users may either own or lease their mobile equipment.

Paging: Paging is considered a "one-way" system and involve the transmitting of tone or tone and voice messages to pocket receivers. A paging system can accommodate many users.

Selected Characteristics of the Service Categories

	GRS	PRIVATE	GLMRS	RCCMRS	PAGING
Principal Feature	Low Cost	Privacy	Telephone Access	Rental of Equipment	Very Mobile
Typical User	Individual	Taxi Company	Business	Business	Doctor
User Owns or Leases	Owns	Usually Owns	Owns or Leases	Usually Leases	Usually Leases
Initial Cost per Mobile	\$200 Average	\$1000 Average	\$1200 Average	\$1200 Average	\$350 Average
Monthly Cost (average)	None	None	\$30; if owned \$75; if leased	\$10; if owned \$40; if leased	\$12; if owned \$25; if leased
Telephone Access	NO	NO	YES	NO	NO
Type of Communication	Multi-Way Voice	Two-Way or Multi-Way	Two-Way Voice	Two-Way or Multi-Way	One-Way Paging

Source: Schindelka, 1977

than with other equipment. Therefore GRS has a more chatty use. Emergency calls are rarely mentioned as a primary purpose.

For GLMRS and private, the primary reason for using the system is business, followed by emergency and personal calls.

A survey of officials from the Federal Communication Commission (FCC) revealed that CB equipment is used quite substantially to help violate laws or to avoid law enforcement. It is almost a tradition among truckers to use their mobile equipment to avoid speed, weight and/or licensing checks. Other illegal purposes are also reported (burglary, robbery, drag racing, prostitution, narcotics trafficking, smuggling, etc.) (Federal Communications Commission, 1975,).

4.2.2 Decision making processes

While the basic motivation is a need for interaction, the decision with respect to mobile radio equipment is dependent on cost. Experience demonstrates that three radio equipped vehicles can do the work of four vehicles without radio. Translated into a benefit/cost ratio, the benefits which can be realized are in the neighbourhood of 8 to 1 (Schindelka, 1977, p. 26). Therefore, the decision to adopt mobile communication depends largely on the ability of the decision maker to be able to recognize the possible benefits and make a cost/benefits type of analysis.

4.2.3 Distribution of users

Private radio systems and GLMRS are most often found in urban environments. By contrast, the penetration of GRS in rural areas is between 50% and 100% greater than in urban areas.

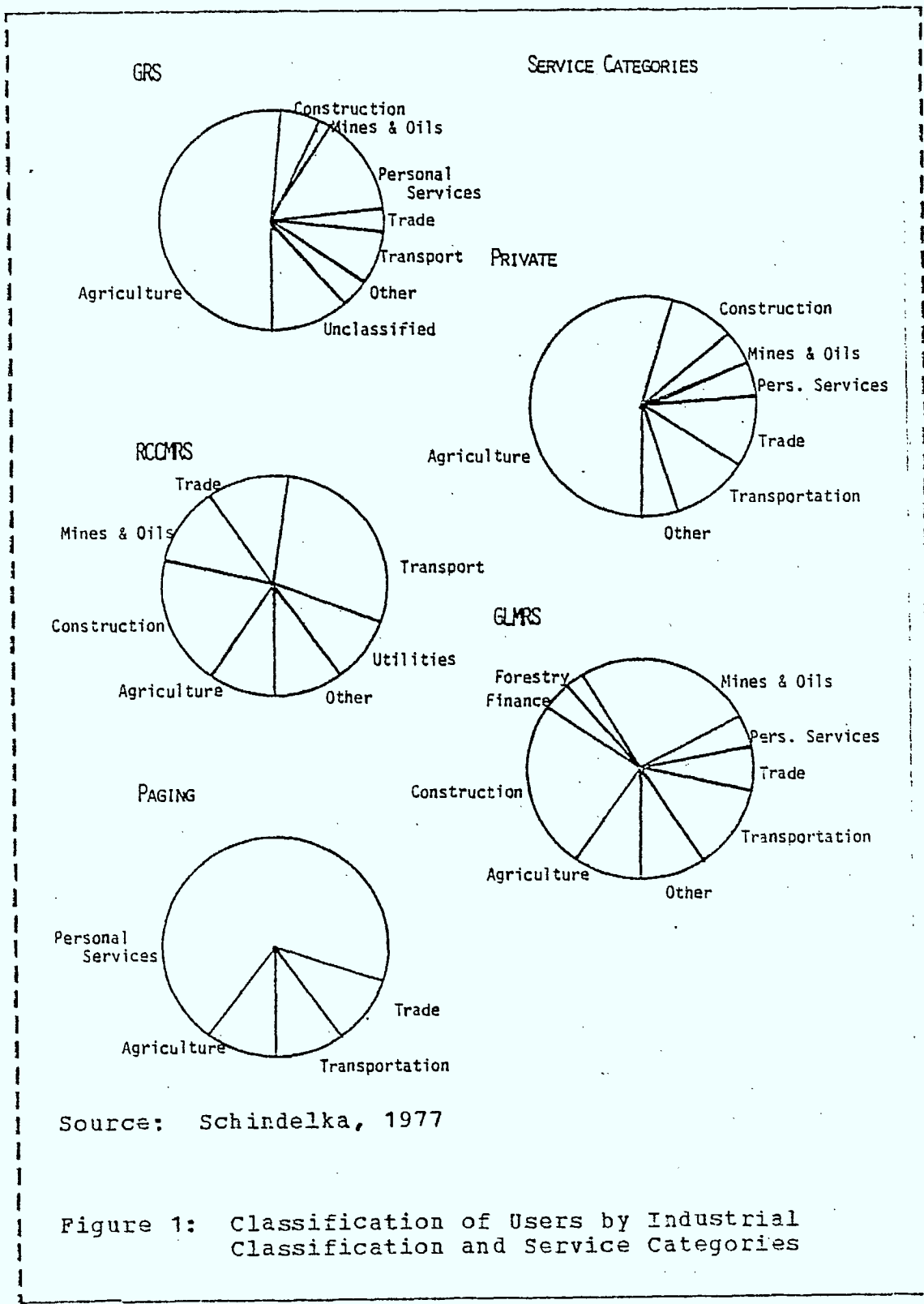
More generally, the greater the economic activity within an area, the higher the penetration of mobile communications. It seems that certain types of media are better adapted to certain types of economic activity:

1. GMLRS: construction, mines and oil;
2. RCCMRS: transportation and construction;
3. Paging: personal services;
4. GRS: agriculture;
5. Private: agriculture.

More precise information is given in figure 1 .

4.2.4 Attitudes and Behaviours

Satisfaction with mobile radio services is far from being complete. A survey of users revealed that two thirds of GRS respondents had a negative attitude toward the service. In general, user complaints revolve around:



Source: Schindelka, 1977

Figure 1: Classification of Users by Industrial Classification and Service Categories

1. small area coverage
2. delays due to congestion
3. lack of privacy
4. high cost
5. friction between business and non business users
(Schindelka, 1977).

These complaints originate most often from business users. On the other hand, non users complain that mobile radio usage create problems for users of television and other electronic equipment (Federal Communications Commission, 1975).

Finally, the Schindelka report (1977, pp. 166-182) contains statistics about a variety of usage behaviours (seasonal variation; types, duration and number of calls; initiation of calls, purpose of calls).

5. TELEPHONE

5.1 STATUS OF TELEPHONY

5.1.1 Present Status

The status of telephony for rural areas in Canada has earlier been comprehensively presented by D.O.C. (Inter-Branch Working Group on Rural Communications, 1976). This section of the review will serve to highlight some findings presented in this D.O.C. document. The nature and magnitude of problems in the rural environment can be represented by the difference in telecommunication services between urban and rural areas. Thus, the long term telecommunications objective of the D.O.C. for rural areas is to minimize or eliminate this difference, or more generally, to provide a service which approximates urban standards. Indeed, a similar objective exist in the U.S. and is evidenced by President Carter's following statement:

I want to improve the quality of life for rural people. I live in the outskirts of a little town of only 683 people. I don't care if 1000 years from now it still has less than 1000 population, but it is important to me that my children and your children have as good an education and as high an income and the same right to share their own destiny as children who live in the largest and wealthiest communities in our nation. We have a long way to go. (Telephony, 1978)

Although, our rural population constituted approximately 18% of our nation's total number of households in 1975, we find that the percentage of rural households without telephones to be in the neighbourhood of 28.5% of the total num-

ber of households without phones³. From another perspective, we might say that we are no worse off than the U.S. when in fact, we have greater than 1.2% of our rural households with phones (Canada: 93.2% in 1976, vs U.S.: 92% in 1978) when compared to the U.S. (Inter-Branch Working Group on Rural Communications, 1976; Telephony, 1978). As well, if we take a more global picture, we stand far ahead of almost every nation. For instance, all twenty one countries (excluding Barbados at 13.6) in Latin America have between 0.1 to 7.7 telephones per 100 inhabitants in 1972 (Criscolo, 1976, p. 328), this compares to 57.2 telephones⁴ per 100 inhabitants in Canada. As partially evidenced here, the telephone services provided to Canadians in rural areas is at least comparable to any in the world, although there still exists a noticeable difference between rural and urban telephone services. Figures 2 and 3 illustrate some of the non-urban resident's telephone usage characteristics.

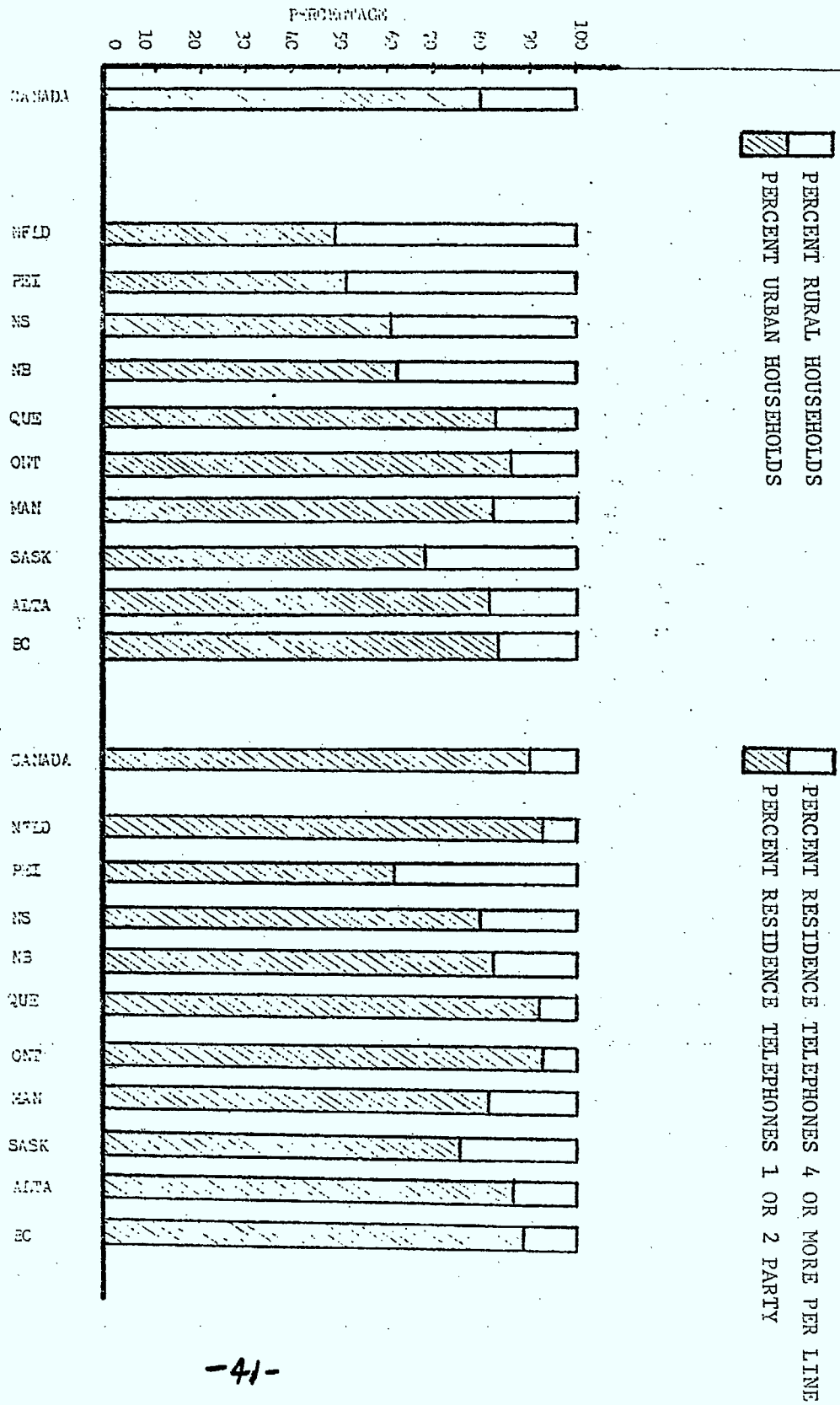
There is no exact relationship between the Statistics Canada definitions of urban and rural and the telephone company's definitions. The equivalent to an urban area in Bell

³Calculated from the data provided in Inter-Branch Working Group on Rural Communications, 1976, p. iv.

⁴Calculated from Inter-Branch Working Group on Rural Communications, 1976, p. iv. It should be noted that this rate was derived from 1975 data and thus, one might expect a slightly lower rate in 1972. Although, the difference in the Latin American rates and the Canadian rate would still seem extremely large.

Source : Inter-Branch Working Group On Rural Communications, 1976, p. 21

Figure 2 : PERCENT RESIDENCE TELEPHONES -
1 OR 2 VS 4 OR MORE PARTIES PER LINE



Total Multi-Party Lines :

Bell Canada: 48,500

M. T. & T. : 6,300

Average Line Fills :

Nova Scotia : 5.5

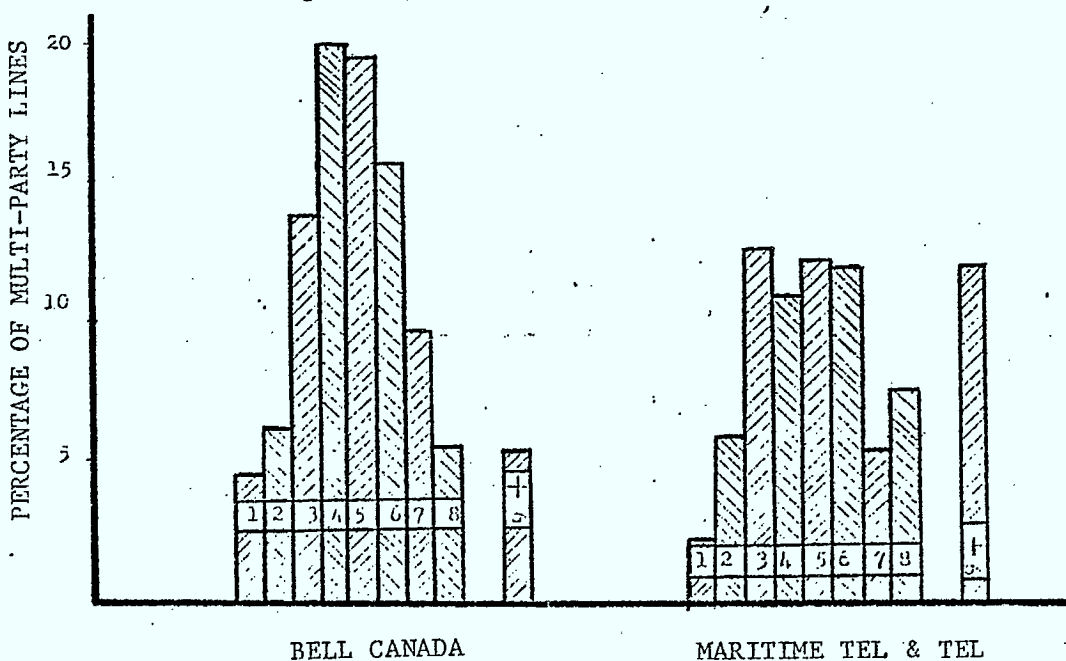
New Brunswick: 5.0

Bell Canada : 4.9

Manitoba : 5.3

Saskatchewan : 4.8

(The numbers in the graph represent the line loading factor.)



Source : Inter-Branch Working Group on Rural Communications, 1976, p. 28

Figure 3 : REPRESENTATIVE MULTI-PARTY LINE FILLS

Canada's terminology for instance is a Base Rate Area (BRA) which is typically located in an urban centre. These are defined as areas with densities of 25 to 30 households per mile or greater. It is also possible to have Locality Rate Areas (LRA's or Island Base Rate Areas), these are typically not located in urban centers (in the Statistics Canada sense) but do have the required density factor with some variability and are completely surrounded by a rural environment. The rural or non-urban area is that area not included in a BRA or LRA.

Where the basic urban service includes only one and two-party lines, whereas the basic rural service includes a lower grade of service, in that the basic service is a multiparty line. Thus, to obtain urban-type service in a declared non-urban area requires the assessment of a premium tariff. Faced with a choice between multi-party line and a more expensive urban type service, over 50% of rural residences subscribe to the multi-party line service (Inter-Branch Working Group on Rural Communications, 1976, p. 26.5). The disadvantages to multi-party lines are obvious and numerous. Lack of privacy, unavailability of line, other parties signalling during a conversation and poorer transmission are just some of the problems which must be contended with.

5.1.2 New Developments

In the realm of telephone services, research and development is an ongoing concern. This is evident from the continual development of new technology which threatens to revolutionize the conventional phone. For instance, just recently Bell Canada and Bell Northern Research have developed and field tested a new type of receiver which could carry out several additional functions (e.g. storing of important numbers, acting as a calculator) with the same high reliability as our present phones but, additionally, with increased quality and decreased cost (Citizen, December 27, 1978, p. 49). This is just one example of how new offerings could change the marketplace. The purpose of this section will be to present some of the discussed new plans to improve telephony, especially as they are related to non-urban residents.

5.1.2.1 NUSI Plan

The Canadian Transport Commission and Bell Canada have, on past occasions, commented on the desirability of providing, in the long run, urban grade service to all non-urban customers. This is exemplified in the CTC's August 1974 decision which in part stated:

Bell's present objective is to eventually achieve Individual and Two-Party line service in all non-urban areas ... and that it will take a very long time to achieve.

The Non-Urban Service Improvement (NUSI) program is an improvement plan for rural telephone services and a big step towards this objective. The NUSI proposal is a four year plan (1977-1980) designed to upgrade rural service.

The thrust of the NUSI plan is the introduction of Four-Party service (i.e. a maximum line load of four subscribers per line) as the basic service offering for non-urban residents. The plan was first proposed by Bell Canada (Bell Canada, 1975) in 1972, but then withdrawn so that Bell Canada might reassess customer acceptance of the Four-Party concept. Bell Canada then commissioned Canadian Facts Co. Ltd. to conduct a non-urban customer research program to generally determine what the customer wants, this was done through a need definition survey. In addition, they were required to establish what the consumer is prepared to pay for it, through a price/demand survey. After using the results of these two surveys as one of the inputs to an extensive and comprehensive evaluation and simulation procedure (see Figure 4), Bell Canada decided to make the upgrading proposal for non-urban residents.

Generally, the plan was examined with great interest and in fact, the Commission ordered Bell to expedite the surveys and post survey evaluation processes. In summary, the results indicate that some Two-Party and many Multi-Party cus-

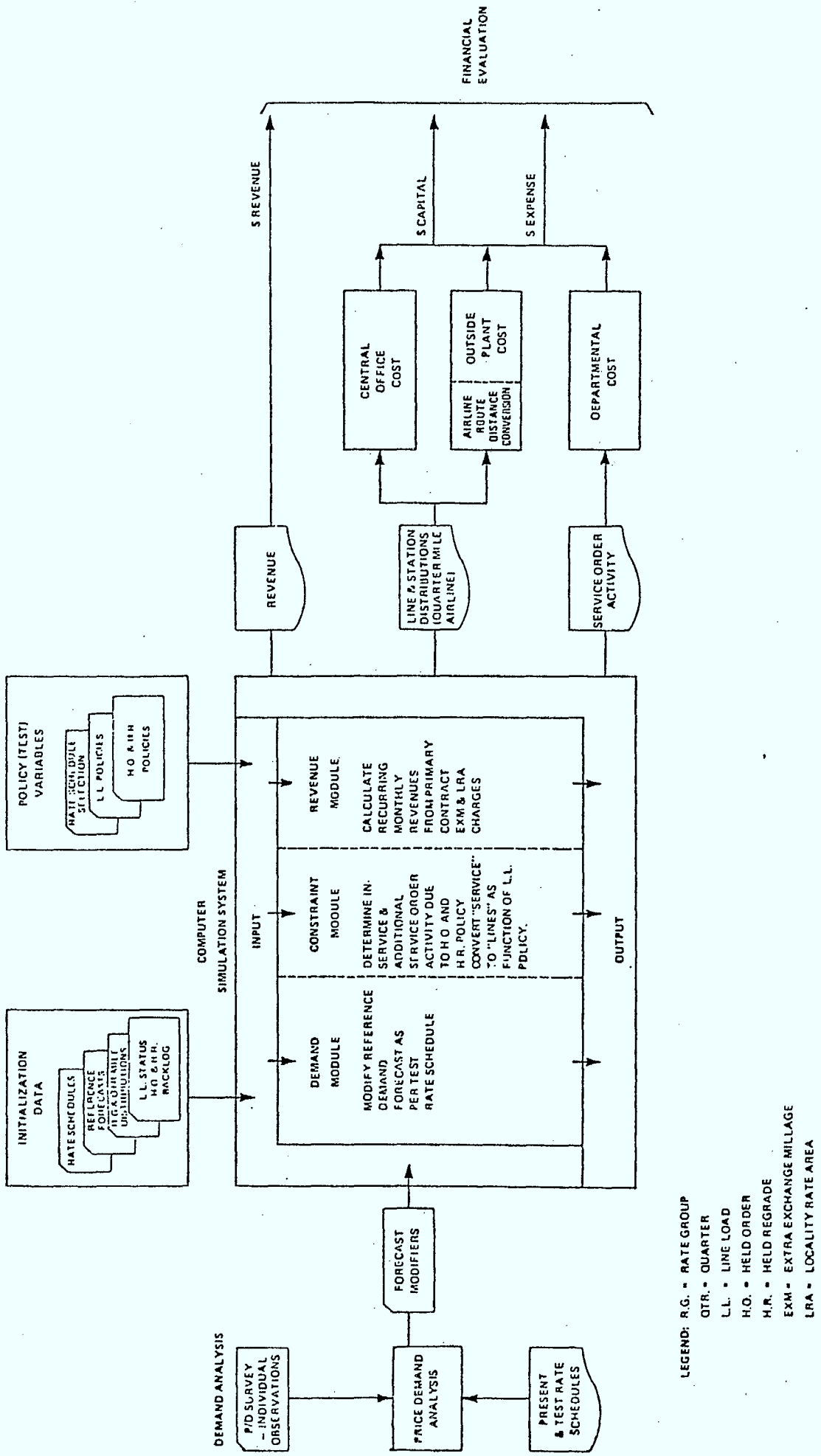


Figure 4 : NUSI Evaluation System - Functional Outline

- LEGEND: R.G. - RATE GROUP
 QTR. - QUARTER
 L.L. - LINE LOAD
 H.O. - HELD ORDER
 H.R. - HELD REGRADE
 EXM - EXTRA EXCHANGE MILEAGE
 LRA - LOCALITY RATE AREA

tomers express an interest in Four-Party service at rates in the range of 10% to 30% over the Multi-Party rate. The results also suggest that close to one half of the total Four-Party and Multi-Party market indicate a demand for the Four-Party basic service and that this demand is relatively insensitive to changes in rate level. Following the favorable survey results to such a new scheme, the NUSI plan was approved (Telecom Decision 77-7) and was to commence immediately with some major investment outlays made during the four years from 1977 to 1980. The required program's construction capital expenditure and estimated rearrangement dollars were estimated to be \$600 million (P(NAPO)3Mar78-608) and \$29.5 million (P(CRTC)3Mar78-208) respectively, over the four year interval.

5.1.2.2 Flat Rate

The flat rate structure has been proposed under various forms and in several instances. In part, the 1974 CTC judgment read:

We have therefore directed Bell to examine and report to us on the feasibility of initiating an optional Four-Party line service at a flat monthly rate.

Generally, this suggestion and others like it have been dismissed on the premise that it would place an unfair financial burden on some customers or that it would benefit disproportionately a large number of subscribers to Multi-Party

service compared to those paying, for instance a higher Two-Party service rate. More recently in compliance with Telecom Decision 77-7 (pp. 16-17), Bell Canada presented a report (P(CRTC)3Mar78-100(e)) which would describe the monthly rates required to establish flat rate individual, 2-party and trunk line rural services for residences and businesses outside the BRA in each rate group. Under the proposed plan, the findings of this report suggest the following:

1. Regardless of the customer's distance from the BRA and of the relative cost of providing the service, all customers located outside the BRA boundaries would be charged the same rate.
2. In general, customers located relatively close to the BRA would experience price increases while those more remote would experience price decreases.
3. More specifically, 49% of the residence customers and 70% of the business customers now paying Extra Exchange Mileage (EXM) charges would receive increases.
4. On the other hand, 49% of the residence customers and 29% of the business customers now paying EXM charges would receive decreases.

5. Finally, "all" residence and business customers now paying LRA charges would receive increases.

Thus, the Commission accepted Bell Canada's argument that the introduction of flat rates in non-urban areas is inappropriate. In addition to the general increases presented above, the following factors (P(CRTC) 3Mar78-100 (e), p. 15) also contributed in making the proposed Flat Rate Plan impractical at this time:

1. the impact on demand of the NUSI program,
2. the absence of demand data needed to evaluate the impact on the customers and Bell Canada,
3. the impact of non-urban Flat Rate on demand over and above the effects of the NUSI program.

It should be pointed out that Bell Canada has been required by the Commission (Telecom Decision CRTC 78-7, p. 23) to carry out a more comprehensive and detailed study on this subject with a view to mounting a flat rate experiment once the NUSI program has been completed.

5.1.2.3 New Technology

Several relatively recent developments have had an impact on telecommunication services. For instance, glass fibre technology (Billowes, 1977), satellite communication (Bil-

lowes, 1977; Telecom Decision CRTC 77-7, p. 12) and radio telephone systems are all having some impact on communication services.

One such system is MAS (Komura et al. 1976). The MAS system (Multi-Access Subscriber Radio Telephone System) has been developed under NTT auspices as a telephone system for rural subscribers. In rural areas, telephone service cannot be easily extended because of technical problems (e.g. line loss) and because of economic problems (e.g. plant cost). MAS was developed to alleviate both technical and economic problems. The system basically uses public mobile radio telephone techniques. It was first introduced in Japan in December 1975. Of course, no system is perfect and MAS is no exception. For instance, only six subscribers are capable of calling at once and you are limited to a radius of about 20km from the base station.

It would seem that it is only a matter of time before new technology becomes operational. For instance, glass fibre technology is just around the corner (Billowes, 1977) and satellite communication is here. Indeed, the CRTC is actually trying to accelerate the development of satellite communication in the more remote northern regions (P(CRTC) 3Mar78-100(a)).

5.1.3 Impact of Telephone Development

"The available literature on the benefits of an improved telephone system is extremely sparse" (Welden, Schulman and Lesser, 1977, p. 7). We would certainly attest to this statement made by a group of researchers from Dalhousie University. They proposed a plan of analysis to measure the impact of an improved telephone system. Although, to our knowledge, it has yet to be implemented and verified. The lack of attention given to this area is well illustrated by Chasia (1976) who examined the choice of technology for "rural" telecommunication in developing countries. Although Chasia's following statement was not given in a Canadian context, it could be made appropriate by justifiably substituting "Canada" for "developing countries" in this quotation (Chasia, 1976, p. 733):

The technologist has paid only peripheral attention to development matters, being content to define his mission in developing countries as merely that of constructing systems to cope with the physical and climatic conditions in these countries. What society did with technology, or what technology did to society has not appeared to be a matter of legitimate concern to him.

The development of telephone systems in rural areas has been "hypothesized" to have a multidimensional impact. This impact may best be presented using a modified version of a three-dimensional perspective made reference to in the earlier mentioned Dalhousie report: 1) Security, 2) Social, and 3) Economic.

The introduction of improved phone systems has an obvious impact on the rural society's overall security needs. Such systems would increase rural residents' accessibility to police, fire and medical assistance. These are certainly not luxuries and indeed constitute basic necessities for which it is difficult to account for any urban-rural differences.

The social dimension is also affected by telephone development. The increased capability to communicate with friends, neighbours, relatives, the relatively recent telephone "help lines", and the access to distress centers are all, although intangible, advantages. Another impact which may be classified as social, and perhaps as business, is that in fact, the telephone may act as a substitute for travel. The introduction or improvement of phone services may in fact have people commute less to see their friends and relatives or travel less to the businesses with which they deal. A moral and political rationale (e.g. to insure that the significant portion of our population which resides in rural areas can enjoy similar benefits as their urban counterpart) may also affect their rural residents' "life style". As well, the telephone is developing as a potential tool to be used in education (Weldon, Schulman and Lesser, 1977, p. 20). This additional development could then lead to an additional economic impact through a better trained work force.

The last dimension, economic is perhaps the most discussed. The presence or improvement in telephone services could be felt through an increase in general economic activity. Economic refers to the general benefits derived by both business and residential sectors, although it has been mostly discussed in the business context. The economic element of the telephone is self evident from the time, money and energy that it saves us. The increased use of computer terminals which require the use of the telephone is an example. Business productivity and employment could also be favorably affected because of the improved communication (i.e. between firms and employees) and because of increased educational opportunities (as discussed earlier). In concluding, it should be noted that the telephone's impact typically considers the positive (or negative) effects on rural residents. On the other hand, we should not disregard the positive effects on urban residents and firms who, in turn, will have a greater ability to communicate with these same rural residents. This may then have an impact through increased urban development.

The above brief expose of the possible results from telephone development in rural areas is a summary of the relatively few articles or reports on this subject (Chasia, 1976; Criscolo, 1976; Telephony, 1978; Weldon, Schulman, Lesser, 1977; Inter-Branch Working Group on Rural Communica-

tions, 1976). Although benefits may be desirable, it should be noted that barriers and problems will be confronted by the development and improvement of telephone services in rural areas. These are:

1. Financial (Criscolo, 1976; Telephony, 1978; Inter-Branch Working Group on Rural Communications, 1976)
2. legal (Telephony, 1978)
3. policy implementation (Telephony, 1978)
4. professional training (Criscolo, 1976)
5. access to some rural areas (Criscolo, 1976)
6. Institutional reorganization (Criscolo, 1976).

These are self-explanatory and serve to remind us of the multi-faceted nature of telephone development in rural areas.

The "measurement" of the impact of telephone development in rural areas is another interesting issue. In the U.S., it has been estimated (Telephony, 1978) that a potential \$1.75 billion may be derived in social benefits for rural residences. This was based on an average of \$120 per year per rural residence. The details as to how this base figure was arrived at are not given but, it is quite amazing to

note the possible magnitude of the impact. If Canada had a similar per capita base, we would estimate that there is:

.932 (telephone penetration)⁵ X 1,271,000 (no. of rural residences) X \$120 (per capita benefit) = \$142.1 million of potential social benefit. Although these benefits have actually never been measured in Canada, the Dalhousie group (Weldon, Schulman and Lesser, 1977, pp. 30-35) has proposed (see Table 14) a set of indicators which could perhaps enable us to obtain such an overall benefit measure for improved telephone services in rural areas.

5.1.4 Quality of Service Indicators (Q.S.I.'s)

In its latest decision (Telecom Decision CRTC 78-7, p. 22), the CRTC reported that 19% of all complaints received by the Commission concerned various aspects of non-urban service, even though non-urban subscribers constitute less than 9% of Bell Canada's total customers. Such statistics have given rise to the need for a more comprehensive set of indicators to measure the quality of service given by Bell Canada in both urban and non-urban areas. Actually, quality of service indicators originated from a decision (Telecom Decision CRTC 77-7, p. 10) of the Canadian Radio-Television and Telecommunications Commission to require Bell Canada to develop appropriate quality of service measures.

⁵Source: Inter-Branch Working Group on Rural Communications, 1976.

TABLE 14

Indicators of Benefits to be derived from Improved
Telephone Services to Rural Areas

I. Primary Indicators

1. Area real personal income per capita as a percent of the national average
2. Area real earned income per capita as a percent of the national average
3. Area unemployment rate as a percent of the national average
4. Area labor force participation rate as a percent of the national average
5. Area proportion of population that is of working age as a percent of the national proportion
6. Area value added per employee as a percent of national average
7. Total private investment per employee as a percent of national average
8. Total public investment per capita as a percent of national average.

II. Secondary Indicators

1. Industrial composition of the area
2. Productivity differences among industries
3. Size of the export base
4. Size of the residential sector

TABLE 14

(continued)

III. Infrastructure Indicators

1. Telephone facilities
 - a) % residences: without telephones
with single party service
with two party service
with four party service
with more than four party service
 - b) Rural areas where one and two-party service is not available
 - c) Number of public telephones
 - d) Repair delay statistics
 - e) Number of telephones which can be called free of long distance charge
 - f) Degree of line congestion at peak times
 - g) Availability of automatic dial
 - h) Availability of direct distance dialing
2. Health facilities
 - a) Hospital beds/capita
 - b) Nurses/capita
 - c) Doctors/capita
 - d) Dentists/capita
 - e) Pharmacists/capita
 - f) Distance from hospital or emergency facilities
3. Transportation facilities
 - a) Miles of paved road/square mile of land
 - b) Miles of unpaved road/square mile of land
 - c) Proximity to major highways
 - d) Proximity to airport
 - e) Proximity to railroad
4. Education
 - a) Expenditures per pupil
 - b) Teacher/pupil ratios elementary, secondary, etc.
 - c) Numbers and types of curricula per school district (Business, vocational, university preparatory)
5. Housing
 - a) Persons/room
 - b) Rental value/room as a percent of income
6. Energy, water and sewage
Availability of adequately serviced land for commercial and industrial purposes.

Source: Weldon, Schulman and Lesser, 1977, pp. 30-35.

In complying with this request, Bell developed service measurement plans which were oriented towards the consumer and anchored to their opinions and priorities. Seven such plans are in the process of being developed:

1. Service Provisioning Measurement Plan (S.P.M.P.) -
Residence: 1977
2. S.P.M.P. - Business: 1980
3. S.P.M.P. -Phonecentre/Teleboutique: 1978
4. Service Continuity Measurement Plan (S.C.M.P.) -
Exchange: 1979
5. Network Customer Service - Local: 1980
6. Network Customer Service - Toll: 1980
7. Customer Access - Operator Services: 1978

As can be noticed above, all plans except for the first one have not (or just recently) begun to be operationalized. In fact for the last rate hearings, Bell suggested a list of ten QSI's to monitor the quality of service. It was the commission's view that these ten indicators did not fully reflect the Company's customer-related operations. The Commission thought that these QSI's were inadequate by themselves since they did not include any measures of: 1) the efficiency of the billing process, 2) the accuracy of the

telephone directory, 3) the speed of service restoration, and 4) the quality of transmission.

Such as to correct for these deficiencies, the Commission now requires (Telecom Decision CRTC 78-7, p. 14) that Bell report, on a quarterly basis, in a format which is comparable over years, and provided by region, business/residence and urban/rural categories, its performance on fifteen quality of service indicators. These are detailed in Appendix 2.

5.2 NON-URBAN RATE STRUCTURE

5.2.1 Tariff Determination

The determination of the total allocated service charge to non-urban residents for telephone services is more complicated than it would seem at first. Because of the introduction of the NUSI program by Bell Canada, since the great majority of Canadian households are served by Bell Canada, and since the rate structures are similar (although not identical) across Canadian phone companies, the discussion to follow will center on the rate structure applicable to Bell Canada's non-urban customers.

As earlier discussed, the "urban" portion of each exchange is contained within a Base Rate Area (BRA). All BRA's are specified and mapped in "Individual Exchange Tar-

iffs" which are filed with the Canadian Transport Commission. Within any BRA, customers can choose between 1 or 2 Party telephone service. Throughout its "non-urban" territory (i.e. outside the BRA), Bell Canada's basic offering is now a 4-Party service. In any given exchange, the rate for the basic (4-Party) service outside the BRA is lower than the rate for the basic (1 or 2 Party) service within the BRA.

The total service charge levied on rural residents is a function of several variables especially if they require an urban-type grade of service. For those requesting the basic 4-Party service, the only incurred cost is the "Basic Service Charge" which, as we shall see in the next few lines, is not a straight-forward levy. On the other hand, if you require 1 or 2 Party service in a non-urban area outside a base rate area (BRA), but within a locality rate area (LRA), then the task of determining your rate becomes more complicated. Essentially, for these customers, the total service charge is the sum of the Basic Service Charge and the LRA charge. This latter charge being significantly below the prevailing EXM (extra exchange mileage) rate. The most intricate tariff structure concerns those customers living outside a BRA and LRA. For these residents, the service charge is the total of the Basic Service Charge, the LRA charge and the EXM charge. In turn, all of these charges are a function of the appropriate rate group and grade of

service, among other variables. Perhaps, the most illustrative and comprehensible manner in which to describe the determination of the telephone service charge is in the following step-by-step procedure (see table 15) combined with figure 5 .

5.2.2 Construction charges

In addition to the charges expanded upon above, customers may be required to absorb additional charges regarding the assessment of construction charges to customers in non-urban areas. In fact, in 1977, construction charges were assessed in about 850 cases (P(CRTC)3Mar78-111). The assessment procedure (P(CRTC)3Mar78-109) is as follows:

1. The Company determines the type and location of the facilities to be provided and the time at which the work is performed.
2. The Company provides, installs and maintains all facilities, but may elect to use the facilities of other public utilities or the customer, where, in its opinion, circumstances warrant. In such cases, the construction charge assessed recognizes the lower expenses incurred.
3. At present, a charge of \$35 applies for each 30 meters or fraction beyond a 165 meter allowance.

TABLE 15

Tariff Determination

Definitions:

Class of service charge = f(business/residence)

Grade of service charge = f(1/2/4 party service)

Weighing factor = f(distance between one
exchange rate center and
an adjoining exchange rate
center)

Telephone number count
in LCA (local calling
area) = Telephone number count
in exchange + (Telephone
number count in each
adjoining area with
"extended area service"
(EAS) X Weighing Factor)

Rate group charge = f(Telephone number count in
LCA)

Charge on distance
from Main station
to rate area = MIN {1/4 mile charge on
distance between Main
station and BRA; 1/4
mile charge on
distance between Main
station and LRA +
LRA charge}

Tariff Determination:

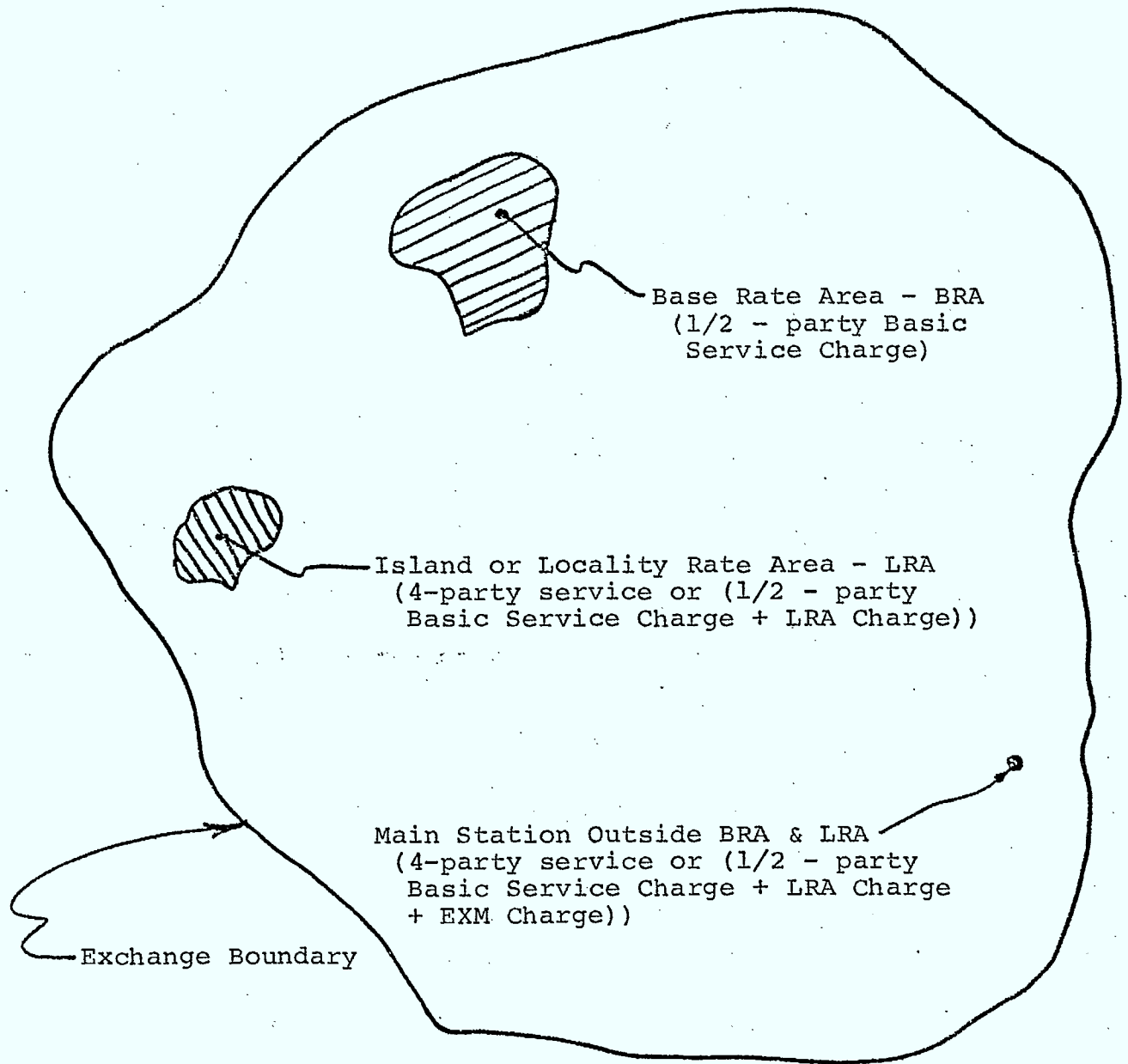
Basic Service Charge = f(class of service,
grade of service,
rate group)

EXM Charge = f(grade of service, rate group,
charge on distance from Main
station to rate area)

LRA Charge = f(grade of service, rate group,
no. of customers using urban
service, charge on 1/4 mile
distance between LRA and
BRA)

TOTAL SERVICE CHARGE

for 4 Party service = Basic Service Charge
for 1 or 2 Party
service = Basic Service Charge +
EXM Charge + LRA Charge



Adjacent Exchange

Figure 5 : RURAL TELEPHONE EXCHANGE

If it is possible to use structures owned by the applicant or another utility, the charge is \$20 for each 30 meters. If construction is in excess of 1650 metres, the excess is charged for based on the expense incurred.

A plan, to spread construction charges more equitably among customers who may obtain service through a facility originally provided at the request of a single customer, is currently being tested for feasibility by Bell Canada in both operating regions. The Company expects to have results of this trial within the next year (P (CRTC) 3Mar78-110).

5.3 USER PROFILE

5.3.1 Demographic and Socio-Economic Traits

From the literature reviewed, it would seem fruitless to draw a comparative profile of users vs non-users of telephone services since only 6.8% of Canadian rural households and 4% of urban households (Inter-Branch Working Group on Rural Communications, 1976, p. iv) are without telephones; as well, none of the reviewed studies are known to report such findings. The studies seem to assume that because of the widespread use of this product, the telephone users are, in fact, representative of the population at large.

Those studies which have reported a customer profile have, on the other hand, related their independent variables (e.g. age, sex, education and occupation) to the "degree" of usage. For instance, Roscoe and Sheth (1972) analyzed American Telephone & Telegraph's MRIS (Market Research Information System) data bank to relate demographic and socio-economic factors to their customers' degree of usage of the long distance service (i.e. long distance expenditures in an average month). The data consists of a national longitudinal panel of some 60,000 customers representing both, business and residential markets. In fact, their MRIS data bank contained, at the time (1972), more than 126 "million" card image records, growing at the rate of 3.5 million records each month. The list of variables actually included in the study is given in table 16. While using regression analysis, their findings suggest that 12.7% of the variance in long distance expenditure can be explained by four statistically significant variables: income, number of rooms, length of residence and life cycle. In summary, the greater the income, the more rooms in the residence unit, the later the stage of the life cycle, and the more recent the move of a residence customer, the greater the average long distance expenditure will be. The bulk of the explanation came from income (77.7% of explained variance). It should be pointed out that, as is typical from this type of analysis, only a little amount (12.7%) of the total variance was explained.

TABLE 16

Demographic and Socio-Economic Variables vs Long
Distance Expenditures

1. Socio-economic status
2. Own/rent
3. Type of residence
4. No. of floors
5. No. of rooms
6. Length of residence
7. No. of moves in past 5 years
8. Sex of head of household
9. Education of head of household
10. Age of head of household
11. Occupation of head of household
12. Family income
13. Family size
14. Life cycle
15. Long distance expenditure in an average
month (dependent variable)

Source: Roscoe and Sheth, 1972.

While using a different technique for analysis (Monotomic AID analysis), these same authors found that customers with incomes above \$15,000, with residence units consisting of eight or more rooms, and with less than ten years of residence at their present location have the highest average of long distance expenditure. Their analysis was extended by applying yet another technique (Free AID analysis). These findings uncovered results not fully revealed either in monotonic AID or stepwise regression. A summary of these findings are found in table 17 .

Generally, the Roscoe-Sheth findings suggest that a certain type of telephone demand can be related to a subset of demographic and socio-economic variables, with income leading the way. On the other hand, the study does not concentrate on non-urban customers, nor does it examine users in terms of their monthly service charge (not including long distance charges) which can vary greatly in rural areas, and nor does it compare the user vs non-user.

Most of the survey research carried out in telephone research has originated from the U.S. In another U.S. study (Perl, 1975), a fairly extensive analysis of economic and demographic factors were examined as possible determinants of telephone availability. Telephone availability is defined as whether there is a telephone "available" on which

TABLE 17

Comparative Analysis of Predictor Variables

Predictor Variable	% Variance Explained		
	Stepwise Regression	Monotonic AID	Free AID
Family income	9.86	9.30	9.30
No. of rooms	0.75	2.69	2.91
Length of residence	0.98	1.42	0.61
Life cycle	1.09	0.39	0.72
Socio-economic score	----	1.34	0.57
Age of head of household	----	0.27	4.02
No. of moves	----	0.17	----
Education of head of household	----	0.46	0.87
Occupation of head of household	----	----	0.71
Type of residence	----	----	0.52
	<u>12.68</u>	<u>16.64</u>	<u>20.23</u>

Source: Roscoe and Sheth, 1972, p. 271.

people in the household can be reached. The findings result from an analysis of several comprehensive data bases: 1) the Current Population Survey for 1958, 1960 and 1965 (35,000 households), 2) the decennial Census of Population for 1970 (64,000 households), and 3) the Survey of Consumer Expenditures for 1960-1961 (14,000 households). Perl (1975) examined seven possible determinants (see table 18) of telephone availability which were for the most part measured in all three surveys.

Perl's analysis which was generally based on cross-tabulation analysis (without any statistical significance testing) revealed the following general conclusions with respect to telephone availability:

1. increases as income increases
2. increases as age increases
3. higher for whites than for blacks
4. higher in urban than in rural areas
5. lower for families on welfare vs those not on welfare
6. lower for households in the South vs those in other regions

TABLE 18

Economic and Demographic Determinants of Telephone
Availability

1. Income
2. Age
3. Household type
4. Urbanism
5. Race
6. Region
7. Welfare status
8. Telephone availability (dependent variable)

Source: Perl, 1978

7. decreases as the rate charged increases, but with a definite income, age and family type effects.

As can be seen above, telephone availability is a function of several variables and although many of these independent variables were usually analyzed on a one-to-one basis, their "cumulative" effect is quite important. For instance, Perl (1978, p. 2) reports that for husband-wife households in rural areas with incomes under \$3,000, with a head who was under 25 and black, only 16.7% of the sampled households reported telephones available. As well, it was found that if one controls for income, age, race and urbanism, male individuals and male heads of households are less likely to have telephones than other household types. Again, although this analysis is quite informative, it does not center on the non-urban customer and makes use of "U.S." data which is "slightly" out of date.

5.3.2 User Needs and Problems

In our earlier discussion of the impact of telephone development on our society, we presented a three-dimensional need perspective consisting of security, social and economic needs. These have already been discussed and thus will not be expanded upon further. Since it is thought that problems generally arise because of unsatisfied or missatisfied needs, the purpose at this point, is to use this same

three-dimensional framework to present the problems elicited in various studies. Figure 6 represents our suggested framework of analysis.

Because of the similarity in general needs and problems between the business and residential sectors, no distinction will be made at this point in our discussion. Although, it should be noted that since they possess differences in rate structure and since the implications are different for each of these two segments, a thorough analysis of these two sectors should proceed separately.

The non-urban resident's unfulfilled "security" needs have pointed to a set of possibly associated problems. For instance, in a study undertaken for the Department of Communications (Goldfarb Consultants Ltd., 1974), respondents, interviewed in focus groups, expressed a relatively strong opinion towards the need for an easier system for emergency dialing. This security concern was again shown in this same study when they expressed maintenance problems due to difficulties in obtaining repair services and the operator. In an older Bell Canada study (1975) and also more recently in a report by the Inter-Branch Working Group on Rural Communications (1976, p. 24), rural residents were found to have poorer transmission and noisier lines. Another reliability problem has been reported by Bell Canada (1975) and NBTel

Sector	Need/Problem		
	Security	Social	Economic
Business			
Residential			
Farm			
Non-Farm			

Figure 6: Framework of Need/Problem Analysis

(Fraser and McIntyre, 1978) who report the, not so infrequent, inoperative mode of rural telephones. These reliability, maintenance and emergency problems may certainly all have, if not dealt with, an impact on the security status of rural residents.

Non-urban residents' "social" needs with respect to telephone usage are probably those which have elicited the greatest response. Several privacy problems, associated with the use of party lines, have been reported: eavesdropping, calls cut short, people dialing on top of a conversation, low volume or weakening of the reception due to people listening in, and the interruption of on-going conversations are all problems which have given rise to their most serious concerns about the use of multi-party lines (Goldfarb Consultants Ltd., 1974; Fraser and McIntyre, 1978; Inter-Branch Working Group on Rural Telecommunications, 1976; Bell Canada, 1975). Accessibility of the telephone is another problem which may be said to affect their social needs. Non-urban residents have also reported (Goldfarb Consultants Ltd., 1974; Fraser and McIntyre, 1978; Inter-Branch Working Group on Rural Telecommunications, 1976) a significant concern with respect to heavy line loads. In a more indirect fashion social needs have also been affected by a more technical dimension of accessibility, that is, the trouble that some residents have in obtaining a dial tone (Bell Canada, 1975). Other problems due to the abuse and ringing of tele-

phones have also had an impact on non-urban residents. In the first instance, some parties act in a very inconsiderate fashion by tying-up the line or others by interfering with the conversation (Goldfarb Consultants Ltd, 1974; Fraser and McIntyre, 1978). Ringing late at night and early in the morning are also other problems of social consequence.

"Economic" needs have also been affected. Several non-urban residents have expressed a frustration at their inability to call neighbours and thus, due to their restrictive local calling boundaries, they must revert to heavier use of the long distance service (Goldfarb Consultants Ltd., 1974; Inter-Branch Working Group on Rural Telecommunications, 1976). Billing errors have also been commented on as well (Goldfarb Consultants Ltd., 1974), although, they almost un-animously indicated that Bell corrected for any errors made on their bills. Another problem of economic consequence was the unjust (they felt) installation and deposit requirements. These were considered very high given that they did not own the equipment (Goldfarb Consultants Ltd., 1974). A more indirect economic impact could also be considered with respect to the "go-around" the customers get when trying to communicate with the business office (Goldfarb Consultants Ltd., 1974). This may in fact cause some customers to give-up on some of their attempts at reaching a solution to their problems. Finally, a specific problem arose for some

business customers of rural areas. They complained (Goldfarb Consultants Ltd., 1974) at having non-business parties on the same party-line. These rural residents would thus receive the same service, although at a lower rate.

All of these problems give rise to a feeling of having been shortchanged. This was well expressed in the Goldfarb report (Goldfarb Consultants Ltd, 1974) when it was stated that: "they (rural residents of Ontario) feel that their monthly charges are not particularly good value when compared with the rates that people in urban areas pay." Although not an exhaustive list of the problems rural residents face in fulfilling their telephone communication needs, the above stated problems do serve to illustrate the more important shortcomings that these customers must contend with. Table 19 summarizes these key problems.

In concluding this section, it is interesting to note how some authors (Bell Canada, 1975; Yeh and Riffel, 1977) have chosen to define rural customers' needs from a supplier/producer orientation. That is, they defined "user" segments in terms of "producer" services (i.e. single and two-party service vs four and multi-party service). The approach adopted in this review is similar to that used in several of those reports reviewed and is more in keeping with today's segmentation procedure which uses "user" needs

TABLE 19

Problems in Fulfilling Telephone Communication Needs

- I. SECURITY
 1. Reliability
 - a) poor transmission and reception
 - b) phone not working properly
 2. Maintenance
 - a) repair services availability
 - b) operator availability
 3. Emergency
 - a) easier access to emergency numbers
- II. SOCIAL
 1. Privacy
 - a) eavesdropping
 - b) calls cut short
 - c) dialing on top of conversations
 - d) weakening of reception as people listen in
 - e) conversations interrupted
 2. Accessibility
 - a) line loads
 - b) dial tone availability
 - c) line tied-up
 3. Ringing
 - a) late night and early morning
 - b) frequency
- III. ECONOMIC
 1. Billing errors
 2. High deposits
 3. High installation costs
 4. Restrictive local calling boundaries
 5. "Go-around" at company's business office
 6. Residential and Business customers on the same party line for the same rate

to define "user" segments. Such an approach shifts the emphasis from the supplier of services to the consumer of services.

5.4 USER DEMAND

5.4.1 Determinants of Demand

Approximately 17% of Canada's total population or 71% of Canada's rural population is "non-farm" rural. In addition, this percentage might very well expand given: 1) the increase leisure time, 2) the increase money and time to spend on or at recreation facilities (cottages, resorts, parks, etc.), 3) the increase in winter recreation, 4) the increase in number and usage of cottages, and 5) the increase in the cost of communication alternatives, for instance, postage and travel (Bell Canada, 1975; Inter-Branch Working Group on Rural Communications, 1976). This list serves to illustrate some possible reasons for an expanding demand on telecommunication services in this new but growing segment.

The rural "farm" segment of the rural population also has imposing demands on telecommunication services which are increasing. For instance, the increasing use of time-sharing computers for accounting, crop planning, market information, farming news and a host of other uses of interest to farmers. The overall growth in demand, in both the rural farm and non-farm sectors, are likely to continue and thus such factors should be monitored closely.

Other more user oriented factors have also been earlier suggested (in the demographic and socio-economic traits section) to affect demand. Briefly these were in the case of long distance usage: 1) family income, 2) number of rooms, 3) length of residence, 4) life cycle, 5) S.E.S. score, 6) Age of head of household, 7) number of moves, 8) education of head of household, 9) occupation of head of household, and 10) type of residence. In the case of telephone availability: 1) income, 2) age, 3) urbanism, 4) family type, 5) race, 6) region of residence, and 7) welfare status, all have been shown to exert an influence on the demand for telephone services.

In another model to forecast long-term telephone availability (i.e. the number of telephone users) other researchers (Yeh and Riffel, 1977) have suggested a different set of variables as predictors of telephone usage: 1) number of households, 2) number of business and manufacturing establishments, 3) number of private service agencies, 4) number of public service agencies including government offices. These rather general predictors could subsequently be estimated with the use of those determinants listed in table 20. It is very interesting that these researchers also included a series of three alternative policies which could be said to also affect total telephone usage. These are: 1) an "efficiency" policy, where the goal is to maximize revenues and minimize expenditures, and where rural service must be self-supporting, 2) an "equity" policy, where the goal is

bringing urban grade service to rural areas, revenue and expenditure considerations notwithstanding, and 3) an "innovation" policy, where the goal is to experiment with communications technology and to use telephone service as a substitute for various forms of travel and face-to-face contacts. Their comprehensive approach may be termed more of a macro perspective to the development of telephone services in rural areas. As well, their approach is more of an investigation into those factors which affect population (rather than telephone) growth.

In an article by two Bell Canada employees (Church and Gordon, 1978) and in a recommendation (Copeland, 1978), an analysis of the demand for telephone services in rural areas was reported. Both approaches are similar in that they both focus on: 1) price, 2) grade of service, 3) line load and 4) demographics. In addition, Copeland (1978) and Dunn, Williams and Spivey (1971) have also suggested the use of other variables, such as: 1) business/residence, 2) reduced number of parties under consideration, 3) extension of toll free local calling, 4) improved circuit quality, and 5) more rapid repair and maintenance service. Typically, the price and services offered were deemed most important while a token mention was also made of certain demographic variables, such as, family size, and income, as factors which may bear relevance in determining demand.

TABLE 20

Determinants of Long-Term Telephone Usage

- I. Number of Households
 - 1. population: a) mortality
b) fertility
c) migration
 - 2. marital status distribution
 - 3. headship rates
- II. Number of Business and Manufacturing Establishments
 - 1. number of crop farms
 - 2. number of livestock farms
 - 3. number of rural non-farm households
 - 4. price of crop and livestock: a) wheat
b) rapeseeds
c) barley
d) cattle
e) turkey
f) etc.
 - 5. price for non-agricultural commodities
 - a) food
 - b) clothing
 - c) fertilizer
 - d) etc.
 - 6. wages and salaries
 - 7. cost of money and investment
 - 8. cost of natural resources
 - 9. size of rural communities
 - 10. distance between major farm centers
- III. Number of Private Service Agencies
 - 1. size of rural farm population
 - 2. size of rural non-farm population
 - 3. size of rural communities
 - 4. distance between major farm centers
- IV. Number of Public Service Agencies and Government Offices
 - 1. hospitals
 - 2. schools
 - 3. public security and other services
 - 4. agricultural and extension programs
 - 5. education programs
 - 6. health and social development programs
 - 7. highways and transportation services
 - 8. housing programs
 - 9. mines, resources and environment
 - 10. parks
 - 11. tourism, recreation and cultural affairs
 - 12. welfare programs

Source: Yeh and Raffel, 1977.

Price has also been discussed fairly extensively elsewhere (although mostly at a theoretical level) as an important determinant of demand (Fraser and McIntyre, 1978; Perl, 1975; Bell Canada, 1975; Inter-Branch Working Group on Rural Telecommunications, 1976; Littlechild, 1970; Dobell et al., 1972; Davis, Caccappolo and Chaudry, 1973; Artle and Averous, 1973; Rabeneau and Stahl, 1974; Squire, 1973).

From the foregoing discussion, we may certainly assume that the demand for telephone services, and more specifically the demand for rural telephone services, is affected by a host of interacting variables. The previously reviewed studies also suggest that it is very hard to isolate the net effects of any one variable but that prices, the services offered, and certain demographic and socio-economic variables all play a role in determining the level of demand.

5.4.2 Forecasting Techniques

This section is the object of a future report and thus will not be elaborated upon at this point. Table 21 will serve to summarize the findings on this topic at this point.

TABLE 21

Forecasting Techniques in the Estimation of Telephone Demand

STUDY	TECHNIQUE
Bell Canada (1975) Perl (1975) Copeland (1978)	Simple Cross- Classification Analysis Logit and Discriminant Analysis
Church and Gordon (1978) Yeh and Riffel (1977) Roscoe and Sheth (1972) Roscoe and Sheth (1972)	Probit Analysis Regression Analysis Free AID and Monotonic AID Analysis
Littlechild (1970) Dunn, Williams and Spivey (1971)	Mathematical Programming Time Series Analysis: Exponential Smoothing, Autoregression, Spectrum Analysis
Thompson and Tiao (1971) Dobell et al. (1972) Davie, Caccappolo and Chaudry (1973)	Box-Jenkins Technique Econometric Model

6. CONCLUSION

The objective of this literature review was to survey the relevant research for procedures, techniques, results and sources of secondary data with respect to our initial objectives:

1. the needs of business and residential rural units with respect to communication services;
2. the short and long term forecasts of rural business and residential demand for communication services.

Due to the late start of the project and the resulting time constraints, the above review cannot be considered "exhaustive". Indeed, although much material has been examined, certain documentation (e.g. some U.S. government reports) has yet to be received.

The review of broadcasting services revealed the following points.

1. There exist secondary data on coverage in rural areas for television services and cable T.V., and on the level of choice of T.V. channels. For radio coverage, only provincial aggregate figures are available. The quality of reception is far

from being even; low lying areas require special reception equipment. Overall, it appears that rural areas are not homogeneous in terms of reception of broadcasting services.

2. Besides the dichotomy of information vs entertainment, little is known about the needs satisfied by broadcasting services. No data were found for rural populations.
3. Data about behaviours (listenership, viewership, ownership of reception equipment, etc.) are not, when available, disaggregated at the rural level.
4. Needs and behaviours with respect to mobile radio services have been investigated only for the Prairies' rural areas.
5. Forecasts have been found only for cable T.V. The studies were conducted in the United States and the markets involved were mainly urban. There is a question whether the models can be generalized to the Canadian rural population.

In the area of telephony, the literature is voluminous, in fact, much of a journal (The Bell Journal of Economics and Management Science) is devoted to an academic discourse on the subject. Although there is much material, little of

it deals directly with our concerns. From the material reviewed, the following general conclusions may be drawn.

1. Except for one report, no examination of "business" needs was undertaken. The one study undertaken did not focus on businessmen but rather on the residential sector with a token mention of some businessmen's wish not to be grouped on the same multi-party lines as Bell's regular household customers.
2. The residential sector has expressed a preference for decreased line loads. In fact, results from Bell Canada and NBTel commissioned studies suggest that people would be willing to pay more for lower line loads. Thus, as a result of the Bell Canada finding, the introduction of the NUSI program will, by 1980 at the latest, offer 4-Party service as the basic service to all rural customers.
3. In addition to rural residents' concern over line load, several other concerns were mentioned which could result in part from heavy line loads. The more important ones being related to long distance calling, difficulties in obtaining the operator and repair services, lack of privacy, poor reception and poor accessibility.

4. Long term business or residential demand forecasts do not appear to be available, although a framework has been suggested in order to produce these predictions.

5. Short term business forecasts have not been reported although short term residential forecasts have been undertaken. These forecasts suggest that demand for telephone services is a function of several factors. In short, telephone demand would seem related to the services offered (e.g. line load and price), certain demographic (e.g. region and length of residence), and socio-economic (e.g. income and age) characteristics.

The literature reviewed and reported covered a cross-section of topics, some of which were not directly related to the above objectives but which we felt were important to a thorough understanding of the communications environment. Although, much literature exists on the topic of communication, not much was found which is directly relevant to our objectives. It is also interesting to note that no real distinction has been made between business and residential sectors. Although, this facet has been deemed necessary for statistical analysis (Dunn, Williams and Spivey, 1971, p. 574), it is also necessary for recommendations to be drawn which better reflect the present operating conditions (e.g. different tariff structures).

Forecasting demand is a difficult undertaking. It requires an ex ante knowledge of predictor variables and of their functional relationship with demand. Furthermore, the adequate forecasting technique depends on the type of data available, the type of population investigated, and the resource constraints. The present literature review revealed some knowledge into these areas, but further exploration appears warranted before an appropriate approach to forecasting demand for communication services in rural areas is selected.

BIBLIOGRAPHY

- Allaire, D., Burnonville-Nelisse, F., Nelisse, C., & Payette, M. Methodology for Evaluating Communications Needs. Sherbrooke: Universite de Sherbrooke, June 18, 1977.
- Analysis of the Industrial Demand for Electricity. The Economic Journal, 1968, June, 277-298.
- Artle, R., & Averous, C. The telephone system as a public good: static and dynamic aspects. The Bell Journal of Economics and Management Science, 1973, Spring, 89-100.
- Balestra, P., & Nerlove, M. Pooling Cross Section and Time Series Data in the Estimation of a Dynamic Model: The Demand for Natural Gas. Econometrica, 1966, 34(3), 585-612.
- Barghouti, S.M. The Role of Communication in Jordan's Rural Development. Journalism Quaterly, 1974, Autumn, 418-424.
- Bell Canada. "Non-Urban Service Improvement Comprehensive Program". (February, 1975).
- Berg, S.V., & Herden, J.P. Electricity Price Structures: Efficiency, Equity and the Composition of Demand. Land Economics, 1976, 52(2), 169-178.
- Berg, S.V., & Roth, W.E. Some remarks on residential electricity consumption and social rate restructuring. The Bell Journal of Economics and Management Sciences, 1977, Autumn, 690-698.
- Billowes, C.A. Rural Broadcasting - A Preliminary Analysis and Review of the Issues and Considerations of Some Future Options. Ottawa: Department of Communications, May, 1977.
- Bortz, P.I., Spongberg, R.C., & Venditti, F.P. Broadland Communications in Rural Areas: Final Report. Denver: Denver Research Institute, University of Denver, November 1973.

- Bortz, P.I., Spongberg, R.C., & Venditti, F.P. Broadland Communications in Rural Areas: National Cost Estimate and Case Studies. Denver: Denver Research Institute, University of Denver, May 1974.
- Bowman, G.W. Demand and supply of network television advertising. The Bell Journal of Economics and Management Sciences, 197 , ,258-267.
- Bureau of management consulting. Areas and Communities in Canada without Off-Air Television Reception - A Survey. Ottawa: Department of Supply and Services, May, 1977.
- Bureau of Management Consulting. Levels of Choice in Canadian Off-Air Television Viewing. Ottawa: Department of Supply and Services, May, 1977.
- Canadian Council on Rural Development. "Commitment to Rural Canada". (1973).
- Canadian Facts Co. Limited. A National Survey Relating to the Use of Cable Television. Ottawa: April, 1976.
- Cargill, T.F., & Meyer, R.A. Estimating the Demand for Electricity by Time of Day. Applied Economics, 1971, 3, 233-246.
- Chasia, H. Choice of Technology for Rural Telecommunication in Developing Countries. IEEE Transactions on Communications, 1976, 24(7), 732-736.
- Church, J.G., and Gordon, I.M. "Market Share Model of Rural Telephone Service". OMEGA - The International Journal of Management Science, Vol. 6, No.1 (1978), 59-64.
- Coase, R.H. The theory of public utility pricing and its application. The Bell Journal of Economics and Management Science, 1970, , 113-128.
- Comanor, W.S., and Mitchell, B.M. Cable Television and the Impact of Regulation. The Bell Journal of Economics and Management Science, 1971, Spring, 154-212.
- Committee on Telecommunications National Academy of Engineering. Reports on Selected Topics in Telecommunications. Washington, D.C.: National Academy of Sciences, 1969.
- Copeland, M.D.G. The Demand for Telecommunications Services in Rural Areas. Institute for Behavioural Research, Survey Research Centre, York University, Downsview, Ontario, (May 25, 1978).

- Cormack, G.D., & Mougeot, L.T. The Availability of Television in the Census Metropolitan Areas. Ottawa: Department of Communications, August 15, 1978.
- Cormack, G.D. Television Network Coverage in Rural Canada Compared with that in the Census Metropolitan Areas. Ottawa: Department of Communications, August 28, 1978.
- Criscolo, R.A. Rural Telecommunications in Latin America. IEEE Transactions on Communications, 1976, 24(3), 325-329.
- Crockett, J.H.Jr. Differential pricing and interconsumer efficiency in the electric power industry. The Bell Journal of Economics and Management Sciences, 197 , , 293-298.
- Davis, B.E., Caccappolo, G.J., & Chaudry, M.A. An econometric planning model for American Telephone and Telegraph Company. The Bell Journal of Economics and Management Science, 1973, Spring, 29-56.
- Dobell, A.R., Taylor, L.D., Waverman, L., Liu, T.-H., & Copeland, M.D.G. Telephone communications in Canada: demand, production, and investment decisions. The Bell Journal of Economics and Management Science, 1972, , 175-219.
- Dunn, D.M., & Williams, W.H., and Spivey, W.A. Analysis and prediction of telephone demand in local geographical areas. The Bell Journal of Economics and Management Science, 1971, Autumn, 561-576.
- Feldman, N.E. Cable Television: Opportunities and Problems in Local Program Origination. Santa Monica, Cal.: The Rand Corporation, 1970.
- Fraser, T.A., & McIntyre, L.E. Rural Line Customer Survey - Summary Report. New Brunswick: New Brunswick Telephone Company, May 24, 1978.
- Golfarb Consultants Ltd. Public Concerns about Telephones/Telephone Services. 1974.
- Griffin, J.M. The effects of higher prices on electricity consumption. The Bell Journal of Economics and Management Science, 1974, Autumn, 515-539.
- Helmer, O. Analysis of the Future: The Delphi Method. Santa Monica, Cal.: The Rand Corporation, 1968.
- How to take cable down to the farm. Broadcasting, 1977, April 11, 60-61.

- Inter-Branch Working Group on Rural Communications. Present Status of Rural Communications in Canada. Ottawa: Department of Communications, July, 1976.
- Johnson, L.L. Cable Television and the Question of Protecting Local Broadcasting. Santa Monica, Cal.: The Rand Corporation, 1970.
- Johnson, L.L. The Future of Cable Television: Some Problems of Federal Regulation. Santa Monica, Cal.: The Rand Corporation, 1970.
- Johnson, L.L. Cable Television and Higher Education: Two Contrasting Case Examples. Santa Monica, Cal.: The Rand Corporation, 1971.
- Komura, M., Miyagawa, T., Suzuki, Y., & Uehara, J. Subscriber Radio Telephone System for Rural Areas. Japan Telecommunications Review, 1976, 18(2), 94-100.
- Lave, C.A. A Behavioral Approach to Modal Split Forecasting. Transportation Research, 1969, 3, 463-480.
- Littlechild, S.C. Peak-load pricing of telephone calls. The Bell Journal of Economics and Management Science, 1970, Spring, 191-210.
- Littlechild, S.C. Two-part tariffs and consumption externalities. The Bell Journal of Economics and Management Science, 197, Autumn, 661-670.
- McFadden, D. Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.). Frontiers in Economics. New York: Academic Press, 1974.
- McGowan, J.J., Noll, R.G., and Peck, M.J. "Prospects and Policies for CATV". Brookings Studies in the Regulation of Economic Activity, (March 1971).
- Mitchell, M.R. State Regulation of Cable Television. Santa Monica, Cal.: The Rand Corporation, 1971.
- Office of Telecommunications Policy. Television Distribution in Rural Areas. Washington, D.C.: U.S. Government, 1975.
- Ownership Study Group. "Ownership of Private Broadcasting: An Economic Analysis of Structure, Performance and Behaviour. Ottawa: Canadian Radio-television and Telecommunications Commission, (October 1978).
- Park, R.E. The Growth of Cable TV and its Probable Impact on Over-the-Air Broadcasting. Santa Monica, Cal.: The Rand Corporation, 1970.

- Park, R.E. Potential Impact of Cable Growth on Television Broadcasting. Santa Monica, Cal.: The Rand Corporation, 1970
- Park, R.E. Cable Television and UHF Broadcasting. Santa Monica, Cal.: The Rand Corporation, 1971.
- Park, R.E. Prospects for Cable in the 100 Largest Television Markets. Santa Monica, Cal.: The Rand Corporation, 1971.
- Park, R.E. New television networks. The Bell Journal of Economics and Management Science, 197 , Autumn, 607-620.
- Perl, L.J. Economic and Demographic Determinants of Telephone Availability. New York: National Economic Research Associates, Inc., April 15, 1975.
- Posner, R.A. Cable Television: The Problem of Local Monopoly. Santa Monica, Cal.: The Rand Corporation, 1970.
- Richardson, K. "The Definition of Rural". D.O.C. Memorandum (February 14, 1978).
- Richardson, K. "A Demographic Overview of Rural Canada". D.O.C. (1978).
- Richardson, K., & Brown, S. Regional Demographic Studies for the Rural Communications Program - Summary Report. Ottawa: Department of Communications, June, 1978.
- Rohlf, J. A theory of interdependent demand for a communications service. The Bell Journal of Economics and Management Science, 1974, Spring, 16-37.
- Roscoe, A.M.Jr., & Sheth, J.N. Demographic Segmentation of Long Distance Behavior: Data Analysis and Inductive Model Building. Annual Proceedings of the Association for Consumer Research, M. Venkatesan (ED.), 1972, 258-278.
- Sankar, U. Investment behavior in the U.S. telephone industry - 1949 to 1968. The Bell Journal of Economics and Management Science, 1973, Autumn, 665-678.
- Schindelka, C.R. Man on the Move - A Users Survey of Mobile Radio Services in Rural Areas of the Prairie Provinces. Saskatoon: University of Saskatchewan, August, 1977.
- Squire, L. The aspects of optimal pricing for telecommunications. The Bell Journal of Economics and Management Science, 1973, Autumn, 515-525.

- Taylor, L.D. The demand for electricity: a survey. The Bell Journal of Economics and Management Science, 197 , Spring, 74-110.
- Telecommunications Research Group. The Extent of Television Network Coverage in Rural Canada. Burnaby, B.C.: Simon Fraser University, August 1, 1978.
- Telephony. "Who Will Look Out For Rural Telephony?" (November 20, 1978), 66-76.
- They're Moving back to the country. Media Decisions, 1976, February, 62-65 120;124-125.
- Thompson, H.E., & Tiao, G.C. Analysis of telephone data: a case study of forecasting seasonal time series. The Bell Journal of Economics and Management Science, 1971, Autumn, 515-541.
- Von Rabenau, B., & Stahl, K. Dynamic aspects of public goods: a further analysis of the telephone system. The Bell Journal of Economics and Management Science, 1974, Autumn, 651-669.
- Weldon, K.L., Schulman, J., & Lesser, B. The Economic Benefits of Improved Telephone Services to Rural Areas. Government Studies Programme, Dalhousie University, Halifax, Nova Scotia, (June, 1977).
- Yeh, M., & Riffel, J.A. Approaches to Demand Forecasting for Rural Telephone Services. Office of Industrial Research, University of Manitoba, (May, 1977).

Appendix A

STEPS TAKEN TO OBTAIN DOCUMENTATION FOR THE LITERATURE REVIEW

Many different sources have been used to determine the extent of publications on the subject of telecommunications in rural areas. To begin, computerized literature searches were conducted using relevant data bases on the subject (see attached work-plan). The bibliography of each of these articles was then reviewed until the arousal of repetitious bibliographies assured the saturation of this source.

Bell Canada was also contacted but seemed reluctant to give out any information. Some was however obtained from the CRTC along with other documentation.

The Canadian Cable Television Association and the Canadian Broadcasters' Association were unaware of any specific study on the subject.

With respect to American studies, the Rand Corporation seemed to be one of the best sources and many of their reports were consulted. The United States Government publications were then systematically looked into. To locate some

of these articles, and hopelly get others, the library of the American Embassy was contacted without success.

It must also be pointed out that much trust was given to different D.O.C. branches to provide studies that had been done or funded by the department or any other research that individual branches knew of.

Because of administrative delays in the awarding of the contract the literature search started a month and a half late. For that reason, a few documents have not reached us yet; the review will be updated upon reception.

WORKPLAN FOR "DEMAND FOR RURAL COMMUNICATIONS" PROJECT

1. Domestic

1.1 Radio

1.1.1 Need

1.1.2 Forecast: Components

1.1.3 Forecast: Models

1.1.4 Secondary Data

1.2 Television

1.2.1 Need

1.2.2 Forecast: Components

1.2.3 Forecast: Models

1.2.4 Secondary Data

1.3 Telephone

1.3.1 Need

1.3.2 Forecast: Components

1.3.3 Forecast: Models

1.3.4 Secondary Data

1.4 Mobile Radio Services

1.4.1 Need

1.4.2 Forecast: Components

1.4.3 Forecast: Models

1.4.4 Secondary Data

2. Business

2.1 Radio

2.1.1 Need

2.1.2 Forecast: Components

- 2.1.3 Forecast: Models
- 2.1.4 Secondary Data
- 2.2 Television
 - 2.2.1 Need
 - 2.2.2 Forecast: Components
 - 2.2.3 Forecast: Models
 - 2.2.4 Secondary Data
- 2.3 Telephone
 - 2.3.1 Need
 - 2.3.2 Forecast: Components
 - 2.3.3 Forecast: Models
 - 2.3.4 Secondary Data
- 2.4 Mobile Radio Services
 - 2.4.1 Need
 - 2.4.2 Forecast: Components
 - 2.4.3 Forecast: Models
 - 2.4.4 Secondary Data
- 2.5 Telex
 - 2.5.1 Need
 - 2.5.2 Forecast: Components
 - 2.5.3 Forecast: Models
 - 2.5.4 Secondary Data

3. General on rural

Appendix B

QUALITY OF SERVICE INDICATORS

I. Provision of Service

- *1. Customer Provisioning Requests: % convenient
The percentage of service installation appointments which prove to be convenient to residence and small business customers.

Standard: 91.6% to 94.5%.

- *2. a) Installation appointments (regular orders):
% met
The percentage of installation appointments for residence and small business service which were kept by the company.

Standard: 93.8% to 96.3%.

- *2. b) Installation appointments (special orders):
% met
The percentage of installation appointments which were kept by the company.

Standard: 90.7% to 95.3%.

- *3. Held Orders per 100 Main inward Movement
The percentage of orders for telephone installations not available to customers on the due date because the company cannot provide the service.

Standard: no standard available, but area objective and actual performance figures will be reported.

4. Transmission Quality Indicator

The percentage of calls encountering noise or poor transmission quality.

Standard: no useful measure presently exists.

Until one is operational (1980), an interim measure is to be reported.

5. Intercept Service: Performance

The speed of intercept answer and of the promptness and accuracy with which an interception is placed on a line when such a service is being provided.

Standard: new measure, the standard is to be developed and reported.

II. Repair Service

*6. a) Initial customer trouble reports per 100 stations

The percentage of first reports the company receives about malfunctions in telephones, extensions, coin telephones, etc., or about the location or performance of Bell owned plant or equipment as well as complaints about Bell's staff.

Standard: new measure, the standard is to be developed and reported.

6. b) Subsequent trouble reports as a percentage of initial trouble reports
The percentage of initial trouble reports which are the subject of more than one complaint prior to corrective action having been taken.
Standard: new measure, the standard is to be developed and reported.

6. c) Repeated reports as a percentage of initial trouble reports
The percentage of initial trouble reports which are repeated within one month of action being taken by Bell Canada. The repeated report may not involve the same precise problem but involves the same telephone line.
Standard: new measure, the standard is to be developed and reported.

6. d) Percent of out-of-service trouble reports cleared within 24 hours
The percentage of initial reports of out-of-service conditions which are cleared within 24 hours.
Standard: new measure, the standard is to be developed and reported.

*7. Repair Appointments: % met
The percentage of repair appointments between customers and Bell Canada which were met on or before the time and date negotiated with the

customer.

Standard: 88.6% to 93.6%.

III. Local Service

- *8. Local Dial Line Observations: % of switching machines not meeting standard

The percentage of local switching machines which do not meet the standard of "% overflow". This is a measure of the extent to which calls fail to reach completion due to a lack of circuits or of switching machine equipment.

Standard: step-by-step equipment: 0.6% to 0.8%;

X-Bar, E.S.S. and S.P.I. equipment: 0.5% to 0.8%.

- *9. Dial Tone Delay: % of switching machines not meeting standard

The percentage of central office switching machines which do not meet the standard for delays of more than three seconds. This is a measure of the extent to which equipment is available to allow the customer to commence dialing a call.

Standard: step-by-step equipment: 1.5% to 1.8%;

X-Bar and E.S.S.: 1.5% to 2.0%.

IV. Long Distance Service

- *10. Direct Distance Dialing - Outgoing Trunk Observations: % blockage and failure

The percentage of DDD calls which: a) fail to be completed or to be completed successfully (e.g.

no-ring conditions, incorrectly reaching a recording, encountering impaired transmission, or being unable to reach the number dialed) due to equipment-caused problems, or b) experience blockage due to the unavailability of equipment as a result of heavy traffic.

Standard: no standard available, Bell Canada is required to utilize the performance "objective" of 1.5% to 3.5% as its performance criterion until the new measure based on customer expectations is introduced in 1980.

V. Operator Service

- *11. Operator Answer Toll and Assistance: % answered within 10 seconds

The percentage of calls received by the long distance and assistance operators which are answered within 10 seconds.

Standard: 90%.

12. Directory Assistance Answer: % answered within 10 seconds

The percentage of calls to the directory assistance operator which are answered within 10 seconds.

Standard: new measure, the standard is to be developed and reported.

VI. Directory Service

13. Directory Accuracy

A measure of the accuracy of customers' listings in the white pages of the telephone directory. Standard: new measure, the standard is to be developed and reported.

VII. Billing

14. Billing Service Index

The percentage of customers' bills in error - i.e. the errors, delays and omissions found in bills.

Standard: 96% to 98%. VIII. General

15. Complaints to Bell Canada Officers and to CRTC per 100,000 Accounts

A measure of poor or annoying performance in relation to particular customers, it is regarded by the commission, as by Bell Canada's president, as a "rear view mirror" indicator.

* These measures were also submitted by Bell Canada as Quality of Service Indicators (Telecom Decision, CRTC 78-7).

Appendix C

CRTC - BELL DATA BASES

	Non-Urban	
Main Held Orders	1972-1980	P (O) 2Mar78-805
Main Held Orders	1976-1977	P (ABC) 3Mar78-93
Main Held Orders	1977-1980	P (CRTC) 3Mar78- 100 (a)
Main Held Regrades	1972-1980	P (O) 2Mar78-805
Main Held Regrades	1976-1977	P (ABC) 3Mar78-93
Main Held Regrades	1977-1980	P (CRTC) 3Mar78- 100 (a)
Subscribers with more than 4 main stations	1976-1977	P (ABC) 3Mar78-93
Subscribers with more than 4 main stations	1977-1980	P (CRTC) 3Mar78- 100 (a)
Exchanges converted to 4 party service	1976-1977	P (ABC) 3Mar78-93
Exchanges converted to 4 party service	1977-1980	P (CRTC) 3Mar78- a00 (a)
No. of L.R.A.'s	1976-1977	P (ABC) 3Mar78-93
No. of L.R.A.'s	1973-1976	P (CRTC) 3Mar78-

		100 (a)
(cumulative)	1977-1980	
No. of L.R.A.'s	1977-1980	P (CRTC) 3Mar78-
		100 (a)
Main telephones	1980	P (CRTC) 3Mar78-
		100 (a)
Subscribers with no more than 4 main stations	1977-1978	P (CRTC) 3Mar78-
		100 (a)
No. of Individual & 2-Party Subscribers by Region (and urban)	1977-1979	P (CRTC) 3Mar78-
		107
Average Line Load on all Multi-Party Lines	1977	P (O) 2Mar78-806
Grants and Financial Assistance Received	1970-1978	P (ABC) 3Mar78-96
		P (ABC) 3Mar78-56
Extimated Rearrangement Dollars for NUSI	1977-1980	P (CRTC) 3Mar78-
		108
Number of Multi-Party Main Telephones by Line Load, by Region, and by Residence and Business Categories	1971-1980	P (CRTC) 3Mar78-
		108
Main Held Regrades for		

Individual and 2-Party Service	1971-1977	P (NAPO) 3Mar78- 514
Main Station Increase for Ontario by Residence and Business	1973-1977	P (OTA) 7Mar78-1
Construction Expenditures by Organizational Entity, by Purpose, and by Class of Plant	1977-1980	P (NAPO) 3Mar78- 608
Additional Number of Employees Required for NUSI	1977-1980	P (Q) 27Feb78-304
Present & Proposed Flat Rates Outside Base Rate Area by Business/ Residence and by Individual/2-Party	1977	P (CRTC) 3Mar78- 100 (e)
Extra Exchange Mileage Charges by Business and Residence	1976-1977	P (CRTC) 3Mar78- 112
Extra Exchange Mileage Charges by 1 and 2 Party Services	1977	P (CRTC) 3Mar78-

Number of Customers Paying

Extra Exchange Mileage

Charges by Individual/

2-Party and by Rate

Group

1977-1979

P (NAPO) 3Mar78-

719

Total (Urban and Non-Urban) 1972-1977

EXHIBIT B-78-231:

Main Held Orders

Customer Provisioning Requests - % Convenient

Installation Appointments - % Met Regular Orders

Installation Appointments - % Met Special Orders

Total Customer Trouble Report Rate

Repair Appointments - % Met

DDD Outgoing Trunk Observations - % Equipment

Blockages & Failures

Local Dial Line Observations' Overflows - %

Weakspots

Dial Tone Delay - % Weakspots

Operator Answer Toll & Assistance - % Answered

Within 10 Seconds

Customer Complaints to Officers & CRTC -

Complaints/100,000 accounts

1977-1979

P (CRTC) 3Mar78-107:

Number of Individual & 2-Party Subscribers

by Region (and non-urban)

