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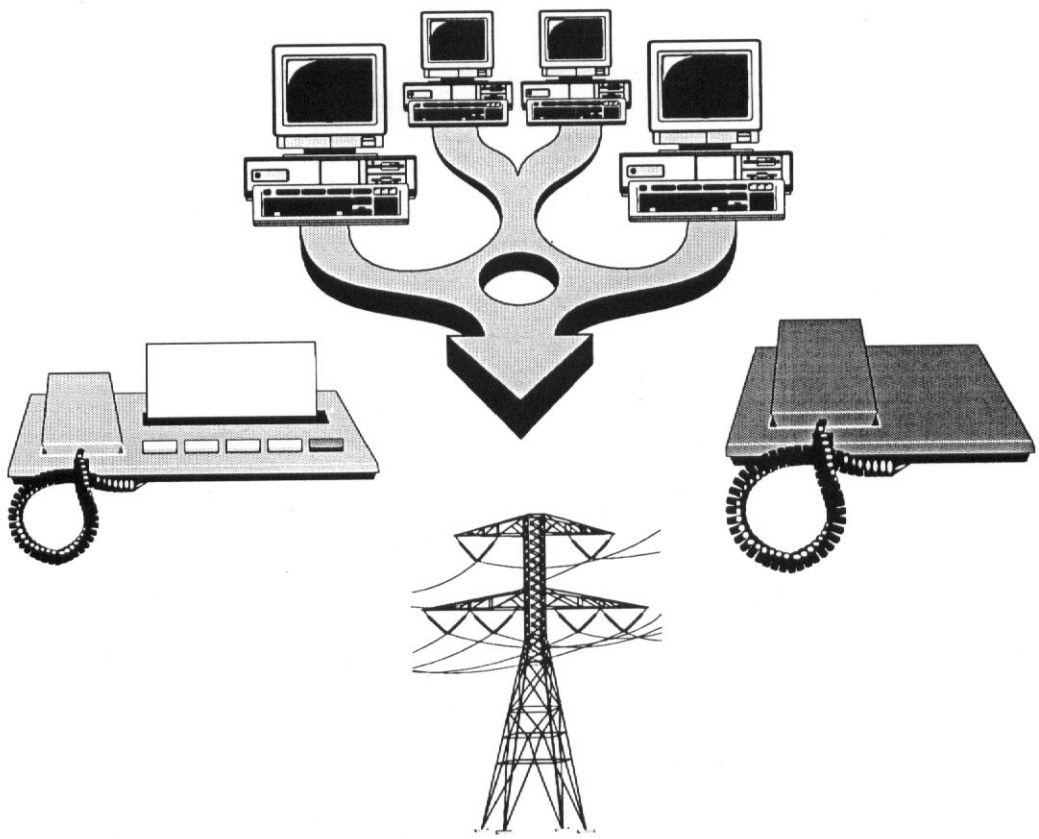
1994 BASELINE DATA



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BRANDON UNIVERSITY

TELECOMMUNICATION USE BY BUSINESSES IN RURAL MANITOBA

1994 BASELINE DATA

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PREFACE

The primary aim of this project was to produce baseline data on the use of modern telecommunications equipment by businesses in rural Manitoba. Tieing into the "information highway" has been touted widely as a revolutionary advancement for rural development in that effects of distance and isolation can be offset, allowing rural businesses to compete in not only urban, but also global markets. Removing spatial barriers also is seen to allow the distribution of new businesses as location-neutral, thus providing opportunities for small communities to attract new residents or expand existing enterprises. Only time will tell if telecommunications technologies can indeed offset the agglomeration effects of metropolitan areas in an urban society.

Although changing rapidly, both the development and utilization of telecommunications technology remains an "urbanocentric" industry. Rural people, of course, buy into new technologies as need arises. Tradition, levels of education, financial resources, use and the complexity of business all play a role in the decision to employ new technology in our daily lifes. It is important to evaluate the results of these pervasive forces on the decisions of individuals to adopt new technologies. This report establishes baseline data for 1000 rural businesses in 1994. These numbers can be used to assess changes in use by rural businesses at any point in the future.

The authors appreciate the advice and guidance provided by members of RDI's External Advisory Committee, and the project Steering Committee. Special acknowledgment is given to Bob Grodzik, Chief of Research, Manitoba Rural Development. Funding was provided by the Government of Manitoba through the Department of Rural Development, the Honorable Len Derkach, Minister. Joan Rollheiser, Administrative Assistant at RDI, prepared the document for publication.

EXECUTIVE SUMMARY

- In 1994, telecommunications equipment had not been integrated widely into the daily operations of small businesses located in rural Manitoba. The majority of use is by larger companies (i.e.: >10 employees, >$250,000 gross revenue) that generally are located in communities of 5,000 or more people.

- The most frequently used types of equipment were the fax machine, computer and cellular phone.

- More than half of the sample used no mobile telecommunications equipment.

- The most significant predictor of telecommunications use was the type of business (Standard Industrial Code). In general, the Financial/Insurance sector and the Business Services sector made more use of fax machines, computers and cellular phones. The lowest use was found within the Health sector and the Consumer Retail and Services sectors. This could be attributed to differences in needs of each sector. Businesses such as law firms and accounting firms work more frequently with information than most retail outlets or restaurants, and make greater use of equipment that supports their information needs.

- The size of a company also influenced telecommunications use. Whether measured in terms of number of employees or by gross revenue, the use of telecommunications increased as the size of the company increased. This likely occurs because larger companies have the financial resources to investigate their telecommunication needs and options, and to implement what will benefit their organization.

- The legal status of a business is related to use of telecommunications. An incorporated business was more likely to use advanced telecommunications equipment and services than are other types, particularly sole proprietorships. Sole proprietorships usually earned less money and had fewer employees — both of which affect the use of telecommunications.

- In many instances, the number of residents of the area in which a business was located affected the type of equipment that a business used. In general, the use of telecommunications equipment increased as population increased.

- Geographic location also affected whether or not a business used certain types of telecommunications equipment. The Central Plains region consistently scored highest in terms of use of computers, dedicated lines, fax machines, and cellular phones. Norman is a close second to Central Plains with respect to use of computers, fax and dedicated lines. This may be attributed to the distribution of both population and businesses in these regions, where a larger proportion of the populations in Central Plains and Norman are located in communities with more than 5,000 residents.

- Rural/urban location played a role in use of cellular phones and dedicated lines, but the use of fax machines and computers was essentially the same for both.

- Businesses in our sample were much lower in use of certain services and equipment than equivalent businesses surveyed in the United States.

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INTRODUCTION

The primary goal of the survey was to collect baseline data to measure the use of telecommunication equipment and services among businesses in rural Manitoba, (outside of Winnipeg) in 1994. In addition to baseline data, efforts were made to determine if any disparities exist among similar businesses, and whether or not the disparities are a result of differing population bases, regional locations, or the number of people employed by the business.

Perceived training and education needs that would assist businesses to remain in competition with their Winnipeg, national and international counterparts also were assessed. Respondents were asked to identify the major obstacles that prevented them from continuing their education.

The report begins with a descriptive overview of data representing all of Manitoba, followed by an analysis of data. Results are compared to a similar survey completed for the NFIB Foundation in Washington, DC.

Overview of Manitoba

Manitoba covers an area of 650,000 KM^2, and has a total population of 1,091,945 people in 1996. Population distribution is very uneven, with 94 percent of the population living in southern Manitoba, and 60 percent of all residents living in Winnipeg. Although northern Manitoba covers about 2/3 of the land area, it has only 6 percent of the total population, with 37 percent of this population residing within Thompson, Flin Flon and The Pas. The rest of the residents in northern Manitoba live in small, isolated communities.

Despite this uneven distribution, Manitoba TeleCom Services (MTS) provides almost universal telephone access (approximately 97 percent coverage). Since 1989, MTS has been upgrading the infrastructure throughout the province, replacing analog with digital switches, party line service with private lines, and older trunk lines. As well, all communities are having or have had their existing calling area expanded to include other nearby exchanges. The system upgrade was scheduled for completion by 1997.

Rural businesses must have the same access to telecommunications as their competitors to remain viable. A 1971 Telecommission report states that "While telecommunications may not have been either a prime cause or constraint to economic development, they have been a very important catalyst for development and a vital part of the economic infrastructure."

Telecommunications includes the equipment, the carriers and the services, and the type of information transferred (data, voice or video). This report covers all these areas in order to describe the use of telecommunications by businesses in rural Manitoba in 1994.

Methods

Person-to-person telephone interviews were conducted with 1007 randomly selected businesses in rural Manitoba (outside of the City of Winnipeg). A stratified sample was used to ensure adequate representation of all regions of the province. The geographic frame was based on established divisions, with an underlying structure of Census Divisions (telephone area codes are mapped to a census division). Six of seven 1991 Census Agricultural Regions were sampled: Eastman, Central Plains, Interlake, Westman, Norman and Parklands (Winnipeg was excluded). Sampling within regions was random with numbers in the sample approximately proportioned to the populations of the regions (Table 1). The assumption that the number of businesses in an area is proportional to population is substantiated by earlier research.

For each region, the business sample size was approximately equivalent to the proportion of population that lived in that region (Table 1). Assuming that a parallel exists between the population and number of businesses, the sample is representative of the business population.

Table 1. Comparison of distribution of businesses sampled against distribution of population

	West-Man	Central Plains	East Man	Interlake	Parkland	Norman
Business sample (%)	33	16	13	14	11	13
Population 1991 (%)	27	15	16	16	10	16

In addition to regionalization, five other variables are used to classify the sample: 1) Standard Industrial Codes (SIC) to identify the type of business, 2) population of the community in which the business is located, 3) the number of employees, 4) gross revenue, and 5) legal status of the business. SIC Divisions (n=11) are used in preference to SIC Sectors owing to small sample sizes in the more refined Sector classes (Appendix A). Divisions 11 (consumer goods and services) and 4 (construction) contain the largest sample sizes, and Division 8 (education, health and social services) has the smallest representation (Table 2).

Table 2. Distribution of SIC Divisions in sample[1]

Division	1	2	3	4	5	6	7	8	9	10	11
%	11	3	13	16	7	5	4	2	11	6	24
#	106	26	134	158	73	47	35	15	112	56	245

[1] See Appendix A for SIC categories

Community populations were subdivided into seven categories (Table 3). Businesses located in rural jurisdictions comprise 27 percent of the sample, and include farms which are considered "small businesses" in the survey. Three cities with populations >10,000 account for 20 percent of the sample (Brandon, Thompson and Portage la Prairie).

Table 3. Distribution of businesses by population of rural area or community

Measure	Rural	500-999	1000-1999	2000-2999	3000-3999	3000-10,000	>10,000
%	27	4	10	14	10	16	20
#	275	38	102	139	96	160	197

The number of employees in a business was divided into four categories (Table 4). The majority of businesses in the sample (approximately 70 percent) employed between 2-10 people, with the next most frequent response being 11-50 employees (Table 5). Businesses that employed no one other than the owner comprised 11 percent of the sample. Since only four businesses fell into the more than 100 employee category, this category was combined with the category of 51-100 employees for analysis. Part-time employees were included in the response.

Table 4. Distribution of sample by number of employees

Measure	1	2-10	11-50	>50
%	11	70	18	1
#	114	701	176	14

Approximately three-quarters of the businesses (756/1007) responded to a question concerning gross revenues. When divided in five categories, 28 percent of the businesses listed >$500,000 gross revenue, 14 percent indicate between $250,000-$500,000, and about 20 percent occurred in each of the three lower categories (Table 5).

Table 5. Distribution of sample by gross revenue

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	21	17	20	14	28
#	155	132	152	102	215

Forty percent (399) of the respondents were sole proprietors, 37 percent (370) operated incorporated businesses, 21 percent (215) were involved in partnerships, and 2 percent (22) had other legal status as businesses. Seventy-six percent (763) of the businesses operated from one site, 17 percent (172) were multi-branched and 7 percent (71) were franchises.

Analysis

Analytical methods are reviewed in Appendix A. The designations "statistically significant" or "significant association" always refer to results that would occur less than one time in 20 by chance ($p<0.05$).

TELECOMMUNICATION EQUIPMENT AND SERVICES USE TOTAL SAMPLE

Possession of telecommunications equipment is one measure of the use of telecommunications. All respondents had telephone service, with many having more than one type of telephone. Ninety-two percent had at least one touch tone phone, including reconditioned phones[1]. Twenty-five percent used a rotary phone. The two phone types are not mutually exclusive and a business can have both types of phones. Touch tone phones are an indication of private lines because they cannot be used on a party line, and are essential for businesses that wish to use any of the more advanced telephone services that do not recognize pulse tone input.

Three types of telephone systems were assessed: private telephone lines, party lines and PBX/Meridian-type telephone systems. Meridian-type telephone systems are multi-line phones that allow a business to have several in-coming lines selected by pressing a button. Calls can be transferred to a specific office. As well, the system can provide numerous advanced features such as teleconferencing and voice mail. PBX systems provide a business with a private self-contained switched telephone system. It is assumed that a PBX or Meridian-type telephone system also is a private telephone line service. In some cases a business indicated they have both private and party lines, or a PBX and private lines. In these cases, the interviewer recorded only the more sophisticated telephone system in use.

The majority of businesses had private lines, with only 28/1007 businesses indicating that their major phone system is a party line. This is important because advanced telecommunications equipment such as modems and fax machines cannot be operated on party lines. In total, all but a small number of businesses in rural Manitoba had modern telecommunications access through existing telephone systems in 1994.

The on-line credit card system had a higher installation rate than the debit card system. This may be accounted for by the fact that the credit card system has been available to businesses for a longer period of time. On-line debit card systems appeared in the last few years in Manitoba.

Use of Telephone Services by Businesses in Rural Manitoba

Manitoba has upgraded to digital switches in nearly all areas of the province. The advantage of digital over analog switches is the ability to provide more advanced telephone services. In 1994, these services were not available to all regions, but services such as redial and speed call are provided by more sophisticated touch tone phones or by advanced telephone systems such as private branch exchanges (PBXs) and Meridian-like systems.

Redial was the most popular telephone feature, with 52 percent of respondents saying they used it regularly (Table 6). This was followed by 26 percent using the speed call feature. High use rates probably can be attributed to the fact that these features were available on most touch tone phones at no extra cost. Call waiting, call forwarding, recall and teleconferencing were used by between 11-18 percent of the rural businesses. Call screen, call trace and voice mail were used infrequently.

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1 Reconditioned phones were defined as inexpensive phones that could be purchased in stores, rather than leased from a telecommunications provider. These provide both the touch tone and pulse tone facility.

Table 6. Use of telephone services by rural businesses, 1994

Telephone Service	Number	Percent
Redial	528	52
Speed call	260	26
Call waiting	183	18
Call forwarding	172	17
Recall	139	14
Teleconferencing	106	11
Call screen	32	3
Call trace	28	3
Voice mail	26	3

Use of Long Distance Services

Although many long distance services were available to businesses to reduce costs, only 663 of 1007 businesses used some type of long distance plan or service in 1994 (Table 7). The most popular long-distance plans were one of the several types of MTS Advantage plans[2] or one of the "Other" plans. Within the "Other" category, the majority state that they were on MTS' Teleplus plan or some other type of MTS plan (other than MTS Advantage or Teleplus), but there also were some that indicated they had switched to either WestCan Telecommunications or Unitel. Few businesses were using the WATS plans that provide bulk rates within a defined region. The 1-900 option was practically unused.

Table 7. Use of long distance services by Manitoba rural businesses, 1994

Long distance service	Number	Percent
Inwats	31	3
Outwats	23	2
Wats	12	1
1-800	57	6
1-900	2	<1
Advantage	245	25
Other	293	29

2 There are several different plans with various savings levels depending on a business's total usage.

Dedicated Lines

Less than half of the businesses surveyed were using any type of telecommunications equipment other than telephones. The highest frequency of use of other equipment occurred for fax machines (47 percent) and computers (46 percent). Cellular phones were by far the most popular type of mobile telecommunication equipment, surpassing the total combined use of mobile phone, pager, and FM band radio (Table 8).

Table 8. Use of telecommunications equipment by Manitoba rural businesses in 1994

Equipment	Frequency (n)	Percentage (%)
Fax	476	47
Computer	465	46
Cellular phone	338	34
Modem or fax modem	278	28
On-line credit card system	140	14
FM band radio	108	11
On-line debit card system	72	7
Pager	63	6
Mobile phone	59	6

Dedicated lines are defined herein as switched telephone lines that are connected solely to a fax machine or modem -not unswitched point-to-point data lines. Within this definition, 447/1007 (44 percent) of rural businesses indicated that they had some type of phone line that was devoted strictly to a fax machine or a modem, or that provided rotary or frame relay access (Table 9). The majority of these businesses (327/447 or 73 percent) had only one line, but 80 businesses had two lines.

Table 9. Use of dedicated lines by rural businesses in Manitoba in 1994

Type of dedicated line	Number	Percent
Dial up (fax)	390	87
Modem	123	28
Rotary	17	4
Frame relay	7	2
Other	42	9

The most popular type of "dedicated line" served a fax machine (87 percent of all such lines). By cross tabulating fax machine ownership with dial up line, 476 businesses had a fax machine, with 358 (75 percent) having the machine connected to its own line.

Of the 278 businesses that indicated that they had modems or fax modems installed in their computers, only 123 (44 percent) indicated that they had them connected to a modem line. This indicates that few businesses regularly used their computer for data transmission. Pharmacists and others in the medical profession were on-line with the Manitoba Health DPIN system. As well, insurance agencies who sell Autopac were going on-line with Manitoba Autopac 2000.

Advanced Computer Systems

Of the 465 businesses that responded positively to having a computer, only 66 had any type of local area network installed. When respondents (who had indicated they had a modem or fax modem installed in their computers) were asked if they had remote access to a computer system of any type, 117 of the 221 responded positively. The majority of these businesses (108/117) used a telephone line to access the remote computer system, with five of them stating that they used a satellite system. Of the businesses that responded, 95 (81 percent) stated that access to the computer network was very important to their business.

Knowledge, Use and Training Relating to Computer Services

Questions about knowledge and use of computer services were asked only of businesses that indicated that they had at least one computer with a modem or fax/modem installed. This sub-sample consisted of 220 businesses.

Knowledge of Datapac was low (39, or 18 percent) considering that 117 businesses indicated that they access a remote computer system, and 108 used a telephone line for data transmission. This occurred in spite of the fact that Datapac provides a switched network for fast and efficient computer data transmission. It is unknown whether this indicated that data transmission takes place locally, over leased data lines, or if businesses were simply using regular telephone lines and paying regular long distance charges.

Overall, knowledge of computer specific services was low. Only 57 respondents (26 percent) listed knowledge of the Internet, and 52 (24 percent) listed compuserve-like services. Envoy was identified by 15 businesses (7 percent). Actual use rates of these services was considerably lower than knowledge rates (Datapac 19, Envoy 1, Internet 7, and Compuserve 6).

An important aspect of the use of telecommunications is the ability to effectively operate equipment and access services. Four areas of training were identified as important: 1) a course using some type of telecommunications equipment or service, 2) LAN training, 3) PC training, and 4) training for a particular software package. A question about telecommunications equipment or service training was designed to identify how important businesses felt it was to train their employees to utilize equipment and services to their fullest extent (whether such equipment was currently installed or would be in the near future). LAN training focuses on familiarizing the trainee with working on a LAN. A PC training question was designed to determine the importance placed on familiarizing employees with computer operation. The software-package training question was meant to identify how important businesses felt it was that an employee know how to use the available software to its fullest extent.

Telecommunications training (10 percent previous and 8 percent future) and LAN training (8 percent previous and 10 percent future) did not appear to be of great importance to rural companies in 1994, whereas PC (46 percent previous and 37 percent future) and software training (33 percent previous and 26 percent future) were in greater demand. This likely results from the fact that more businesses had a PC and were operating specific software packages, than used LAN (14 percent).

Of the 46 percent of businesses which indicated that they had at least one employee with previous PC training, 66 percent had a computer. As well, 39 percent of these respondents indicated that they had plans to attend a PC course in the near future.

Of the 148 businesses that indicated that they would be purchasing a computer in the near future, 44 percent had at least one employee with previous PC training. When asked if there were future plans for PC training, 55 percent indicated yes. Thus, there is demand for courses familiarizing people with computers, especially for businesses that were planning to acquire a computer for the first time.

The universities and colleges in Manitoba have moved towards providing courses in rural areas. This is accomplished by establishing satellite operations, broadcasting over television and by video conferencing. When asked a question about what the respondent would like to see offered in their community, the majority indicated a demand for introduction to computers and applications, and more advanced computer training. A second major area included more courses that deal with small business operating needs in accounting, management and marketing.

USERS OF MOBILE TELECOMMUNICATION

A derived mobile telecommunication use index measures a respondent's total use of pagers, cellulars, mobile phones and FM band radio. Each positive response to an option counts as one increment. The maximum value is four, the minimum is zero. Fifty-six percent of the rural businesses did not use any type of mobile telecommunications in 1994, and an additional 34 percent used only one type. Only 8 percent used two modes, and 2 percent used three modes. One respondent used all four options (Table 17, Appendix B).

The use of mobile telecommunication varied among types of businesses. Most businesses in the food retail sector (SIC=10) and the consumer goods and services sector (SIC=11) seldom used mobile telecommunications. Businesses in the transport/communication (SIC=5), chemicals/minerals products (SIC=2), construction (SIC=4), and food, beverage and tobacco/wood and paper/energy (SIC=1) sectors, however, had the highest incidence of utilization of three different types of mobile equipment (Table 18, Appendix B).

Among regions, businesses in the Central Plains area had the highest incidence of mobile telecommunication use, and Norman had the lowest rate. Norman consistently scored lower in all mobile index categories. This indicates significant variation in regional use of mobile telecommunication (Table 17, Appendix B).

Use of Cellular Phones

Cellular phones were by far the most popular piece of mobile equipment with 337 businesses (34 percent) of all businesses having at least one cellular phone. The majority of these businesses had been using a cellular for 2 to 5 years, with only 9 percent having used them for more than 5

years. Most businesses that use cellulars had only one phone (63 percent), while 18 percent (61 businesses) had two cellulars.

The highest percentage of use of cellular phones occurred in the construction (54 percent), finance/insurance (51 percent) and transportation/communication sectors (44 percent). The lowest use was in the food retail sector with only 9 percent of the sample indicating they used cellular phones. Analysis indicated that a significant association exists between the type of business and use of cellular phones (Table 19, Appendix B).

Businesses in rural locations (46 percent) were more likely to have a cellular phone than were businesses located in a community (30 percent). A significant association exists between the rural/urban location of a business and the use of cellular phones (X^2=18.63, $p<0.05$). Cellular phone use was distributed relatively evenly among the various sizes of urban communities, ranging from a low of 24 percent in communities of less than 500 to a high of 38 percent in communities of more than 10,000 people.

When assessed in terms of size of business based on number of employees, smaller businesses did not use cellular as much as did larger businesses. Use increases from a low of 18 percent for businesses with one employee, to 57 percent for businesses with >50 employees (Table 21, Appendix B). Similar results occurred when size of business was assessed by gross revenue (Table 22, Appendix B).

Analysis also indicates that there is a significant association between regional location and cellular phone use. This is not surprising, since cellular phone service was not available in Norman or in northern parts of the Interlake and Parkland regions. This accounts for the fact that the highest use of cellular is in southern Manitoba (Westman, Central Plains and Eastman) (Table 20, Appendix B).

Co-ops (50 percent) (the majority of businesses in the "Other" category) and incorporated businesses (43 percent) were significantly more likely to have cellular phones than were sole proprietorships(26 percent) or partnerships (30 percent) (X^2=28.4,$p<0.05$). One reason may be that a larger proportion (79 percent) of sole proprietors fall into the less than $250,000 gross revenue category, a fact that already has been shown to associate with lower cellular phone use. As well, sole proprietorships had the highest percentage in the single employee category (20 percent) as compared to 4 percent for incorporated and 9 percent for partnerships. This association also leads to lower cellular phone use.

Overall, cellular phone use was greatest in business sectors that require travelling or working on location such as construction, insurance, and transportation. Since cellular phone service was available only in the southern portion of Manitoba, geographic region plays a large part in whether a business used a cellular phone or not. Businesses located in a rural area were more likely to use cellular than were businesses located in an urban community. As well, larger businesses with more employees and higher gross revenues had a higher rate of cellular phone use, despite the fact that cellular use may be just as important, if not more important to smaller companies. Legal status also played a part in determining cellular phone use, although this may be a result of the fact that sole proprietorships employ fewer workers and have lower gross revenues. Size of urban community does not appear to be a contributing factor to the use of cellular phones.

Use of Mobile Phones

A distinction is made between mobile and cellular phones, even though they both provide mobile phone service. This is based mainly on a difference in technology. Whereas mobile phones are an

older technology that requires the assistance of an operator, cellular phones are more portable and are used for direct communication with no operator assistance. As well, mobile phone service was available more widely than cellular phone service. Even so, only 6 percent of the businesses in rural Manitoba used mobile phones in 1994. The majority of businesses (38 of 56) that used a mobile phone had only one phone, but 11 businesses did have two mobile phones.

The business sectors with the highest use rates of mobile phones were the restaurant/accommodation/recreation sector (SIC=9) at 11 percent, the equipment manufacturing/wholesale sector (SIC=3) at 10 percent, the transport sector (SIC=5) with 8 percent and the food,beverage,tobacco/wood & paper/energy sector (SIC=1) with 8 percent (Table 23, Appendix B). The other sectors' use was very low.

Rural businesses (7 percent) were somewhat more likely than urban businesses (5 percent) to have a mobile phone.

Mobile phone use increased steadily as the number of employees in a business increased (Table 24, Appendix B), but the association between the two was not statistically significant. Similarly, the distribution of the use of mobile phones was fairly even among gross revenue categories (Table 25, Appendix B).

Since the use of cellular phones is determined partially by location, one would expect businesses that do not have access to cellular phone service to use mobile phones. This was in fact the case. Businesses in the southern part of Manitoba had a much smaller incidence of mobile phone use as compared to businesses in Norman. A significant association occurs between mobile phone use and geographic location (Table 26, Appendix B).

Mobile phone use was distributed relatively evenly among the various sizes of communities. It appears that the population of an area has no bearing on whether a business used a mobile phone (Table 27, Appendix B). The use of mobile phones also varied little with the legal status of a business (Table 28, Appendix B).

In summary, mobile phones were not a popular telecommunication option in 1994. Only one factor was associated with whether a business used mobile phones and that is the business' geographic location. Mobile phones were used in areas where cellular phone service is either not available or the service is poor because the business is located on the fringes of an access area.

Use of Pagers

Only 6 percent (63 of 1007) of rural businesses surveyed used pagers in 1994. The majority of these businesses had used pagers for more than 2 years (34 of 63). As well, 39 of the 63 businesses had only one pager in use.

Among types of businesses, highest pager use rates occurred in the chemical/metallic products sector (SIC=2) at 15 percent, and the construction sector (SIC=4) with 11 percent (Table 29, Appendix B). The remaining sectors had a low incidence of pager use. A significant association was evident between use of a pager and type of business.

There was a small difference (4 percent) in pager use between rural and urban regions, with higher use rates (7 percent) in urban areas.

The use of pagers was higher in larger businesses and lower in smaller business. Greatest use occurred in businesses with 11-50 employees (19 percent) (Table 30, Appendix B). Similarly, the

greater a company's gross revenue, the more likely that company was to use pagers, reaching a high of 11 percent in the highest revenue category (Table 31, Appendix B).

Different use rates for pagers by region was sufficient to produce a statistically significant association. Central Plains had the highest incidence of pager use at 11 percent, followed by the Interlake and Norman at 8 percent. Parkland had the lowest use of pagers at 2 percent (Table 32, Appendix B).

Businesses in communities with populations of >5,000 people had a greater use rate for pagers than did businesses located in areas of lower population (Table 33, Appendix B). Observed differences, however, range only between 0-9 percent among community category.

Among the various legal types of businesses, the highest use rate for pagers occurred for businesses in the "Other" category (14 percent, primarily Co-ops) and in incorporated businesses (9 percent) (Table 34, Appendix B). Partnerships and sole proprietorships had the same level of use (4 percent). A significant association occurs between legal status and pager use. Sole proprietorships had the highest percentage of businesses with low gross revenues and the largest percentage of businesses that employ 10 or fewer employees. Both variables affect the use of pagers.

In summary, the pager was not a popular option in 1994, as only 6 percent of businesses used one. Businesses within SIC sectors 2 (chemical and metallic products) and 4 (construction) were more likely to use pagers. Companies that employed more than 10 people and had gross revenues of >$100,000 also were more likely to use pagers. In addition, businesses located in communities with populations of >5,000 people were more likely to have a pager than were businesses located in smaller communities. Sole proprietorships and partnerships had much lower use than incorporated businesses and businesses in the "Other" category.

Use of FM Band Radio by Businesses in Rural Manitoba

FM band radios were used by 11 percent of those surveyed (108 businesses). This is the second highest percentage among the four types of mobile telecommunication options that businesses were questioned about (cellular is highest). Many businesses (51 of 108) that used radio had five or more radios installed, not including the home base.

Businesses in the Transportation/Communication sector (SIC #5) made the highest use of FM band radios at 26 percent (taxis, school buses etc). This use rate was followed by that for Food, Beverages and Tobacco businesses (SIC #1; 24 percent) and by Construction (SIC=4; 17 percent) (Table 35, Appendix B). Both the Health sector (SIC=8) and the General Business Services sector (SIC=7) did not use radios. FM band radio use was associated significantly with business type.

Businesses located in rural areas (21 percent) had a much higher incidence of FM band radio use then did urban businesses (8 percent). This difference is significant (Table 36, Appendix B).

Radio use was significantly higher for businesses with >11 employees, as compared with those with fewer than 11 employees (Table 37, Appendix B). Similarly, radio use was considerably higher for businesses with gross revenues of more than $500,000, than for all other businesses (Table 38, Appendix B). Results, therefore, are consistent for both measures of size of business.

The distribution of radio use among the different regions was very even, indicating that radio use was not affected by the business's geographic location (Table 39, Appendix B). Also, with a spread

of only 7 percent, there is no significant association between size of community and FM band radio use (Table 40, Appendix B).

Similar to mobile and cellular phone use, incorporated businesses and businesses in the "Other" category made greater use of FM band radio than did businesses that are partnerships or sole proprietorships. The association between a company's legal status and FM band radio use is significant (Table 41, Appendix B).

In summary, the majority of FM band radios were used by businesses within Transportation/Communication, Construction, Equipment and Food, Beverage/Wood and Paper/Energy sectors. Use was non-existent for the Business Services and Health sectors. Radios were used more frequently by businesses located in rural areas, by businesses with >10 employees, and by businesses with gross revenues of >$500,000. Size of community did not affect whether or not a business used radio. Legal status of a business and radio use were related.

USE OF FAX MACHINES

Forty-seven percent of all businesses surveyed owned or leased a fax machine. Of the 531 business that did not have a fax machine, only 109 (21 percent) planned to purchase or lease one in the near future. This question did not account for businesses that did not have a fax machine but used one at a different location (e.g.: local bank, town office, other business).

The highest ownership of fax machines occurred within the Business Services sector (83 percent) and the Finance/Insurance sector (77 percent) (Table 42, Appendix C). The lowest use occurred in SIC sectors 8 through 12, with the lowest being that of Food retail (30 percent) and the Health sector (33 percent). A strong association was evident between type of business and ownership of a fax machine.

Businesses within an urban community were more likely to have a fax machine than were businesses located in a rural area (Table 43, Appendix C). This could be a result of the fact that the two sectors that had the highest fax use had only a few businesses located in rural areas (1 for SIC=6, and 2 for SIC=7).

The probability that a company had a fax machine increased with the number of employees (Table 44, Appendix C). Values ranged from 18 percent for single employee businesses to 86 percent for large firms. Similarly, the higher the gross revenue of a business the more likely the business was to have a fax machine (Table 45, Appendix C). There was a significant association between both number of employees and gross revenue and fax ownership.

Fax machine ownership is highest in the Central Plains area and in Norman. Considering the remoteness of even the largest communities in Northern Manitoba, it is not surprising that 56 percent of businesses have a fax machine. A recent postal strike just about wiped out northern businesses because customers could not send either orders or payments, forcing the businesses to acquire fax machines to circumvent mail services. It has already been noted that Central Plains generally has a higher total usage of mobile telecommunications, so perhaps the Central Plains is more advanced in terms of adopting and using advanced technology in general (Table 46, Appendix C).

In general, the larger the population of an area, the more likely businesses located there owned or leased a fax machine (Table 47, Appendix C) (X^2=20.67, $p<0.05$). Values range between 38-55 percent among community size categories, and the association was significant.

Sole proprietorships (33 percent) and partnerships (43 percent) owned fax machines less often than did incorporated businesses (65 percent) and businesses in the "Other" category (55 percent) by a statistically significant margin (Table 48, Appendix C).

In summary, the type of business determined the ownership of a fax machine. Businesses in the Financial/Insurance and Business services sectors had a higher incidence of fax machine ownership than did businesses in the Food retail, Health, Consumer Goods and Services and Restaurant sectors. The larger a company (measured by either gross revenue or number of employees) the more likely the company had a fax machine. Regional location did have an affect on whether a business had a fax machine, with Norman and Central Plains having the highest incidence of use. There also was an association between the population of a community and fax ownership with businesses located in a population area of >5,000 people being more likely to have a fax machine than businesses located in areas with lower populations. Finally, an incorporated business was more likely to have a fax machine than was a sole proprietorship or partnership.

COMPUTERS IN RURAL BUSINESS

Overall, 46 percent of all rural Manitoba businesses owned or leased a computer in 1994. Of the 533 businesses sampled that did not have a computer, 148 (28 percent) were planning to purchase a computer in the near future. Sixty-six businesses indicated that they had some type of local area network. Of the remaining 400 businesses that had a computer and no local area network, the majority (67 percent) had only one computer in use. Seventeen percent had two computers. When asked if they planned to install a LAN in the near future, 41 of 400 answered positively.

Businesses in the Finance/Insurance sector (89 percent) and the Business services sector (86 percent) had the highest incidence of computer ownership (Table 49, Appendix D). The lowest incidence of ownership occurred in the Restaurant/Accommodation/Recreation sector (29 percent). A significant association exists between the type of business and whether a computer was used within that business.

There was little difference between computer use by rural based businesses versus urban based businesses (Table 50, Appendix D). Forty-five percent of rural and 47 percent of urban businesses had computers.

The incidence of computer ownership steadily increased as the number of employees and gross revenue of a business increased (Tables 51 and 52, Appendix D). These associations were significant. Values ranged from 25 percent with single employees to 86 percent with >50 employees, and from 27 percent with revenues <$50,000 to 72 percent with revenues >$500,000.

Among regions, businesses in the Central Plains had the highest incidence of computer ownership (56 percent). The Interlake ranked lowest with 38 percent of businesses surveyed having a computer. Norman had 39 percent ownership. Other regions have values between 46-50 percent (Table 53, Appendix D).

The low incidence of computer ownership in the Interlake may be attributed to two factors. First, the Interlake sample had the highest percentage of businesses with 10 or fewer employees (86 percent), and the association between number of employees and ownership shows that the fewer people employed, the smaller the probability that a business had a computer. Second, the Interlake sample also had the highest percentage of businesses with gross revenues of <$250,000 (64 percent). When the same two factors were compared for the Central Plains area it has the lowest

percentage of businesses with 10 or fewer employees (75 percent) and the lowest percentage of businesses with gross revenue at <$250,000.

Businesses located in larger communities (>2,000 people) were more likely to have a computer than were businesses in smaller communities (Table 54, Appendix D). Values ranged from 37 to 54 percent, and varied enough to produce a significant association between computer ownership and the population of a community.

Incorporated businesses (63 percent) had a higher ownership of computers than did sole proprietorships (34 percent) and partnerships (Table 55, Appendix D). The values vary enough among categories to produce a significant association between the legal status of a business and computer ownership.

In summary, the business sectors with the highest ownership of computers were Finance/Insurance and Business Services. The lowest incidence of computer ownership was found in the Restaurant/Accommodation/Recreation sector. The larger companies , both in terms of gross revenue and number of employees, were more likely to have a computer than were smaller companies. As well, businesses in the Central Plains were more likely to have a computer than were businesses in the Interlake or the Norman regions. There also was a direct relationship between community size and computer use. A business's legal status played a part in computer ownership, with incorporated businesses having a higher computer ownership rate than sole proprietorships or partnerships.

DEDICATED LINES IN RURAL BUSINESSES

Business services (80 percent) and the Finance/Insurance sectors (70 percent) had the highest dedicated line installation rates (Table 56, Appendix E). The lowest incidence occurred in the Health sector (27 percent), and the Construction sector (33 percent). The association between the type of business and whether there was a dedicated line installed is significant.

Businesses located within an urban community in rural Manitoba were more likely (47 percent) to have a dedicated line than were businesses located in a rural area (33 percent) (Table 57, Appendix F). This probably relates to the expense that a business in a rural area would have to pay to get an additional line onto their property and to the fact that party lines were the norm until a few years ago. The difference is statistically significant.

There was a well-defined increase in the percentage of dedicated lines as the number of employees in a business increased (Table 58, Appendix E). A strong association was supported by the variation from 15 percent for single employee businesses to 86 percent for large businesses. Similar results occurred as a company's gross revenue increased. Values range from 19 percent for businesses with <$50,000 revenue to 77 percent for those with revenues >$500,000 (Table 59, Appendix E).

Among regions, Central Plains had the highest rate of installation of dedicated lines (54 percent) in 1994. Norman was second (52 percent). This is not surprising, considering that Norman also had the second highest incidence of fax machine ownership. Eastman had the lowest incidence of dedicated line installation (31 percent of businesses) (Table 60, Appendix E).

As the population of the community in which a business was located increased, so did the probability that a business had a dedicated line. There was a strong association between the population size and dedicated line installation, with values ranging from 24 percent in communities

with <500 residents to 57 percent in towns with >10,000 residents. Rural businesses had a 35 percent value (Table 61, Appendix E).

Incorporated (65 percent) and "other" businesses (55 percent) had much higher rates of use of dedicated lines than did sole proprietorships (29 percent) and partnerships (37 percent) (Table 62, Appendix E).

Since dedicated line installation is a result of a business having a fax or computer, it is logical to expect the same associations for these telecommunication modes. Business services and the Finance/Insurance sectors had the highest incidence of dedicated lines. As well, businesses located in an urban area were more likely to have dedicated lines than their rural counterparts. As the number of people a business employed and it's gross revenue increased, so did the incidence of dedicated lines installation. Just as fax usage was highest in Central Plains and Norman, and just as fax usage increases as population increases, so too did the incidence of dedicated lines.

SUMMARY

A summary of the most widely used advanced telecommunication equipment is presented for each of the independent variables (type of business, region, size of business, rural/urban location, legal status, and size of community). Selected dependent variables are the usage of fax machines, computers, cellular phones and dedicated lines.

Type of Business

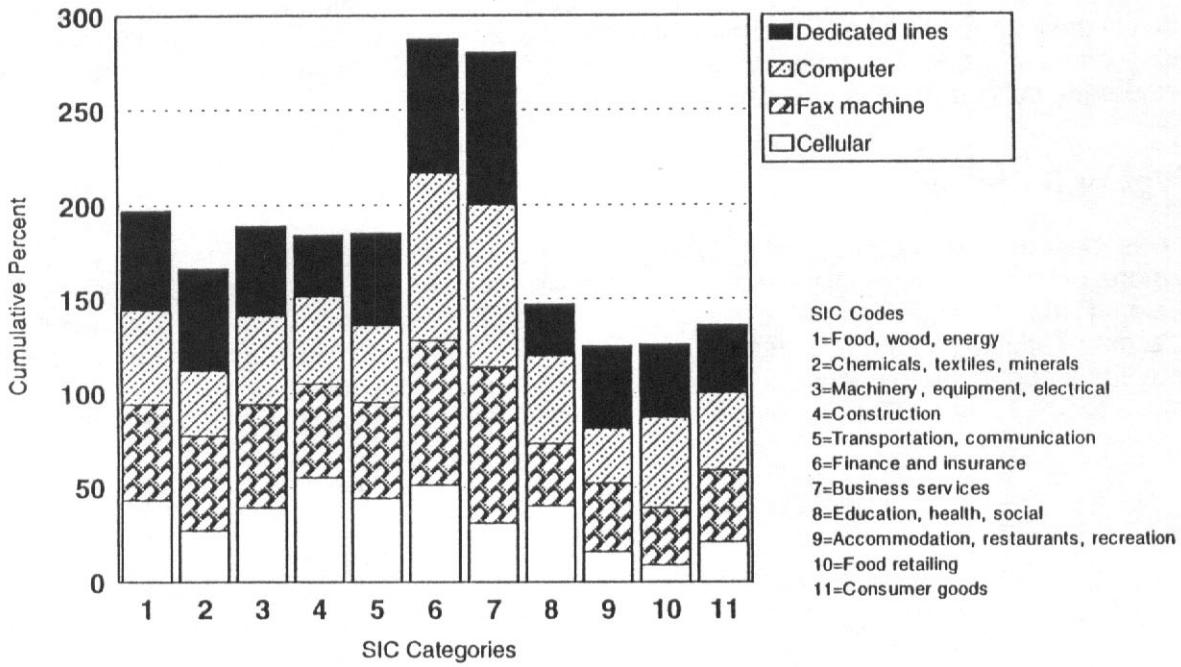
Use of each type of equipment by type of business (SIC) indicated that the two greatest users of more advanced equipment were businesses in the Finance/Insurance and the Business Services sectors (Table 10 and Figure 1). Businesses in Consumer Goods and Services, Food Retail, and Accommodation/ Restaurants/Recreation were the lowest users of equipment. Values were derived by adding the percentage of users for each type of equipment (cumulative scores). Total values for the highest user groups were nearly three times the values for the lowest user groups.

Table 10. Summary of selected equipment use by type of business

Equipment	1	2	3	4	5	6	7	8	9	10	11
Cellular	43	27	39	54	44	51	31	40	16	9	21
Fax machine	51	50	55	50	51	77	83	33	36	30	38
Computer	50	35	47	46	41	89	86	47	29	48	41
Dedicated lines	53	54	48	33	49	70	80	27	44	39	36

Figure 1

Cumulative Use of Selected Equipment by Type of Business



Variation by Region

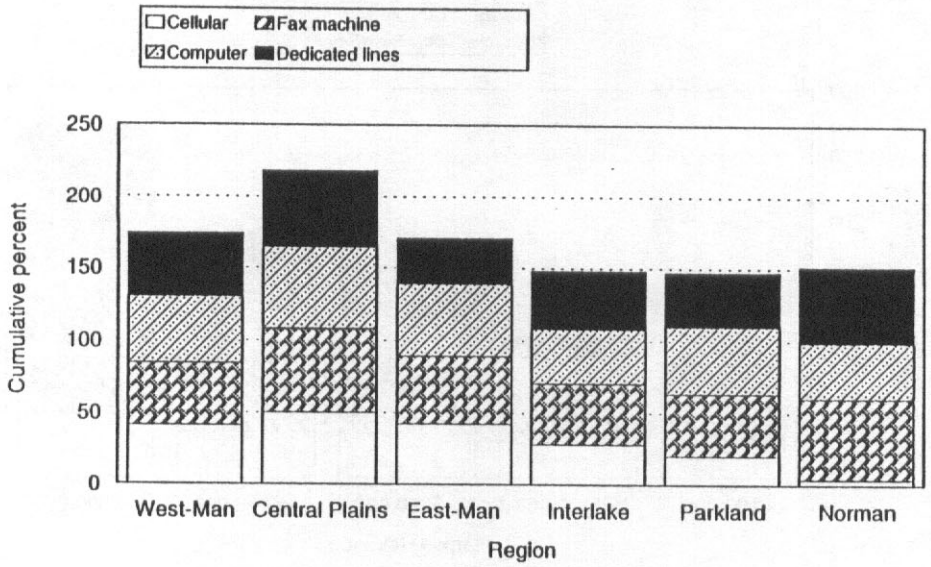
Table 11 presents the percentages of use and Figure 2 shows the cumulative use of selected equipment by region. Businesses in the Central Plains region were by far the greatest users of the listed equipment, with about 40 percent greater use than apparent in other regions. Use in other regions was relatively evenly distributed, ranging from a cumulative high of 175 percent to a low of 150 percent. Despite the fact that Norman did not have cellular phones, it had high values in terms of use of fax machines, computers, and dedicated lines.

Table 11. Use of selected equipment by region

Equipment	West-Man	Central Plains	East-Man	Interlake	Parkland	Norman
Cellular	41	50	42	28	20	4
Fax machine	43	58	47	42	43	56
Computer	46	56	50	38	47	39
Dedicated lines	43	54	31	40	37	52

Figure 2

Cumulative Equipment Use by Region



Size of Business

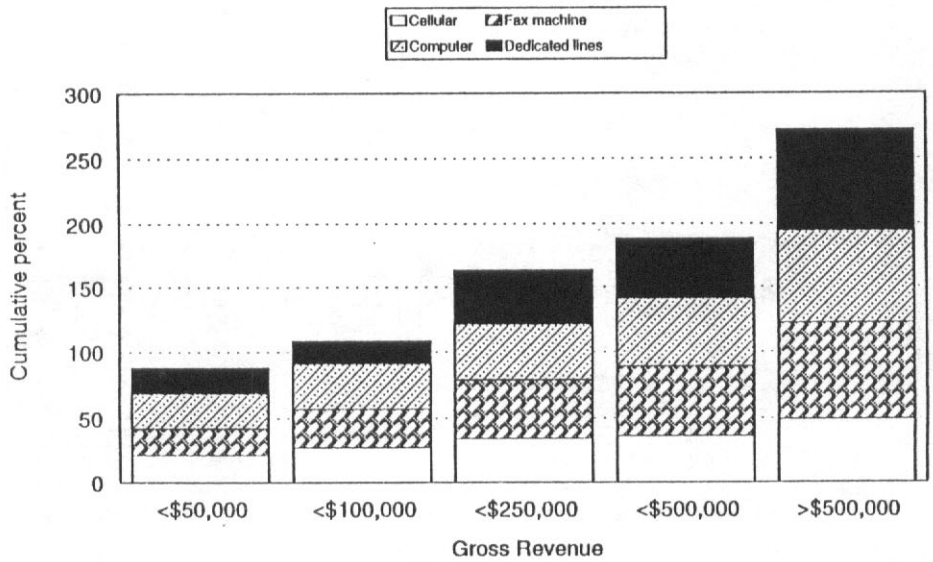
As demonstrated in previous analyses, there was a definite increase in use of equipment as the gross revenues of a company increased (Table 12 and Figure 3). Companies with higher gross revenues generally had more money not only to identify their telecommunications needs, but also to purchase equipment. All four types of equipment evaluated follow the trend, but variation in use of cellular phones was less pronounced. Use rates for fax machines, computers and dedicated lines were virtually identical among categories.

Table 12. Summary of equipment use by gross revenue of a business (percent)

Equipment	<$50,000	<$100,000	<$250,000	<$500,000	>$500,000
Cellular	21	27	34	36	49
Fax machine	21	30	45	53	73
Computer	27	34	42	52	72
Dedicated lines	19	17	42	47	77

Figure 3

Cumulative Use of Selected Equipment by Gross Revenue

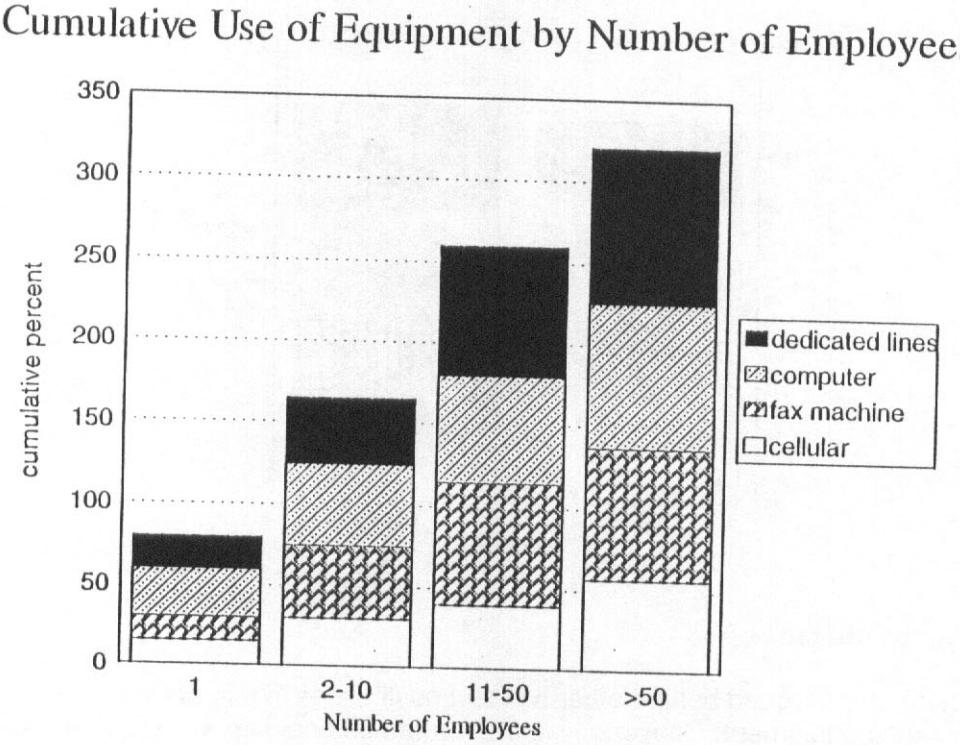


Similarly, there was a definite increase in use of equipment as the number of employees in a business increased (Table 13 and Figure 4). One can conjecture that the more employees a business had, the higher the company's gross revenue would be, and gross revenue has already been shown to be a predictor of use of advanced equipment. By either measurement, therefore, the use of modern telecommunications equipment increased as the size of business increased. When assessed by number of employees, the use by larger businesses was four times that of the smallest business when estimated by cumulative percentages (Figure 4).

Table 13. Percent use of equipment by number of employees in a business

Equipment	1	2-10	11-50	>50
Cellular	18	34	43	57
Fax machine	18	45	72	86
Computer	25	43	70	86
Dedicated lines	15	41	76	86

Figure 4



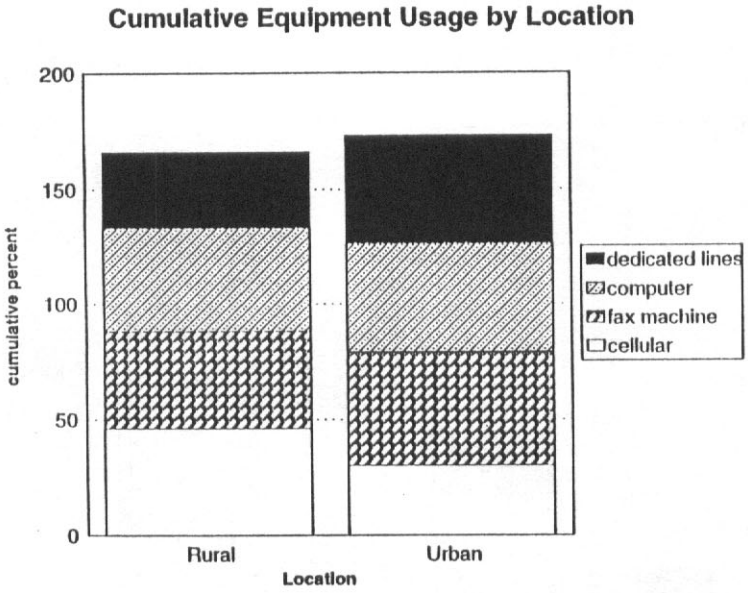
Urban versus Rural Based Businesses

Despite apparent differences between the use rates of dedicated lines (high in urban businesses) and cellular phones (high in rural businesses), they appear to cancel each other out when equipment use is evaluated on a cumulative percentage basis (Table 14 and Figure 5). This results in an apparent even distribution of cumulative equipment use by businesses in rural and urban locations.

Table 14. Use of equipment of rural/urban location

Equipment	Rural	Urban
Cellular	46	30
Fax machine	42	49
Computer	45	47
Dedicated lines	33	47

Figure 5



Legal Status of Business

Sole proprietorships lagged behind other types of businesses in use of more advanced types of telecommunication equipment. Conversely, incorporated businesses were further advanced. The reasons behind these differences may lie in the facts that sole proprietorships had less revenue and fewer employees, both of which have been shown to have an effect on equipment used.

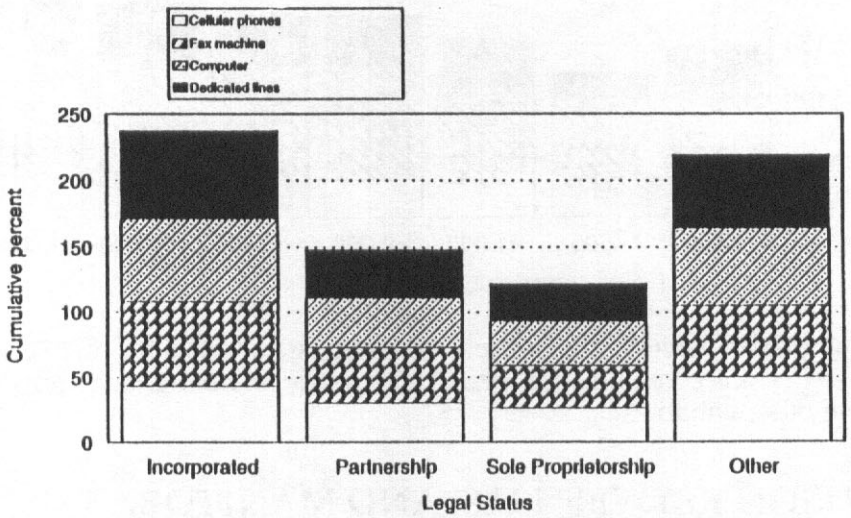
Incorporated businesses had the highest use rates for all types of equipment except cellular phones (Table 15 and Figure 6). Use by incorporated businesses was double that of partnerships and sole proprietorships, but less variation occurred with "other" forms of legal status. Although significant, differences in use according to legal status was less pronounced than that observed for other variables on a cumulative percentage basis.

Table 15. Use of equipment by legal status

Equipment	Incorporated	Partnership	Sole Proprietorship	Other
Cellular phones	43	30	26	50
Fax machine	65	43	33	55
Computer	63	38	34	59
Dedicated lines	66	37	29	55

Figure 6

Cumulative Use of Equipment by Legal Status



Size of Community

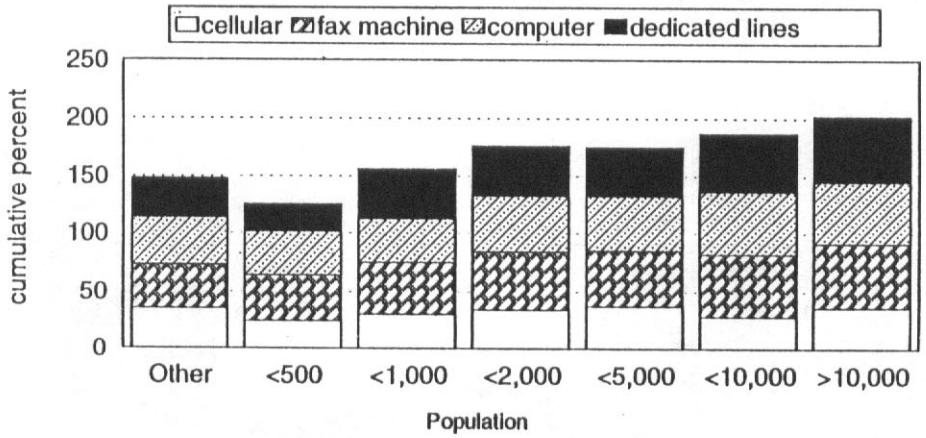
In general, as the population of a community increased so did the overall use of advanced telecommunication equipment by business (Table 16 and Figure 7). The only significant difference existed in the category "rural", where cumulative use was higher than that of communities with less than 500 people, but less than that of all other communities. The "rural" category is a catch-all for telephone area codes that did not map to a community or area for which Statistics Canada provided population counts from the last census.

Table 16. Use of equipment by size of community

Equipment	Other	<500	<1,000	<2,000	<5,000	<10,000	>=10,000
Cellular phone	35	24	30	34	37	28	36
Fax machine	38	40	45	50	48	54	55
Computer	40	37	37	48	47	54	54
Dedicated line	35	24	44	44	43	51	57

Figure 7

Cumulative Use of Equipment by Population



Based on cumulative percent, businesses in the largest communities had 75 percent higher use rates than those in small communities. Size of community, therefore, does not differentiate use as clearly as some other variables.

COMPARISON BETWEEN U.S. AND MANITOBA BUSINESS TELE-COMMUNICATIONS SURVEYS

In 1994, a survey was carried out for the National Federation of Independent Business Foundation (NFIB) in Washington, DC. The purpose of that study was "to investigate the importance of telecommunications services to small businesses in the United States and to explore their preferences as to how and by whom these services are delivered[3]. The questionnaire was mailed to 11,065 businesses randomly selected from the NFIB membership list, and 4,597 businesses responded. Although the purpose was different from that of this survey, there is some information that is available on types of telecommunication equipment used by businesses that can be used for comparative purposes. This information includes use of fax machines, modems, voice mail, 800 service, and pagers.

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3 Stephen C. Perry. Who Will Connect Small Businesses To The Information Superhighway? NFIB Foundation, December 1994.

Although the survey population was NFIB members, their characteristics are similar to the population of this survey. The majority of businesses are either sole proprietors or corporations, most of the sample population falls into the 2-10 employee range (61 percent), 78 percent of businesses that responded indicated that they are local businesses, and most businesses had only one location. Comparison between types of businesses is not possible because the NFIB survey uses a different classification. In total, the populations are similar and a comparison of the telecommunication use between the two groups is reasonable.

The NFIB data for fax machine ownership has 8 percent of the sample not responding, so the percentages are computed on the number that responded to the question. For comparison, all the NFIB data in categories '1', '2-3' and '>3' are combined. Statistical analysis indicates a significant difference between the two populations regarding fax machine use (Table 17). Businesses in Manitoba had a lower proportion of businesses using fax machines (47 percent) than do businesses that responded to the NFIB survey (68 percent) ($p<0.05$).

The NFIB data set for use of modems was compressed into a 'yes/no' category. The NFIB data set made no distinction between plain data modems and modems that also provide fax capabilities, so we combined these two categories for comparison. As well, in our survey the modem question was asked only of those businesses that had at least one computer, so our sample size is 465 businesses. The two surveys differ with regard to modem installation. A higher percentage of businesses in Manitoba (60 percent) had modems installed than did businesses that responded to the NFIB survey (50 percent) ($p<0.05$).

Businesses in Manitoba were much less likely to use pagers (6 percent) than were businesses that responded to the NFIB survey in the US (19 percent). The differences are statistically significant ($p<0.05$).

Another comparison available from the NFIB survey was that of the use of voice mail. As noted earlier, voice mail was not available to all businesses in Manitoba. The NFIB survey does not indicate if the same situation exists for its respondents. The differences in use of voice mail between the two populations is significant ($p<0.05$). In this case, Manitoba businesses (3 percent) were much less likely to use voice mail than were businesses responding to the NFIB survey (8 percent).

Finally, comparison of use of 800 services resulted in significant differences between the two populations ($p<0.05$). The business sample in Manitoba had a much lower usage (6 percent) of a 1-800 number than did businesses in the NFIB sample (24 percent).

In summary, Manitoba businesses had a lower use of fax machines, pagers, 1-800 numbers and voice mail than did their counterparts in the NFIB survey. The installation of modems, however, was higher for Manitoba businesses.

One can speculate why Manitoba businesses were lagging behind similar businesses in the United States with regards to telecommunications use. One explanation could be the fact that the NFIB survey was mailed, and the sample was 'self selecting' (people who feel they have little to offer do not respond to the survey). Although more than 11,000 NFIB surveys were mailed out, only 42 percent were returned, whereas the Manitoba survey had a sample size of 1,500 with 1,007 completed, a 67 percent response rate. One item noted during our phone survey was that some respondents felt that their response was of little importance if their business was small or if they did not use any equipment or services other than the telephone. It was only because of the personal nature of a telephone interview that many smaller companies completed the survey. This may have made a difference in the final results.

APPENDIX A

Standard industrial code groups

SIC Division	SIC Sector	Title
1	A	Food, Beverage and Tobacco
1	B	Wood and Paper
1	C	Energy
2	D	Chemicals, Chemical Products and Textiles
2	E	Metallic Minerals and Metal Products
3	F	Machinery and Equipment (except electrial machinery)
3	G	Transportation Equipment
3	H	Electrical and Electronic Products
4	I	Construction and Related Activities
5	J	Transportation Services
5	K	Communications
6	L	Finance and Insurance
7	M	General Services to Business
8	O	Education, Health and Social Services
9	P	Accommodation, Restaurants and Recreation Services
10	Q	Food Retailing
11	R	Consumer Goods and Services

Analysis of Survey

Type of Analysis Used

The Chi-Square (x^2) test was used throughout this report. This test provides a procedure for dealing with cross-classified data to determine if the variables in question are independent or not. This test was chosen because it makes fewer assumptions about the data. The analysis begins by making independence the null hypothesis (H_0). If the observed and expected frequencies are too far apart, the original assumption is rejected -that is, that the two variables are independent. The test is set up as follows:

H_0: X AND Y ARE INDEPENDENT
H_1: THEY ARE DEPENDENT
at the α=0.05 level of significance, reject H_0 if $v \geq x^2(1-\alpha),(r-1,c-1)$

The actual Chi-Square value used for comparison (v) was calculated by SAS, a statistical analysis application.

A second type of analysis was used to compare the results against those of other surveys. Since the data involved are binomial (yes or no), the test selected simply determines whether the proportions of the two populations (p_X and p_Y), that have a certain property are the same or different. Our purpose was to determine if Manitoba's population used a lower level of certain types of equipment than did other populations. The test was set up as follows:

H_0: $p_X = p_Y$
H_1: $p_X \neq p_Y$
at the α=0.05 level of significance, reject H_0 if either (a) $Z \leq -Z\alpha/2$ or (b) $Z \geq . Z\alpha/2$.

$Z\alpha$ is a value from a Z-table (in this test Z 0.05= 1.96), Z is a value calculated from the data, p_X is the proportion of businesses in this survey that used a certain type of telecommunications equipment and p_Y is the proportion of businesses in the other survey that used the same type of equipment. If the null hypothesis is accepted, we cannot conclude that our population had significantly a different use level of that type of equipment.

APPENDIX B

USE OF MOBILE TELECOMMUNICATIONS

Table 17. Total mobile telecommunication use by regional location (%)

Mobile index	West-Man	Central Plains	East-Man	Interlake	Parkland	Norman
0	53	42	53	62	66	71
1	36	42	35	29	28	24
2	9	13	8	7	6	5
3	2	3	4	1	0	2
4	0	0	0	1	0	0

Table 18. Total mobile telecommunication equipment use by SIC (%)[1]

Mobile index	1	2	3	4	5	6	7	8	9	10	11
0 (no use)	41	58	49	37	43	49	63	60	65	8	72
1 (one mode)	40	39	38	43	37	47	37	40	28	14	24
2 (two modes)	17	0	11	15	15	2	0	0	6	2	3
3 (three modes)	3	4	2	4	6	2	0	0	1	0	<1
4 (all modes)	0	0	0	<1	0	0	0	0	0	0	0

[1] SIC codes are listed in Appendix A

Table 19. Cellular phone use by SIC[1]

Measure	1	2	3	4	5	6	7	8	9	10	11
%	42	27	39	54	44	51	31	40	16	9	21
#	45/106	7/26	52/134	86/158	32/73	24/47	11/35	6/15	18/112	5/56	52/245

[1] SIC codes are listed in Appendix A

A significant association occurs between type of business and use of cellular phones ($X^2=94.37, p<0.05$)

Table 20. Cellular phone use by region[1]

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	41	50	42	28	20	4
#	136/330	79/158	56/133	40/144	22/110	5/132

[1] A significant association exists between region and use of cellular phones (X^2=95.87, $p<0.05$)

Table 21. Cellular phone use by number of employees[1]

Measure	1	2-10	11-50	>50
%	18	33	43	57
#	20/114	235/701	75/176	8/14

[1] A significant association exists between size of business and cellular phone use (X^2=23.05, $p<0.05$)

Table 22. Cellular phone use by gross revenue of businesses

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	21	27	34	36	49
#	32/155	35/132	52/152	37/102	106/215

Table 23. Mobile phone use by type of business (SIC codes)[1]

Measure	1	2	3	4	5	6	7	8	9	10	11
%	8	4	10	5	8	2	3	0	11	2	3
#	8/106	1/26	13/134	8/158	6/73	1/47	1/35	0/15	12/112	1/56	8/245

[1] SIC codes are listed in Appendix A

Table 24. Mobile phone use by number of employees[1]

Measure	1	2-10	11-50	>50
%	5	5	8	14
#	6/114	37/701	14/176	2/14

[1] No significant association occurs between number of employees and mobile phone use (X^2=3.40, p>0.05)

Table 25. Mobile phone use by gross revenue

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	7	3	7	7	7
#	10	4	11	7	14

Table 26. Mobile phone use by region[1]

Measure	Westman	Central Plains	East-Man	Interlake	Parkland	Norman
%	3	6	4	5	6	16
#	10	9	5	7	7	21

[1] A significant association occurs between region and mobile phone use (X^2=30.34, p<0.05)

Table 27. Mobile phone use by size of community

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>=10,000
%	6	8	7	7	5	7	4
#	16/275	3/38	7/102	9/139	5/96	11/160	8/197

Table 28. Distribution of mobile phone use by legal status of business

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	7	6	5	0
#	25/370	13/215	21/399	0/22

Table 29. Pager use by type of business[1]

Measure	1	2	3	4	5	6	7	8	9	10	11
%	9	15	5	11	6	2	3	0	8	4	3
#	9/106	4/26	7/134	18/158	4/73	1/47	1/35	0/15	9/112	2/56	8/245

[1] SIC codes are listed in Appendix A
A significant association occurs between type of business and pager use (X^2=20.11, $p<0.05$)

Table 30. Pager use by size of business measured by number of employees[1]

Measure	1	2-10	11-50	>50
%	2	4	18	7
#	2/114	29/701	31/145	1/14

[1] A significant association occurs between size of business and pager use (X^2=47.90, $p<0.05$)

Table 31. Pager use by size of business measured by gross revenue

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	4	2	5	4	11
#	6/155	3/132	8/152	4/102	24/215

Table 32. Pager use by region[1]

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	5	11	5	8	2	8
#	15/330	17/158	7/133	12/144	2/110	10/132

[1] A significant association occurs between region and pager use (X^2=12.48, p<0.05)

Table 33. Pager use by size of community

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>=10,000
%	34	0	56	5	6	9	1
#	10/275	0/38	6/102	7/139	6/96	14/160	20/197

Table 34. Distribution of pager use by legal status of business[1]

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	9	4	4	14
#	34/370	9/215	17/399	3/22

[1] A significant association occurs between legal status of a business and pager use (X^2=11.74, p<0.05)

Table 35. Radio use by type of business (SIC codes)[1]

Measure	1	2	3	4	5	6	7	8	9	10	11
%	24	4	11	17	26	2	0	0	8	4	4
#	25/106	1/26	15/134	26/158	19/73	1/47	0/35	0/15	9/112	2/56	10/245

[1] SIC codes are listed in Appendix A
A significant association occurs between type of business and ratio use (X^2=60.66, p<0.05)

Table 36. Radio use by rural/urban location[1]

Measure	Rural	Urban
%	2	8
#	44/208	64/799

[1] A significant association occurs between rural/urban location and radio use (X^2=29.70, p<0.05)

Table 37. Radio use by number of employees in a business

Measure	1	2-10	11-50	>50
%	2	9	23	21
#	2/114	62/701	41/145	3/14

Table 38. Radio usage by gross revenue[1]

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	7	9	7	5	19
#	11/155	12/132	11/152	5/102	41/215

[1] A significant association occurs between gross revenue and radio use (X^2=23.94, p<0.05)

Table 39. Radio use by region

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	11	11	11	9	13	10
#	36	17	15	13	14	13

Table 40. Radio use by population of community

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>=10,000
%	13	11	14	10	13	7	9
#	35/275	4/38	14/102	14/139	12/96	11/160	18/197

Table 41. Distribution of FM band radio use by legal status of business[1]

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	15	10	6	32
#	55/370	21/215	25/399	7/22

[1] A significant association occurs between a business' legal status and radio use ($X^2=25.32$, $p<0.05$)

APPENDIX C

USE OF FAX TECHNOLOGY BY RURAL BUSINESS

Table 42. Fax ownership by type of business[1]

Type of business (SIC codes)											
Measure	1	2	3	4	5	6	7	8	9	10	11
%	51	50	55	50	51	77	82	33	36	30	38
#	54/106	13/26	74/134	79/158	37/73	36/47	29/35	5/15	40/112	17/56	92/245

[1] SIC codes are listed in Appendix A.
A significant association occurs between type of business and use of FAX (X^2=61.70, $p<0.05$)

Table 43. Fax ownership by rural/urban location

Measure	Rural	Urban
%	42	49
#	88/208	388/799

Table 44. Fax ownership by number of employees in a business

Measure	1	2-10	11-50	>50
%	18	45	72	86
#	21/114	317/701	126/145	12/14

Table 45. Fax use by gross revenue of business

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	21	30	45	53	73
#	33/155	39/132	69/152	54/102	157/215

Table 46. Fax ownership by region in Manitoba

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	43	58	47	42	43	73
#	141/330	91/158	63/133	60/144	47/110	157/132

Table 47. Fax machine ownership by size of community[1]

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>=10,000
%	38	40	45	50	48	54	55
#	103/275	15/38	46/102	70/139	46/96	87/160	109/197

[1] A significant association occurs between size of community and use of FAX machines (X^2=20.67, $p<0.05$)

Table 48. Distribution of fax machine ownership by legal status[1]

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	64.6	43.3	32.8	54.6
#	239/370	93/215	131/399	12/22

[1] A significant association occurs between legal status and use of Fax machines (X^2=79.79, $p<0.05$)

APPENDIX D

Table 49. Computer ownership by type of business[1]

	Type of business (SIC codes)										
Measure	1	2	3	4	5	6	7	8	9	10	11
%	50	35	47	46	41	89	86	47	29	48	41
#	53/106	9/26	63/134	72/158	30/73	42/47	30/35	8/15	32/112	27/56	100/245

[1] SIC codes are listed in Appendix A
A significant association occurs between type of business and computer ownership (X^2=76.97, $p<0.05$)

Table 50. Computer ownership by rural/urban location

Measure	Rural	Urban
%	45	47
#	93/208	372/799

Table 51. Computer ownership by number of employees in a business[1]

Measure	1	2-10	11-50	>50
%	25	43	70	86
#	29/114	300/701	123/145	12/14

[1] A significant association occurs between number of employees and computer ownership (X^2=72.24, $p<0.05$)

Table 52. Computer ownership by gross revenue of a business

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>$500,000
%	27	34	42	52	72
#	42/155	45/132	64/152	53/102	155/215

Table 53. Computer ownership by region

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	46	56	50	38	47	39
#	152/330	89/158	66/133	54/144	52/110	52/132

Table 54. Computer ownership by community size[1]

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>10,000
%	40	37	37	48	47	54	54
#	110/275	14/38	38/102	66/139	45/96	86/160	106/197

[1] A significant association occurs between size of community and computer ownership (X^2=17.2, $p<0.05$)

Table 55. Distribution of computer use by legal status of a business[1]

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	63	38	34	59
#	233/370	81/215	137/399	13/22

[1] A significant association occurs between legal status and computer ownership (X^2=72.2, $p<0.05$)

APPENDIX E

Table 56. Dedicated line installation by type of business (SIC categories)[1]

Measure	1	2	3	4	5	6	7	8	9	10	11
%	53	54	48	33	49	70	80	27	44	39	36
#	56/106	14/26	64/134	52/158	36/73	33/47	28/35	4/15	49/112	22/56	89/245

[1] SIC codes are listed in Appendix A
A significant association occurs between type of business and dedicated line installation (X^2=53.4, $p<0.05$)

Table 57. Dedicated line installation by rural/urban location[1]

Measure	Rural	Urban
%	33	47
#	69/208	378/799

[1] A significant association occurs between rural/urban location and installation of dedicated lines (X^2=13.3, $p<0.05$)

Table 58. Dedicated line installation by number of employees in a business[1]

Measure	1	2-10	11-50	>50
%	15	41	76	86
#	17/114	285/701	133/145	12/14

[1] A significant association occurs between number of employees and dedicated line installation (X^2=123.02, $p<0.05$)

Table 59. Installation of a dedicated line by gross revenue of a business

Measure	<$50,000	<$100,000	<$250,000	<$500,000	>=$500,000
%	19	17	42	47	77
#	30/155	23/132	64/152	48/102	166/215

Table 60. Dedicated line installation by region

Measure	Westman	Central Plains	Eastman	Interlake	Parkland	Norman
%	43	54	31	40	37	52
#	141/330	85/158	53/133	58/144	41/110	69/132

Table 61. Dedicated line installation by size of community

Measure	Other	<500	<1,000	<2,000	<5,000	<10,000	>10,000
%	36	24	44	44	43	51	57
#	97/275	9/38	45/102	61/139	41/96	82/160	112/197

Table 62. Distribution of dedicated line installation by legal status

Measure	Incorporated	Partnership	Sole Proprietorship	Other
%	65	37	29	55
#	239/370	79/215	116/399	12/22