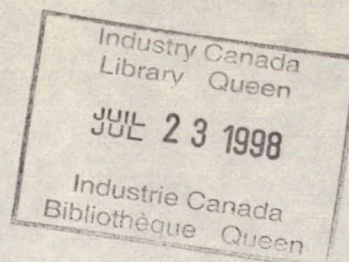


**Videotex and the
Canadian labour market
: some potential effects**

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VIDEOTEX AND THE CANADIAN LABOUR MARKET:
SOME POTENTIAL EFFECTS

prepared for the
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I. Introduction

Much has been written about a technological "revolution" now underway in the field of microelectronics and computer communications. This "revolution" is thought to be sweeping us into the post-industrial society at a rapid pace and it is, therefore, a matter of the highest priority and urgency that governments act now to exploit to the fullest the potential benefits of the new microelectronics while at the same time, minimizing any disruptive effects on the economy generally, and the labour market in particular.

"The technology of communications is in a period of revolutionary change." (Martin, 1978)

"A new wave of technology is about to sweep Canada. The critical question is the extent to which Canadians will participate in this rapidly growing area. The technology is developing so quickly that even knowledgeable persons in the industry have trouble keeping abreast of developments. The prime purpose of this paper is to underscore the immediacy of the issue. We do not have the luxury of time." (Science Council of Canada, October, 1978)

"Canada is going through a revolution whose social, economic and cultural effects are likely to be more far-reaching than most of us can imagine, more drastic in its transformation of human lives and society than any revolution in history. We are, in common with other industrilized countries, in the midst of a revolution brought on by the meshing together of communications and computers in ways that have transformed our traditional notions about signals, systems and carriers." (Ostry, January, 1979)

The frequent reference that is made to this class of developments as "revolutionary" would seem to imply that Canada is on the threshold of substantive structural changes of a kind that could re-shape the economy in a very profound manner. The extent of the changes foretold and the speed with which changes are coming convey a sense of urgency for governments to act. How they should act, and in what way relevant policies should be modified or changed, is the subject of much debate and will likely continue to be so in the period ahead.

Since 1770, when Hargreaves patented the spinning jenny and set off what was to become known as the industrial revolution, technological change has been a cause for much debate and at times the cause for grave concern. The major technological changes now confronting Canada and the rest of the world are no different in this respect. At the core of it is microelectronics.

"Microelectronics is a technology that can deal with a huge variety of tasks involving the reception, manipulation, and transmission of information. The electronic component that best illustrates the application potential of this technology is the microprocessor. It represents a 'universal' piece of circuitry since, like a conventional computer, it can be given a series of programmed instructions to deal with any number of different functions." (McLean, March, 1979)

Videotex is a specific product that exploits the new microelectronics technology.

Videotex is a generic term for "public, network-based interactive, information retrieval services" which use modified domestic television receivers as terminal equipment. Telidon is a specific type of videotex system, developed in Canada at the Department of Communications Research Centre. A request for information by a household or business videotex subscriber, and a resulting return information transmission, can be made via a telephone line, a modified cable TV line or (at some time in the future) an optical fibre.

The range of services that could be made available to business and household users through videotex is considerable.

"...such systems would allow the introduction of such things as electronic newspapers, electronic mail, electronic publishing by individuals, and many other business, entertainment and new home services, delivered electronically to home television receivers... Students could access many data bases for almost immediate display of data or graphics on their TV screens. Architects could transmit drawings to clients across town or across the country. Homebound persons could take university courses. The system would also make possible new outlets for artistic expression. Emergency services such as fire and burglar alarm systems could be provided. People in isolated areas would have access to a wide range of information and entertainment previously available only to those in the urban south." (Department of Communications, August 15, 1978)

The current status of videotex may be summarized as follows. The British Post Office is currently carrying out market trials of a videotex system called PRESTEL. Similar exploratory efforts with videotex are being made in France, Germany and Japan. Various field trials of such systems are planned or underway in the United States. In Canada, Bell Canada has recently announced field trials of its "Vista" videotex system on a small scale in Montreal, Toronto and Ottawa. A large-scale market trial is to begin in 1980. Similar field trials will soon be underway in Manitoba when the Manitoba Telephone System commences its experiment in new home information services.

There seems little doubt that videotex will soon be widely available. It does not seem to be a question of if it will be generally accepted but rather how quickly that acceptance will be gained. At this early stage in videotex development it is not known just how much the videotex equipment will cost, what services will actually be available on it or what will be the user cost of those services. That makes any projections at this time of videotex acceptance and use over the next decade and a half exceedingly difficult. For this study, two scenarios are assumed rather than forecast in order that some of the possible implications of videotex for the development of the labour market might be reviewed. As a meaningful basis for making forecasts becomes available, the projection of acceptance and associated implications can be accordingly revised.

It is assumed that the historical pace of market penetration of colour TV may be used as a possible guide to the pace of acceptance of videotex. (This is the approach taken by Tamec Inc. in their study cited in the bibliography). In Table 1 the penetration rate for TV sets in Canada is shown. It took a decade for that rate to reach two-thirds of Canadian households. In Table 2, two assumptions ("slow" and "fast") about videotex acceptance are portrayed for the period to 1995. The "fast" scenario shows videotex in two-thirds of all Canadian households by 1990; the "slow" scenario shows that two-thirds level being reached by 1995. It may well be the case that, in view of other developments taking place in the fields of satellite transmission, earth station technology and fibre optics that both of the scenarios in Table 2 may prove to be too slow.

TABLE 1
TV MARKET PENETRATION
Selected Years
(figures in brackets are percentages of all households)

Year	Number of households	Households with at least one TV set (all types)	Households with at least one colour TV set
1967	5,293,000	5,006,000 (95%)	106,000 (2%)
1972	6,111,000	5,853,000 (96%)	1,479,000 (24%)
1977	7,022,000	6,823,000 (97%)	4,764,000 (68%)

Source: Statistics Canada (cited in Tamec Inc., January, 1979).

TABLE 2
 VIDEOTEX MARKET PENETRATION:
 ALTERNATIVE SCENARIOS

Selected Years
 (figures in brackets are percentages of all households)

Year	Number of households	Households with videotex ("slow" acceptance)	Households with videotex ("fast" acceptance)
1980	7,629,000	38,000 (0.5%)	38,000 (0.5%)
1985	8,758,000	1,489,000 (17%)	2,190,000 (25%)
1990	10,054,000	4,524,000 (45%)	6,536,000 (65%)
1995	11,265,000	7,322,000 (65%)	9,500,000 (84%)

Source: Figures for 1980, 1985 and 1990 estimated by Tamec Inc. (see Tamec Inc. January, 1979). Extrapolations for 1995 by CANECS.

On the other hand, in view of the enormous range of regulatory matters that remain to be resolved, involving complex and sensitive negotiations between federal and provincial governments, it may be the case that the acceptance scenarios in Table 2 are too fast.

In the above, the resolution of relevant regulatory matters and the determination of relative prices for videotex equipment and videotex services were all mentioned as factors in the rate of household acceptance of videotex. Of course, the same factors have a bearing on business use as well. Interactive computing and the use of video display terminals for data input, manipulation, storage and retrieval have been growing in acceptance and use for some time in the business community. Data banks of information have expanded at a rapid pace, covering wider and wider classes of subject matter. One such "information bank" is that being offered by the New York Times:

"The Information Bank offers a wide variety of highly specialized services for business firms, industrial companies, the communications industry, government agencies, academic and public libraries. Whichever service (or group of services) is selected -- the end result is a structured information flow designed to meet current management needs The system's constantly expanding data base of over 1.4 million items is compiled from more than 70 worldwide publications..." (New York Times, advertisement)

With videotex, the scope for delivery of such services will be widened immensely.

As with most technological advances that have occurred since the earliest days of the industrial revolution there is concern about the possible effects of videotex. The potential impact of the new computer communications technology raises issues ranging from cultural and political sovereignty to economics.

"The new technology, when introduced, could have profound social and economic implications for the country, with particular impact on Canadian industry, education, balance of payments, public administration, health services, transportation, culture and mechanisms for financial transactions ... the technology, once developed into a full interactive network across Canada, offers enormous potential for increased leisure, universal access to knowledge, decentralization and participatory democracy by permitting Canadians to communicate and learn from one another more effectively than they ever have in the past. As well, the system would provide a low-energy alternative for many activities currently done by conventional transportation. This new technology also dovetails with a number of other recent developments, such as communications satellites, fibre optics, computer communications, and the interconnection of various advanced communications technologies, all of which are leading to what experts have been describing for some time as the post industrial or information society." (Department of Communications, August, 1978)

The economic issues arising out of the videotex development frequently are directed specifically at employment and unemployment. The microelectronics "revolution", like other technological developments of the past, raises the spectre in the minds of some of massive labour displacement and higher levels of unemployment. It is the potential labour market impact of videotex that is the focus of these notes although, it will readily become apparent that it is not possible in the limited time available, to isolate the specific effects of videotex from those of microelectronic developments generally, or indeed from the broader array of technological changes likely to be taking place in the period ahead.

Section II is directed toward some of the main aspects of the Canadian labour market, focussing particularly on its evolution to date. Section III focusses on the period ahead to the mid-1990's. It deals with population change, labour force participation and labour supply, on the one hand, and with output, productivity and labour demand on the other. The Section draws on materials prepared for two meetings of First Ministers on Medium Term Economic Prospects, one in February 1976, the other in November 1978. In Section IV, the issue of videotex as an element in technological change in the period ahead is addressed. What are the types of effects videotex might have on labour supply? On labour demand? What might be the relationship of videotex to the issue of "technological unemployment"? The final Section draws together the conclusions of the study and suggests some possible avenues for future research.

II. Recent Labour Market Developments

The principal features of the development of the Canadian labour market are widely known. For the purposes of this study, they will be summarized very briefly. The Economic Council of Canada 1976 published its report People and Jobs: A Study of the Canadian Labour Market. That report, and the supporting studies, provide a useful information source for our purposes.

For many years, employment in Canada has increased at a substantially higher rate than in any other major industrial nation. However, in spite of that expansion in employment, the rate of unemployment has been trending upward. In 1967-68, the number of persons unemployed averaged 325,000; in 1977-78, the corresponding number was 890,000. As a percentage of the labour force the rate went from 4.2 per cent to 8.2 per cent in a decade. Over that same period, there was a net increase in total employment of 2.4 million persons, or about 30 per cent. However, increases in the size of the labour force outstripped the overall increase in the number of jobs available.

Table 3 summarizes selected employment statistics for the period 1967-1978. Of the age/sex groups shown, women in the age 25 and over group showed by far the largest increase, both in absolute terms and in percentage terms. In the period 1967-68,

women in the age 25 and over group accounted for 22 per cent of total employment. Men in the same age group accounted for 54 per cent of total employment. By 1977-78, the corresponding proportions were 27 per cent and 48 per cent. The proportion of total employment accounted for persons in the age 15-24 group remained about unchanged over the decade.

TABLE 3
EMPLOYMENT IN CANADA
BY SELECTED AGE AND SEX CATEGORIES
1967-1978

Year	Total	Men		Women	
		Age 25 and over	Age 15-24	Age 25 and over	Age 15-24
(thousands of persons)					
1967	7,451	4,058	1,001	1,606	787
1968	7,593	4,093	1,017	1,662	821
1969	7,832	4,178	1,052	1,742	860
1970	7,919	4,203	1,057	1,800	860
1971	8,104	4,245	1,083	1,876	899
1972	8,344	4,324	1,136	1,951	934
1973	8,761	4,448	1,230	2,083	1,000
1974	9,125	4,559	1,310	2,192	1,064
1975	9,284	4,605	1,299	2,304	1,077
1976	9,479	4,666	1,299	2,421	1,094
1977	9,648	4,714	1,317	2,517	1,100
1978	9,972	4,796	1,352	2,683	1,141
1967-68 to 1977-78					
Change	2,288	679	326	966	317
% change	30.4%	16.7%	32.3%	59.1%	39.4%

Source: Statistics Canada, The Labour Force Survey.

Table 4 summarizes data on the sectoral composition of employment in Canada over a 25-year period. To more clearly indicate the underlying long-term trends, the proportions of employed persons by sector are averaged over five-year intervals. The most notable changes were the following:

- declining relative importance of the Primary Sector (agriculture; forestry; fishing and trapping; mines, quarries and oil wells) and of the Manufacturing Sector
- increasing relative importance of the Services Sector, (community; business and personal services; public administration; and finance, insurance and real estate)

The substantial shifts in the distribution of employment by sector are reflected in the occupational distribution of the work force. Close to one-half of all jobs in Canada are now in office and professional occupations.

Like employment, the size of the labour force has also risen more rapidly in Canada than in other major industrial countries. The rapid increase reflects the combination of natural growth, net migration and higher rates of labour force participation. Table 5 summarizes labour force participation rates since 1967 by selected age and sex categories.

For men in the 25 and over age group the participation rate has tended downward reflecting a combination of demographic factors along with the trend toward earlier retirement. For persons in the 15-24 group, the period 1972 onward is characterized by a marked upward movement in rates of labour force participation. This may be attributed to a combination of a reversal of the earlier trend towards longer schooling, together with more part-time work by students.

TABLE 4
EMPLOYMENT IN CANADA
PERCENTAGE DISTRIBUTION BY SECTOR
1952-56 to 1972-76

Sector	1952- 1956	1957- 1961	1962- 1966	1967- 1971	1972- 1976
Primary ⁽¹⁾	20.1	15.6	12.3	9.8	7.8
Manufacturing	24.7	24.4	24.3	23.1	21.4
Construction	6.3	6.7	6.5	6.2	6.4
Transportation, Communication and other Utilities	9.9	9.7	9.0	8.8	8.7
Trade	16.4	16.8	16.7	16.6	17.3
Services ⁽²⁾	22.7	26.7	31.1	35.6	38.4

(1) Includes agriculture; forestry; fishing and trapping; mines, quarries and oil wells.

(2) Includes community, business and personal services; public administration; and finance, insurance and real estate.

Source: Statistics Canada, The Labour Force Survey.

TABLE 5
 LABOUR FORCE PARTICIPATION RATE IN CANADA
 BY SELECTED AGE AND SEX CATEGORIES
 1967-1978

Year	Total	Age Group: 25 & over		Age Group 15-24
		Men	Women	
1967	57.6	84.5	32.3	56.6
1968	57.6	84.0	32.8	56.5
1969	57.9	83.8	33.8	56.4
1970	57.8	83.3	34.5	56.0
1971	58.1	82.7	35.4	56.7
1972	58.6	82.3	36.2	58.1
1973	59.7	82.3	37.6	60.5
1974	60.5	82.2	38.5	62.5
1975	61.1	81.9	40.0	62.9
1976	61.1	81.1	41.1	62.4
1977	61.5	80.9	42.1	63.2
1978	62.6	81.0	44.0	64.4

Source: Statistics Canada, The Labour Force Survey.

For women in the 25 and over age group increases in rates of labour force participation have been considerable. This development has been analyzed as follows:

"The reasons for the increased participation of women in jobs outside the home are complex, but a number can be identified. First, while there has been a relative decline for some years in the kinds of physical jobs that are traditionally looked upon as a male preserve -- farming, fishing, logging, and mining -- employment has expanded sharply in white-collar occupations, including teaching, nursing, and other professions where the talents of women have been increasingly recognized, and in clerical, service, and recreation jobs. Second, rising costs are encouraging employers to develop part-time work or short-term jobs that permit the employment of women who are prepared, at least for the moment, to accept fairly low remuneration in return for more flexible employment arrangements that meet the needs of their immediate family circumstances. But of probably even greater significance are the social and cultural developments that have altered women's perceptions of their role in society, which, coupled with more effective birth-control methods, have led to reduced emphasis on child-bearing and to greater career orientation".
(Economic Council of Canada, 1976)

As the role of women in the work force has grown, their share of unemployment has also. Unemployment rates by selected age and sex groups are summarized in Table 6 for the period 1967-1978. It is clear that the relative unemployment rates of women and young people are considerably higher now than a decade ago.

In discussing labour force, employment and unemployment trends it is important to bear in mind that the figures represent "stocks" or snapshots of the numbers of persons in different labour force categories at various points of time. From week to week, from month to month, there is a considerable flow of persons into and out of the labour force, into and out of jobs, into and out of the ranks of the unemployed.

"Such movements are at once the life-blood and the bane of the allocative mechanism: the former because the mobility of people and the flow of jobs are essential for healthy economic growth; the latter because the infinitely varied characteristics of workers and of jobs, and the inevitable imperfection of the information system, combine to produce the mammoth task of matching them in the labour market. The immensity of this function may be appreciated when we bear in mind that the unemployed are workers of almost infinitely diversified characteristics relating to skill, experience, ambition, reliability, location, and wage aspirations, while vacancies may similarly be variegated according to skill requirements, working conditions, opportunity for advancement, location, and wages. The more readily these attributes are matched, the more quickly vacancies and unemployed workers will be transformed into additional employment. The more difficult the reconciliation, the longer the duration of vacancies and unemployment." (Economic Council of Canada, 1976)

The matching process of jobs and workers is facilitated through a variety of public and private placement services. The educational system in general, training and retraining programs in particular, seek to ensure the best possible fit of skill requirements and skill availabilities.

TABLE 6
UNEMPLOYMENT RATE IN CANADA
BY SELECTED AGE AND SEX CATEGORIES
1967-1968

Year	Total	Age Group: 25 & over		Age Group 15-25
		Men	Women	
1967	3.8	3.0	2.8	6.5
1968	4.5	3.5	3.3	7.7
1969	4.4	3.2	3.7	7.5
1970	5.7	4.1	4.4	10.0
1971	6.2	4.3	5.0	11.1
1972	6.2	4.1	5.7	10.9
1973	5.5	3.4	5.4	9.6
1974	5.3	3.3	5.1	9.3
1975	6.9	4.3	6.5	12.0
1976	7.1	4.2	6.6	12.7
1977	8.1	4.9	7.4	14.4
1978	8.4	5.2	7.7	14.5

Source: Statistics Canada, The Labour Force Survey.

Higher rates of unemployment now compared to a decade ago have been attributed to a number of factors. Some of these have to do with legislative and institutional developments. Others have to do with changes in attitudes, which in turn are interrelated with forces bearing on part-time work, job turnover, multiple job-holding and other phenomena. Notably missing in any review of factors bearing on recent higher levels of unemployment is any reference to "technological unemployment". The possibility of an accelerating rate of displacement of workers due to technological change was not considered important in the Economic Council's major study. Nor does such a factor get any mention in current economic reviews such as those contained in the Annual Report of the Governor of the Bank of Canada (1978) or the Economic Review of the Department of Finance (1978).

In contrast, the Science Council of Canada has been forcefully putting forward a point of view that technological factors are very important in shaping the Canadian economy and affecting its ability to sustain high and rising levels of employment and thus contain increasing unemployment.

"The Canadian economy is faced with a serious crisis which is manifest in high unemployment, persistent trade imbalances, and a falling currency. These immediate problems reflect a deeper crisis in the structure of Canadian industry, and in particular, manufacturing, which precedes the recent recession in the Western economies."

"High levels of technological and managerial truncation, and relative technological backwardness have placed Canadian industry at a particular disadvantage in light of the substantial changes taking place in world economies. The advanced industrial nations are moving into more technologically advanced forms of production -- the "new" industrial revolution. This trend threatens to outpace the innovative capacity of Canadian industry to such an extent that our manufactured products will no longer be competitive with those of our principal trading partners. Further, a number of developing countries with lower labour costs are moving into many of the conventional areas of industrial activity (e.g. assembly manufacturing operations), thus threatening to displace a significant number of Canada's traditional manufacturing activities through increased price competition. To maintain a high wage, high employment economy in the face of growing foreign competition, it is vital that Canada overcome the structural and technological weaknesses of its industry, quickly and effectively. A rebuilding of Canada's industrial structure as well as improving its technological capability is required." (Science Council of Canada, February, 1979).

To what extent technological factors may have in some way contributed to the increased average rates of unemployment over the past decade is not at all clear. But it is a question that would appear to warrant a closer look than it has received thus far, especially in view of the significance of some of the technological changes that have already occurred. For example, within the electronics industry:

"The computer and office equipment sub-sector has been transformed beyond recognition in the last ten to fifteen years; both its products and markets have changed significantly. In the early 1960s, the majority of office machines were mechanical or electromechanical, and electronic computers formed a relatively small proportion of the sub-sector's range of products and total sales. Over the last decade, almost every piece of office equipment has some form of microelectronic computing capability. The market growth for electronic computers themselves has been phenomenal, and there has been a trend towards the increased integration of every item of office equipment." (McLean, March, 1979).

It appears that there is no clear understanding of the Canadian labour market impact of some of the important technological developments of the past decade. That makes even more complex the task of anticipating the future labour market impact of important technological developments in the complex communications field.

III. Looking Ahead: Some General Considerations

As has already been noted, technological changes now underway in the microelectronics field are being hailed as "revolutionary". We are being warned to prepare for a major transformation of the economic market place and, therefore, of the job market as a consequence. We should expect to move into the "wired society", out of the industrial economy and into the information economy. Certain assumptions have been made about what that transition could imply in terms of videotex acceptance and use. It is the task now to set the stage to explore some of the economic implications of that transition. This will be done in the overall context of certain aggregate economic projections and targets. The microelectronics "revolution" in general, and videotex in particular, could have potential effects on job availability (both jobs created and jobs destroyed) and on labour supply. Both are discussed in the following section.

The Federal Minister of Finance presented a paper ("Canada's Economy - Medium-term Projections and Targets") at a meeting of First Ministers in February, 1978. A follow-up paper ("A Review of Canada's Medium-term Economic Projects") was presented to a First Ministers' Conference on the Economy in November, 1978.

"For some time governments at all levels have been aware of the need to extend the time horizon and the comprehensiveness of the framework in which policy issues should be analyzed. Efforts to provide a longer-term perspective have been made in dealing with specific policy questions such as tax reform or energy policy. As well previous Royal Commissions, the Economic Council of Canada and other non-governmental bodies have undertaken longer-term analyses. A detailed examination of the longer-run potential of the economy, its medium-term prospects and the issues which will confront us in attempting to improve economic performance in the medium and longer-term appears critical to the development of a medium-term economic strategy." (Department of Finance, February, 1978)

In contrast to a short-term framework for economic forecasting, the medium and long-term period is one in which the effects of changes in the rate of capital accumulation and changes in the technology of the economic process must be anticipated and accounted for. Given the apparent degree of effort, at both the federal and provincial government levels, that went into that projections and targets study, it should be a useful benchmark for the analysis which follows.

Over the longer-term, the size of the working-age population is a key determinant of labour market developments. There are two sources of change in the size of the working-age population: natural increase and net migration. The projections make fertility rate and immigration assumptions which result in much slower growth of the total population in the future than in the past. Those data are summarized in Table 7. The projected growth rates imply a total population of 25.8 million in 1985 and of 28.6 million in 1995. The corresponding labour force source

population in those years is 19.7 million and 22.2 million, respectively. A fertility rate of 1.8 was assumed over the projection period. Net migration of 100,000 persons per year was also assumed in the initial projections. In November, 1978, the latter assumption was modified downward and a net migration level of 50,000 per year on average was considered more realistic. That change, caused a further reduction in the forecast growth rate of the working-age population relative to historical rates.

To go from the labour force source population to labour supply, projections of participation rates had to be made.

"The projections indicate that the participation rate will stabilize in the period after 1986. This occurs despite a continuing rise in the female participation rate and is primarily due to demographic factors. As the population ages, the distribution of the population becomes more concentrated in the high participation rate age groups. As the aging process continues, however, a larger proportion of the population approaches the retired age and the participation rate ceases to increase." (Department of Finance, February, 1978).

Between 1981 and 1990, the projections show the overall male participation rate roughly stable (77.7%-77.9%), and the overall female participation rate rising only slightly (from 47.4% to 49.5%). By November, 1978, those assumptions were reconsidered and female participation rates were revised upward slightly.

TABLE 7

RATES OF GROWTH OF THE POPULATION AND
THE LABOUR FORCE SOURCE POPULATION:
1901-1976 and 1976-1995

	Total Population	Labour Force Source Population (1)
	(per cent)	
<u>Actual</u>		
1901-1911	3.0	3.2
1911-1921	2.0	1.8
1921-1931	1.7	2.1
1931-1941	1.0	1.6
1941-1951	2.0	1.6
1951-1961	2.7	2.1
1961-1971	1.7	2.3
1971-1976	1.4	2.1
<u>Projected</u>		
1976-1981	1.3	2.0
1981-1986	1.3	1.4
1986-1990	1.1	1.2
1990-1995	0.9	1.1

(1) Source population refers to persons 14 years of age and over prior to 1975 and persons 15 years of age and over thereafter.

Source: Department of Finance, February, 1978, p. 11.

Taking all of these factors together - the projection of natural population growth, net immigration and labour force population - one gets a view of the labour force growing much less rapidly in the future than it has heretofore. Probably the most critical assumption lying behind that projection has to do with the female labour force participation rate. It has been highly unpredictable in the past and projections have consistently erred on the side of understating female labour force growth. Nonetheless, to the extent that the projections of labour supply prove to be on track, there will be a diminishing rate of flow of workers to be absorbed into the economy of the next decade and a half. Such a trend would mitigate the pressures on the labour market to absorb workers technologically displaced as a consequence of the microelectronics "revolution".

The projections used a measure of aggregate labour productivity defined simply as GNE (i.e. real gross national expenditure) per employee.

"... growth in output per worker results from the interaction of a number of factors. Among the most important are: increases in the capital stock per worker; technological improvements; shifts in employment from low productivity to high productivity industries; large-scale exploitation of new resources; and, improvements in the education and skill levels of the labour force. Historically, all of these sources of productivity growth have contributed to the steady increase in output per worker which Canada has experienced." (Department of Finance, February, 1978)

For the period ahead, a slight decrease in the rate of productivity growth is foreseen.

"While there is little evidence to indicate a significant reduction in productivity growth it has been assumed that productivity will grow 2.0 per cent per annum for the foreseeable future, slightly less than the average growth of 2.2 per cent for the period 1954-1975." (Department of Finance, February, 1978)

The medium-term projections considered by First Ministers portray an evolving labour market whence net job creation expands at a sufficiently rapid pace to absorb a diminishing rate of increase in the labour force. Real output per worker continues to increase, but slightly less rapidly than in earlier historical periods. Unemployment rates overall are projected to trend downward slightly over the longer-term. The jump in the average unemployment rate from just over four per cent to over eight per cent in the past decade is not expected to be repeated for reasons of accelerating labour saving technological change in the economy or for that matter for any other reasons. Does such a view give sufficient recognition to the potential impact of the microelectronics "revolution" in general or to the widespread acceptance and use of videotex?

IV. Videotex and the Canadian Labour Market

In this section the objective is to focus on selected aspects of the possible Canadian labour market impact of videotex. It is assumed that the total Canadian population will grow to about 28.0 million in 1995 (an increase from just over 23.5 million at the present time). Among the approximately 11.0 million households in Canada at that time it is assumed that between 7.3 million and 9.5 million of them (an increase from zero at the present time) will have videotex equipment and access to a wide range of videotex services. What will be the possible labour market impact of such an extent of videotex market penetration? The general issue can be examined in terms of effects on labour supply and on job content and availability.

Labour Supply

Videotex could affect the rate of growth of the labour force source population in certain ways. A greatly expanded flow of information across international boundaries will expand the knowledge of persons outside of Canada about opportunities and life styles available here. In the same way, Canadians will become more knowledgeable about living conditions and employment opportunities elsewhere. An increase in the availability of such information could affect gross flows of immigrants and emigrants.

Net migration tends to be related to economic conditions in Canada relative to elsewhere. This is both a reflection of the

relative availability of employment opportunities to which workers respond, as well as a consequence of the management of immigration policy. Should there be any significant displacement of labour as a consequence of overall technological change or for any other reasons, resulting in high unemployment, this would tend to cause net migration to decline and the resulting growth of the labour force source population to diminish. On the other hand, to the extent that new technology may be creating job opportunities for skill groups in short supply in Canada, and assuming such skills are available elsewhere outside of Canada, relatively more workers may be drawn in than would be discouraged.

Educational planners and employment and immigration policy managers would obviously benefit from reliable projections of labour demand by occupational groups in the information economy of the next decade or so. Through appropriate policy adjustments, changes in the education system and manpower training programs could prepare Canadian residents for the opportunities that will be available in the information economy of the future. The need to fill such job opportunities with immigrants would be accordingly reduced. However, if the management of our education and training system is not sufficiently accommodating to changing market demands, then the need to meet skill shortages through encouragements to non-residents will be that much greater. Net migration and the rate of growth of the labour force source population will be affected accordingly.

It is possible that videotex could have an overall net impact on net migration and therefore on labour supply and unemployment. Whether it will do so will in part be determined by the foresight and wisdom of those who formulate, finance and implement various aspects of our education and training policies. The current problem in the Canadian universities in regard to the relative underfinancing of programs to train business managers and the consequent shortage of such Canadian-trained personnel is not encouraging in this regard.

The possible effect of videotex on labour force participation rates is particularly difficult to determine. Even the historical behaviour of participation rates is not well understood.

The task of empirically determining an individual's labour force status has always been a complex one. A series of concepts have evolved which, like the national income and expenditure accounts involve a market transaction and market activity test of one sort or another. The housewife who works in the home is not considered to be in the labour force; nor is the value of her work accounted for in the national accounts measure of output. Videotex, by effectively bringing the market place into the household in numerous ways, will complicate the application of definitions such as those for gainful employment, job seeking activity and so forth. But quite apart from measurement problems, the opportunity to be in the labour force will become available to a larger portion of the population as a consequence of the "electronic

highway" at least partly substituting for conventional transportation between places of work and places of residence.

Videotex technology and services will greatly expand the availability of educational, recreational and cultural services. This will affect decisions to enter the work force and decisions bearing on early retirement from the work force. The potential for videotex to enhance the quality of life, and the resulting implications for work attitudes, go well beyond a purely economic analysis.

As opportunities for capital labour substitution and for labour-saving technological change have expanded over the period in which industrial economies have developed, available work has been "shared" as a consequence of the shorter work day, the shorter work week and longer periods of annual leave. One would expect such a pattern to continue and possibly accelerate as a consequence of the microelectronics "revolution". Indeed, because of the potential for videotex to enhance the quality of life, there could be a considerable effect on an individual's work-leisure choice.

"Can we find work for people in spite of automation, or should we restructure work patterns so that people work less? An alternative to a high unemployment rate is a reshuffling of work so that everyone works shorter hours.... in a world characterized by high automation and a desire for leisure time, it would make sense to have a $3\frac{1}{2}$ day work week. Persons could work three days one week and four days the next, alternating three and four day weekends. The machinery and computers would work a seven-day week, run by alternating staff. We should slave-drive the machines in order that we can

have more leisure, or a richer life." (Martin, 1978)

As a consequence of changes in numbers of hours worked per year, the number of persons employed could continue rising, as has been forecast for Canada over the next number of years, while the number of manhours gainfully employed either increased less rapidly or even declined. Videotex could have an impact not only on the rate of labour force participation (whether persons choose to be in or out of the labour force) but also on the extent of labour force involvement as measured by hours of work.

Some of the potential effects videotex could have on labour supply have been indicated here. Some could work in the direction of augmenting labour supply while some could work in the opposite way to reduce labour supply. On the basis of the limited investigation possible thus far, we would have to conclude that the net overall direct effects of videotex on the rate of increase of the labour force would be negligible. This is, of course, not to say that for certain age and/or sex groups, participation rates could not be affected. Nonetheless, taking all of the forces together, it would appear at this time that supply augmenting effects could well about offset the supply diminishing effects.

Labour Demand

The conventional wisdom among economists in Canada who have looked at long-term employment prospects is that relative

declines in employment in goods production, as a consequence of capital investment, technological change and changes in consumer and business demand will be more than offset by a growth of employment opportunities in the service sector. The Department of Finance projections, for example, indicate such a pattern, at least to 1981 (that is as far forward as their sectoral employment projections go).

It should be noted that there are those who question the extent to which employment in service production will in fact be able to replace employment in goods production.

"Unfortunately, the crucial role that the manufacturing sector must play if full employment conditions are to be established in Canada is often overlooked. A particularly deceptive argument in this context is the view that Canada's economy can prosper on the basis of growth in "service sector" job-creation independently of manufacturing sector job-creation. This view reflects a superficial understanding of our economy. A large part of the service sector is intricately linked to the production of goods. A large part of the growth of service sector jobs is related to the production of goods rather than to the provision of services for final consumption. (Second Tier Committee, October, 1978)

"Canada depends on the service sector as the main employer of its increasing labour force. In this area, microelectronic devices can be expected to revolutionize product repair, medical diagnosis and treatment, education, administration of governmental benefit programs, consulting services, merchandising, and banking. Some services (such as word processing and telecommunications) will suffer particularly severe labour displacement. Canada must find a balance between the strategies of rapid development and exploitation of a microelectronics industry, which would improve international competitiveness, but cause

major dislocations of labour, and the retention of labour-intensive technology, which would lose employment to more efficient foreign competitors. (McLean, March, 1979)

On the one hand, service sector employment is seen by some as derivative from economic activity in goods production. On the other hand, there is potential for labour-saving technological change in the service sector which would permit purchases of services to continue to grow rapidly but with relatively less labour required in the provision of those services.

In looking at both the overall impact of videotex on employment and its possible impact on particular industrial sectors, the traditional differentiation of the industrial economy into goods producing and services producing may not be the most analytically useful one. In recent years there has been growing interest in the concept of "the information economy" as an extension of the service economy and the importance of analyzing economic activity generally, and labour market activities specifically, within an information economy framework. A number of the issues involved in the analysis of the information sector of the Canadian economy were examined in a CANECS study for the Department of Communications submitted in October, 1977 (see reference in bibliography). To understand the impact of videotex on (to use the language of the proponents of information economy accounts) knowledge producers, knowledge distributors, market search and

coordination specialists, information processors and information machine workers, would require a detailed analysis of hundreds of very specific occupational categories, their definitions and their activity content as well as their experience and skill requirements under current and probable future technologies. Such a detailed analysis is well beyond the scope of this preliminary study but would be worth undertaking for the purpose of determining the likely impact of videotex in particular, and of the microelectronics "revolution" generally, on specific classes of workers and jobs at a level of detail of relevance to manpower planners and education policy makers.

In looking into the labour market impact of technological advances such as videotex it is important to bear in mind, on the labour demand side of the market, it is not simply a question of jobs created or destroyed. Rather, the content of some jobs can be seen to be changed and it then becomes a matter as to how employers react to such changes. One long-established way, of course, is through a process of upgrading the skills of those already employed rather than releasing workers and trying to find qualified new ones. Simply put, one way in which videotex could have an impact on the labour market is through its effects on job content: job descriptions would evolve in accordance with the changing technology. This does not necessarily involve displacement -- and unemployment -- of people. So much will depend on how changes are introduced and what policy adjustments are made to ensure an economically

and socially desirable pattern of adjustment.

Taken together, the above-mentioned general categories of information economy workers accounted for 35.8% of the Canadian work force in 1961 and 39.7% in 1971. For comparison we note that the proportion of total payrolls accounted for by information workers in Canada in 1971 was 39.2% while in the United States, the corresponding proportion was 53.5%. We have some distance to go in the relative growth of our information sector, in comparison to the United States, even on the basis of current technology.

While the precise specification of what is and what is not included in the universe of information workers is subject to considerable controversy, for any particular specification the group has been growing as a percentage of the total work force and is generally expected to continue to do so. Videotex will not likely have any net affect on that trend although for specific sectors and occupational groups it could have an influence. For example, jobs filled by persons in occupational groups coming under the general categories of public information disseminators and communications workers can be expected to be positively affected by widespread videotex use. In contrast, jobs filled by persons in the general occupational group "search and coordination specialists" (which includes such persons as insurance salespersons and agents and real estate salespersons) would likely be affected negatively by videotex.

Table 8 identifies the occupational groups within the information sector where the impact of videotex could likely be most significant, and sets out the nature of such impacts. By impact is meant an affect on the rate of increase (or decrease) in the number of persons gainfully employed in the particular occupational category as a consequence of the widespread use of videotex. Of course, to say that videotex may have a negative impact on a particular occupational group does not mean that the number of persons in that group will decline. Rather, the group may continue to grow but for reasons other than videotex which outweigh the direct videotex effects.

On the basis of this preliminary review of the employment impact of videotex one sees, again, specific effects that could both create jobs as well as reduce job opportunities. Taken at the level of overall Canadian employment, the net effect of videotex could well be nil. Similarly, in terms of the overall composition and structure of the labour force, differentiated in terms of the widely-used general sectors specified in Table 4, the net effect of videotex could also be nil although, as we have noted, among the various information worker occupations there could be specific effects.

Videotex, like so many other developments in the micro-electronics "revolution" should contribute positively toward enhancing labour productivity. It should also contribute positively toward enhancing labour market efficiency. For example,

TABLE 8

DIRECTION OF LIKELY JOB IMPACT OF VIDEOTEX
BY OCCUPATION GROUP, INFORMATION SECTOR

	Positive	Neutral	Negative
<u>A. Knowledge Producers</u>			
Scientific and technical workers	*		
Private information services	*		
<u>B. Knowledge Distributors</u>			
Educators	*		
Public information disseminators	*		
Communications workers	*		
<u>C. Market Search and Coordination Specialists</u>			
Information gatherers		*	
Search and coordination specialists			*
Planning and control workers		*	
<u>D. Information Processors</u>			
Non-electronic based			*
Electronic based		*	
<u>E. Information Machine Workers</u>			
Non-electronic machine operators			*
Electronic machine operators	*		
Telecommunication workers	*		

videotex could have an important effect on regional unemployment and on reducing labour turnover (thus reducing the number of people "between jobs" and, therefore, the number of unemployed). Business opportunities in small towns and even in remote areas could be expanded. A greater dispersion of work opportunities could result from some of the advantages of the large business and commercial centres being made more widely available in smaller towns and rural areas through computer communications generally and videotex in particular.

"The rapid expansion of metropolitan areas in Canada at a rate of three per cent per year, compared with two per cent for medium-sized towns and cities, and one per cent for villages and hamlets, reflects the fact that most new investment is taking place in or around the metropolitan areas. The movement of population, native born and immigrant, to these growth areas follows naturally." (Economic Council of Canada, 1976)

Frictional unemployment associated with people re-settling has been one of the factors associated with such population movements. Videotex can take some of the factors bearing on work opportunities to where people want to live. Also, videotex coupled with developments in satellite transmission technology can bring many of the recreational and cultural benefits of the big cities to small town, rural areas and remote communities. This can have the effect of sharply reducing the labour turnover, often associated with boredom in such areas.

Videotex can serve as a powerful tool for enhancing the effectiveness of placement and counselling services and thus reducing the effort and expense associated with job search. Available work opportunities could be one of the many information services available on videotex, making just that much easier the task of matching available skills and interests with available employment opportunities.

The Canadian labour market could be faced with an accelerated pace of adjustment to evolving circumstances brought on by rapid technological advance, including introduction and widespread use of videotex. How well the market responds will depend in large measure on the economic policy environment that exists to facilitate that adjustment.

On the basis of this preliminary investigation we are drawn to the conclusion that, subject to government policies in all of those areas affecting the labour market evolving in an orderly manner to most readily facilitate technological adjustment, the net labour demand and supply effects of videotex, in aggregate, will be negligible. While certain classes of workers and jobs will be affected, so to should the efficiency of our market adjustment processes. Such a conclusion is not dependent on differences in assumptions about the speed of videotex acceptance and use on the order of magnitude discussed earlier in the report.

V. Summary, Conclusions and Directions for Further Research

There is the view, notably within the science and technology community, that society and the economy are at the threshold of "revolutionary" changes in microelectronics technology which potentially could have a pervasive impact on numerous aspects of our lives, on the economic system in general and on the labour market in particular. An important element in that new technology is the development of videotex systems, of which the Canadian Telidon system is the most advanced.

Telidon could make Canada a world leader in two-way television technology. Funds have been designated for carrying the development work through field trials. Should the developmental work on that particular system continue to progress as well as it has thus far, and should it emerge as the North American standard for all such systems, it could have important direct benefits for the Canadian electronics manufacturing industry. That industry has been faced with a rapidly expanding domestic market but, with a deteriorating foreign trade account in electronics products, a declining share of the Canadian market has been going to Canadian manufacturers. That share, presently about 60 percent, is down from almost 80 percent a decade ago. Correspondingly, employment in the Canadian electronics industry has generally been falling since the late sixties. It is widely

hoped that in the years ahead, Telidon technology may be the catalyst for bolstering the industry and improving its employment record.

This study does not address itself to the direct labour market effects of a possible revival of the Canadian electronics industry as a consequence of developments related to videotex in general, or Telidon in particular. Rather, it is directed to the broader questions of the acceptance and use of videotex on a broad scale in Canada over the next decade and a half and the resulting array of implications that may be felt, notably on employment, labour supply and unemployment. This is indeed an ambitious undertaking given that only a very short amount of time was available to take a look at the issue. What has been attempted is a first cut at the problem, to develop an understanding of the types of implications that could be felt and to identify, where possible, the groups in particular occupations or sectors most likely to be affected. In the course of the study the attempt is made to bridge the gap between the "revolutionary" effects anticipated by some of those in the science and technology community, and what might be described as the "conventional wisdom" about the evolution of our overall economy and its anticipated aggregate performance over the medium and longer term.

In looking at the array of factors having a bearing on the functioning of the Canadian labour market, one is confronted

by an extremely long list, ranging from strictly economic considerations to government policy, social customs, attitudes, weather conditions and geography. Needless to say, technology and technological change can also figure prominently in that array of factors affecting our labour market performance. To isolate the labour market implications of technological change, or of a specific type of technological advance such as videotex, is indeed a complex task. The Economic Council of Canada, after three years of intensive study, published its report on the Canadian labour market (People and Jobs: A Study of the Canadian Labour Market, 1976) in which technological change and its effects did not figure very directly or very prominently.

In view of the importance of recent developments in microelectronics technology, of which videotex is but one such development, it would appear timely and of some considerable priority to address the issue of whether accelerating displacement of workers and disruption of the labour market might be possible in the immediate future as a consequence of technological change. This brief study is a small step in that direction. Its principal task and achievement was to bring some of the relevant issues together and raise some questions about them.

The opening section of the report describes videotex in the context of the new developments in microelectronics technology. Drawing on a variety of recent sources (all of

which have been released either in 1978 or 1979) the nature of the technological "revolution" is discussed. Videotex in particular is seen as a vehicle for allowing household and business users the opportunity to do things they are now doing (such as making financial transactions, booking travel arrangements and being informed of current news developments) in more efficient and time-saving ways, and the opportunity to do things they are not now doing (such as participating in business meetings in Vancouver, Montreal and Halifax in the same day or enjoying a play at a distant out-of-town theatre) either because it is not possible to do so or it is too costly. One has only to read a volume such as James Martin's The Wired City to appreciate the vastness of the array of opportunities that the new technology can open up.

The principal conclusion one comes away with from the opening section of the study is that there is a significant number of voices talking about a "revolution" and meaning it quite literally in terms of the speed and extent to which accustomed ways of doing things could change.

The second section of the study reviews some of the principal features of the Canadian labour market as it has developed over the last number of years. Many of the main features are by now quite well known: the most rapid rate of job creation experienced by any of the major industrial countries,

rising relative importance of the service producing industries and "white collar" occupations, declining relative importance of the primary industries (i.e. as a major employer) and of the manufacturing sector, rapid increases in the size of the labour force, notably as a consequence of particular demographic developments but more importantly as a result of fast rising labour force participation of women and, more recently, of young people, and successively higher overall rates of unemployment, even when the economy in other respects is operating at high levels of demand and output, with a notable relative deterioration of the unemployment situation of women and the young.

The analysis of that section draws attention to two problems in the interpretation of the historical labour market record that are of particular significance for the present study. The first is that, in view of the developments that have occurred in the diffusion and implementation of computers and computer-related technologies over the past decade or so, there appears to have been little attempt to identify what effect, if any, such developments may have had on our deteriorating unemployment record. The second is the unsatisfactory state of our knowledge of the factors affecting labour force participation, notably of women, and specifically of the possible relationship between the creation of employment opportunities of particular interest to women arising out of computerization. An incomplete

understanding of the past relationship between technical change and labour market developments provides a shaky foundation for venturing to look at possible relationships between them in the future.

The third section of the report describes a view of the Canadian economy looking ahead about a decade and a half. The particular view described is one which was developed through consultations between economic policy makers in the federal and provincial governments and discussed at two meetings (in February 1978 and November 1978) of First Ministers. It is, therefore, a view of the Canadian economy of the future which is deserving of some attention. The projections period happens to coincide with that period of time when the science and technology community is claiming much of the impact of the new microelectronics technology will be felt and the time when the transition will be completed into the post-industrial information economy.

Demographic factors (shifting age distribution of the population and lower birth rate assumptions) and reduced rates of net migration combine to produce a profile of lower rates of growth of the Canadian labour force source population over the next decade and a half. This factor, together with an assumed tendency toward a levelling off of the overall average labour force participation rate (the result of slightly declining participation rates for men and only modest increases in rates for women) produces a profile of labour force growth

at considerably lower rates than has been recorded in the past. What this means, of course, is that the Canadian economy under such circumstances would be under relatively less pressure than heretofore to generate substantial net increases to the stock of work opportunities.

Aggregate productivity (measured broadly as real national output per employed person) is forecast to increase at an average annual rate of 2 percent per year, slightly less rapid than the rate recorded over the past couple of decades. Since that forecast applies to output per employed person, the projected rate of increase is consistent with an even more rapid improvement in output per unit of labour input and continuation, or even acceleration, of the trend toward a shorter work-day and work-week and longer periods of annual leave.

Aggregate employment levels, after allowing for cyclical variation, are expected to grow at such a rate that, in view of the assumptions made about labour supply, the overall unemployment rate will be trending slowly downward. While cyclical variations around that trend can be expected, the basic long-term trend of the unemployment rate is projected downward.

In the second section of the study, an important aspect of labour market dynamics is stressed. When it is said that the aggregate employment level increased by, say, 2 percent in a year, that is in fact a net increase. The gross increment of new job opportunities would have been much higher than that,

but the gross figure is offset, of course, by the reduction that occurs in "redundant" jobs elsewhere. The dynamic element of the overall employment situation should always be kept in mind, especially when considering the impact of technological change on the labour market. When questions are raised about the possibility of rising technological unemployment, they are really questions about whether the labour market has the dynamic efficiency required to accommodate an accelerated pace of worker displacement and accelerated growth of new work opportunities. The long-term employment growth projections, which show net increases in the number of persons employed at less rapid rates than recorded on average historically, could be consistent with higher rates of technological displacement, especially if that new technology itself contributes to improvements in labour market efficiency, a point elaborated on in the fourth section of the study.

The principal question one is left with at the end of the third section of the study is whether or not a projected long-term improvement in the aggregate unemployment rate takes sufficient account of the "revolutionary" changes forecast by the science and technology community. A long-term slowing in the rate of increase of the labour force and a long-term average rate of net job creation consistent with a declining unemployment rate sound like evolutionary economic progress is being forecast in a world thought by some that will be characterized by

revolutionary technological change.

The fourth section of the study is addressed specifically to the question of videotex and the labour market. Somewhere between the end of the 1980's and the mid-1990's, probably two-thirds of Canadian households and large numbers of Canadian businesses will be wired with videotex capability. If political considerations stand in the way of resolving the web of regulatory matters raised by the concept of videotex, then the penetration rate for videotex could be less than that. On the other hand, if regulatory matters are speedily resolved, and if companion developments in the fields of satellite transmission, earth station technology and fibre optics proceed rapidly, then the penetration rate for videotex at that time could be even greater.

Today's science authors can write whole books listing off the multitude of ways in which videotex could affect our lives. There seems to be little about the way we work or the way we play that potentially could not be changed in some way or other by its capabilities. In the limited time available to do so, the fourth section of the study focusses on some examples of the ways in which videotex might affect labour supply, labour demand and the efficient functioning of the labour market.

Probably one of the most difficult questions on the supply side is the way in which videotex might affect the labour force behaviour of married women. On the one hand, the vast increase in opportunities for educational and cultural development

in the home might discourage many women from seeking careers in the work force. On the other hand, the opportunity to engage in meaningful and productive employment through the means of videotex and without leaving the comforts and convenience of the home could well encourage other women to enter the work force. The same choices will be encountered by men, of course, and by young people.

On the demand side of the labour market, the net effects of videotex are no less ambiguous. Take the pulp and paper industry, for example. Apart from the new microelectronics technology affecting process automation in the production of paper, and making redundant certain types of production labour, it is thought by some that videotex could considerably reduce the market demand for paper. Newspapers, magazines and advertising materials would be replaced by the electronic medium. The day's news could be read off the big screen on a wall of the home, at one's convenience, and without the need for costly printing and delivery mechanisms. On the other hand, developments in printer technology may see most videotex users equipped to make their own printed copies of things they read or images they see that they want to keep. The net result could be that we will go through a transformation from large-scale centralized printing operations, to small-scale, localized capabilities in the home and in the office. Will the demand for paper, on balance, decline or increase and what could be the net impact on employment

in paper production? It may prove to be the case that the microelectronics "revolution" has greater potential for affecting employment in the paper industry directly through its impact on production process control than indirectly through videotex causing any decrease in the demand for paper. And should there be a reduced demand for labour in the paper industry, for either or both of these reasons, it still does not necessarily mean that there will be fewer persons employed in making paper. We may see the industry headed for four six-hour shifts per day and a three and one-half day work week. Changes in microelectronics technology will probably cause an improvement in labour productivity in the paper industry but they will not necessarily lead to a decline in paper industry employment.

A significant portion of measured unemployment at any point in time consists of persons voluntarily between jobs. One of the benefits of our high standard of living is that many people can afford to quit jobs they do not like (boredom, personality clashes with other workers, etc.) in order to seek greener pastures elsewhere. The job search process takes time and unemployment insurance benefits ease some of the financial burden associated with the time taken. Videotex could make the job search process highly efficient. Consider the potential for public or private placement services being made available on a dial-up basis through videotex. Consider the potential two-way flow of information about a job and about a job seeker that could take

place by means of videotex. Consider the number of "interviews" that could take place in a single day. Videotex could well be a powerful tool for improving the dynamic efficiency of the labour market and reducing the number of persons who are counted as unemployed.

What the national average unemployment rate will be in the videotex world of 1990 will depend on how we measure employment and unemployment at that time. The measurement problems associated with the consistent application of labour force concepts will be even more serious then than they are today. What will it mean to be "unemployed and seeking work"? Seeking what kind of work and where? Seeking full time or part time work? How much of what kind of "work" is necessary to be considered "employed"? Is monetary compensation the only meaningful compensation criterion applicable to gainful employment? And so on. The forecaster today, making predictions of labour market phenomena such as the unemployment rate in the videotex world of a decade hence, has the double task of not only predicting what might be happening, but also predicting how what might be happening might be measured. (One thing is for certain: if the measured unemployment rate is an unreliable barometer of social welfare today, it will be even more unreliable for that purpose a decade hence.)

In the decade of so ahead, during which time videotex

will become an accepted and important part of the lives of millions of Canadians, many changes undoubtedly will occur in the labour market. But just as the process of developing the new technology, diffusing it and marketing the products that it makes possible all takes time, so too does the process of developing policies for economic development, fiscal management and labour market effectiveness also take time. Through the numerous instruments available to them, governments can seek to create a business climate in which market forces can best work out the numerous adjustments that will have to be made as the many dimensions of the "post-industrial" economy become a reality. Governments also have within their means the power to create regulatory, institutional and host of other obstacles to impede the orderly adjustment of the market process and thus to contribute to the realization of the worst fears of those who see the new microelectronics technology as a threat. Forecasting the labour force, employment and productivity effects of videotex a decade or so hence in large measure is the task of forecasting the policy course we will choose to take.

Directions for Future Research

As has been stressed all along, the present study is only a preliminary examination of a very complex set of problems having to do with an important area of technological change and its effects on the labour market. The study does point to certain areas where

further research could beneficially be undertaken. Three such areas are briefly described in what follows.

(1) Videotex and its Possible Impact on Labour Force Participation Rates

The determinants of changes in labour force participation rates, particularly for married women and for young people, are not well understood. The conventional wisdom holds that over the medium and longer term, the Canadian unemployment problem will diminish in relative importance, in large part because of less pressure being placed on the economy to generate jobs as a consequence of an anticipated easing in the rate of growth of the labour force (see pp. 24-26 above). Are the views about labour force participation rates which underlie such a forecast valid?

Videotex could have a wide range of effects on the decision for or against participation in the labour market. Do certain age-sex groups enter the work force in pursuit of new, more "meaningful" uses of time? There will be new work opportunities, on the one hand, and new leisure and educational opportunities, on the other hand, and more readily available information about and access to both as a consequence of videotex. What specific effects can all of this have for labour force participation of particular groups in the economy?

(2) The Diffusion of Developments in Telecommunications Electronics and Resulting Effects on Labour Demand

It was observed in the study (see pp. 34-35) that videotex could affect job content in a significant way and that the manner in which employers adapt to such changes could have an important bearing on the measured labour market performance indicators. A detailed study of selected occupation groups and how they might be affected by the likely array of developments in telecommunications electronics during the 1980's could produce considerable valuable information of use to policy makers in the fields of manpower training, education and immigration. What changes in job requirements for specific occupational groups must be anticipated and how will the work force adapt to new demands and responsibilities? A careful review of how job and worker adaptations were made as a consequence of the process of computerization over the past decade or so could be enlightening as one part of getting at these questions.

(3) Videotex as an Instrument for Improving Labour Market Efficiency

As was stressed in the study (see pp. 17-18) labour market dynamics involve far more movement of persons into and out of jobs, into and out of the work force, than could be implied from any simple examination of changes in the "snapshot status" of the market at different points in time. Crucial to the whole process is information: which employers are looking for what kinds of

employees? which prospective employees are looking for what kinds of work? Videotex in a significant proportion of Canadian homes could play a very important role in the identification and matching process. It could be a service that is offered by one or a group of private agencies. Or it could be an extension of the Canada Employment Centres. It could even be integrated into some of the mechanisms for determining active job search on the part of those drawing unemployment insurance benefits. There is an interesting set of questions here that could benefit from close examination.

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