GAMMA

UNIVERSITÉ DE MONTRÉAL ☐ MCGILL UNIVERSITY

THE INFORMATION SOCIETY:

THE ISSUE AND THE CHOICES

Integrating Report

Phase I GAMMA Information Society Project

by

Kimon Valaskakis

Director, GAMMA Group

and

Professeur titulaire de Sciences économiques
Université de Montréal

March 31st, 1979

GAMMA, Suite 210,
3535 Queen Mary
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Prepared for the Department of Communications
Under Contract Number 05478-00253 -
Contract period: November 9, 1978 - March 31st, 1979.

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EXECUTIVE SUMMARY

THE INFORMATION SOCIETY:

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Phase 1

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OBJECTIVES AND APPROACH

The Information Revolution has been the subject of countless treatises, books, and magazine articles. Appropriately, a great deal of attention has been given to the technical aspects of this seminal event, but not enough to its socio-economic implications. If the expected changes are as fundamental as is generally anticipated - and their scope has been compared to the British Industrial Revolution and, in some cases, to the invention of the wheel! - they must be fully analyzed.

The GAMMA study on the Information Society proposes to focus on these socio-economic effects, particularly as they affect Canada. The first phase of study, ending with the drafting of this report, had three major objectives:

1) Identification of the precise nature and causes of the central process of change which is leading us to an "Information Society".

2) The description of the alternate scenarios of such a society which will result from this process of change.

3) A preliminary assessment of potential impacts, it being understood that a full empirical evaluation will be conducted in the proposed second phase of research.

To meet these objectives, six technical papers were commissioned, from which this Integrating Report was drawn. The first two focused respectively on the micro-economic and macro-economic aspects of "information". The next three concentrated on the factors leading Canada into the information era, and the sixth technical paper examined the information-gathering activity (Research and Development) in the Canadian information sector itself. The six papers, as reflected in this Integrating Report, constitute a framework for the full empirical studies to be conducted in Phase II (see p. *VIII*) for the title of each technical paper).

The Report has also taken into account the many excellent national and international treatises on this subject, and has attempted to build upon rather than duplicate them.

PRINCIPAL FINDINGS

1. *NATURE AND CAUSES OF THE EMERGENCE OF THE INFORMATION SOCIETY*

Energy and information are in a fundamental sense the ultimate factors of production. An agricultural and an industrial society are energy-intensive. The emerging post-industrial society seems to be information-intensive. In an economic sense, information is both a "commodity" and an activity. As a "commodity", it may be traded on visible and invisible markets and exhibit some of the characteristics of a public good. As an activity, it is both an end in itself (the so-called "primary information sector"), and a means to an end (the so-called secondary information sector) (Chapter 2).

The central process of change is not so much an "information explosion" as a more subtle process which we have termed informediation. Informediation is the processing, storing, and transferring of information by high-technology "media". These media include both computer and telecommunication devices. Informediation is now the most important agent of societal transformation. (Chapter 2).

Three principal factors explain the phenomenal rise of informediation:

(i) *Technology push*

Twin technological revolutions in telecommunications and computer-science have led to a triple phenomenon of decreasing unit costs, decreasing physical volume (miniaturization), and huge increases in the capacity of information machines. The value-for-the-money improvement is so great that a comparable evolution in the manufacturing of cars would today allow us to buy a Rolls-Royce for $5.

(ii) *Demand-Pull*

Much weaker than technology push, demand-pull seems to be following rather than leading. There is as much evidence of information overload as information thirst. The OECD countries seem to have an over-abundance of certain forms of information.

Nevertheless, the logic of stages of development is leading the industrial economies to demand more information because, in a sense, they have run out of things to consume. The rich countries are moving towards what some have called "toy economies". Many of the information-intensive consumer

goods on the market are either overt toys (video-games, etc.) or disguised toys (stereo-sets, multi-channel TV, home terminals, etc.)

We call the move towards greater consumption of information goods the Maslowe-Engel Effect. From Maslowe is borrowed the idea of a hierarchy of needs with psychological needs predominating after the physiological needs have been satisfied. From Engel is borrowed the idea that, as income increases, the proportion spent on necessities decreases and that spent on luxury-items increases.

(iii) *Public policy*

Canadian public policy has accelerated technological changes in the telecommunications field but has not been strong in the micro-electronics sector. Overall, its impact is erratic and uncertain because it lacks comprehensiveness and concertation. Policies are too sectoral and often uncoordinated, as various levels of government and the public and private sectors each pursue their own interests. The net effect is that Canada suffers through rather than leads the Information Revolution. (Chapter 3)

2. *ALTERNATE SCENARIOS OF AN INFORMATION SOCIETY*

The expression "Information Society" was found to be meaningful only if based on an operationally significant concept of an Information Economy. An Information Economy is characterized by a situation where over 50% of its GNP is produced in the broadly-defined information sector.

This definition is very wide and may include pre-industrial, post-industrial, and "never-industrial" information economies. To further identify the forms of the post-industrial Information Society, it is necessary to distinguish between three alternate scenarios:

(i) *The "Télématique" Scenario*

Constructed from the contraction of the French "télé-communication-informatique" describing the convergence of telecommunication and computer technologies, the Télématique Scenario is characterized by:

(a) the existence of a "central electronic highway" linking offices, homes, and factories to each other via cable and satellite transmission. This electronic highway

would be international in scope and integrate world-communications.

(b) the ubiquity of micro-electronic computers transforming the mode of production and consumption. Robotization of manufacturing becomes complete and penetrates the factory, the home, and the office of the future.

This "maximum informediation" scenario could in turn offer more than one variant depending on how the issue of content (what information will be travelling along the electronic highway) is dealt with. One possibility is trivial content with the Télématique Scenario quickly leading to information overload. in the second case, we have totalitarian content where the electronic highway is used for the promotion of a particular ideology. In the third variant, optimum content is achieved which satisfies both individual and collective needs (Chapter 4).

(ii) *The "Privatique" Scenario*

Advocated by Bruno Lussato in France, the "Privatique" Scenario calls for a decentralized high-technology Information Society. It is the "computer without telecommunications" option. The small computer becomes an instrument of individual or small group fulfillment. There are no universal link-ups and the electronic highway is severely limited. To its partisans, the Privatique Scenario is the best way to reap the benefits without the costs of informediation (Chapter 4).

(iii) *The "Rejection" Scenario*

The trivialization of content or the dehumanization of a computer-dominated life-style may lead to a Rejection Scenario. This situation would be characterized by consumer rejection of the high-technology information devices. Low and intermediate technology information systems would predominate.

Among the variants of "Rejection" there could be:

- a revival of traditional information media (novels, poetry, theatre, ballet);
- a revival of spiritualism and religion (Islam, Christianity, cultism, etc.)
- a return to small-group living with maximum physical and interpersonal contact (as in the communes of the late sixties and early seventies).

3. THE POTENTIAL IMPACTS

The most probable socio-economic effects of the Information Society are likely to be the following:

(i) *Profound impact on the future of human labor*

Substantial disemployment without matching re-employment is a probable consequence. Complete elimination of industries and locational shifts are to be expected. On the positive side, working conditions and wages are likely to improve and the distinction between leisure and labor, increasingly blurred (Chapter 5).

(ii) *Changes in Canada's international competitive position*

Given the severe foreign competition, without a carefully thought-out and implemented policy, Canada is in danger of being by-passed by the Information Revolution, at least from the production side. Many threats have to be met and opportunities seized. (Chapter 6).

(iii) *Reduction of energy-use*

Significant substitutions between energy and information use are possible. Micro-electronics may reduce energy-use in all aspects of life and the Information Society may then become a "Conserver Society". (Chapter 7)

(iv) *Mixed socio-political implications*

The Information Society is likely to enhance the satisfaction of many individual needs and at the same time frustrate others. It is a mixed bag, a Pandora's Box and Prometheus Hope all rolled into one. (Chapter 8).

(v) *Vulnerability*

Significant security threats from both natural causes (accidents) or man-made action (external threats and internal terrorism) may greatly increase the vulnerability of our society, especially if the Télématique option is chosen. (Chapter 9).

Each of these impacts will have to be fully researched in the second phase of the investigation.

RECOMMENDATIONS

Because the Information Society is a mixed proposition bringing with it considerable costs and benefits, a well-articulated public policy is required to minimize the costs and maximize the benefits. This leads us to make two recommendations.

RECOMMENDATION 1. *The Federal Government should assume leadership in formulating a comprehensive and concerted plan to make Canada fully competitive in the emerging global Information Society.*

The U.S., Japan, Britain, France, and Germany, in addition to the large multinational corporations, are mapping out 10-year strategies to enhance their competitiveness in the information industries. Substantial sums of money have been allocated to implement each of these plans.

Canada should also have its "game-plan" which should be comprehensive, rather than narrowly sectoral, and concerted. Concertation implies the full cooperation of the private sector and the provincial governments and not just a federal venture.

RECOMMENDATION 2 *As an integral part of the formulation and implementation of this development plan, the Canadian Government should enlarge its research base, by conducting or commissioning full empirical studies on the potential socio-economic effects of the Information Society along the lines suggested in Part II of the Report.*

Unlike the British Industrial Revolution, which was "discovered" a century after its occurrence, the effects of the Information Revolution can today be reasonably anticipated. Canada has the opportunity to take the leadership in conducting advanced impact studies to become aware of the "things to come" and to develop suitable adaptation strategies. The enlargement of this research base is, in our view, part and parcel to the formulation of the comprehensive development plan.

In sum, Canada is faced with a golden opportunity to develop international leadership in an area where it has always been strong. This past strength though is as volatile as past hockey championships. Unless key decisions are made soon, the information future will not be ours.

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TECHNICAL PAPERS

PHASE I

INFORMATION SOCIETY PROJECT

PAPER 1 J. Bernstein, (Assistant Professor, Faculty of Management, McGill University): The Micro-Economics of Information: Structural and Regulatory Aspects.

PAPER 2 R. Jouandet-Bernadat, (Professeur titulaire, Ecole des Hautes Etudes Commerciales): Macro-économie de la Société Informatisée.

PAPER 3 J.L. Houle, (Professeur, Ecole Polytechnique): La Poussée technologique et les coûts unitaires décroissants en télématique.

PAPER 4 P.S. Sindell (Senior Research Associate, GAMMA): Public Policy and the Information Society.

PAPER 5 E.I. Fitzpatrick-Martin, (Research Associate, GAMMA): Social Implications of the Information Economy.

PAPER 6 R. Wills, (Economist): Research and Development in the Information Sector of the Canadian Economy.

INTEGRATING REPORT

CHAPTER 1

GENERAL OBJECTIVES OF THIS REPORT

1.1 GENERAL OBJECTIVES OF THIS REPORT

For the past 10 years, it has become increasingly fashionable to talk about a so-called "Information Revolution", a revolution so profound as to be compared with the British industrial revolution or even, the invention of the wheel! Books, papers, and reports have proliferated on the subject and in the last three years, the debate has focussed on the expected emergence of an Information Economy, itself leading to a full-fledged Information Society. At the base of these forecasts is the contention that two clusters of innovations, one in the field of computer science, and the other in telecommunications, are converging to fundamentally alter the mode of production. The post-industrial society, which was initially thought of to be merely a service-dominated one, is now appearing under the guise of an information-dominated one. (It is worth noting in passing that not all services are information-connected and not all information is service-connected. A porter at the airport provides a non-information service. A computer on the hand, although a manufactured good, conveys information).

Although the term "revolution" has been much abused, since there is scarcely a field of human endeavour that will not claim its contemporary "revolution", a close study of the information-telecommunication fields confirms the reasonableness of such a description. However, in the euphoria related to the technological change, a subject now treated almost ad nauseam in both the technical and the popular press, comparatively little attention was given to the socio-economic impacts of such change. The term "socio-economic impact" must be taken in its widest sense here. Specific sector studies have been produced, but the all-important phenomenon of interdependence is still to be explored. If the technological change is truly revolutionary, the societal impact is likely to be comprehensive, not partial.

Under contract with the Department of Communications of the Federal Government of Canada, GAMMA was given a mandate to initiate a study of the implications of an Information Society divided into at least two phases. The first phase, completed by this report, had as its objectives :

(1) To identify, analyze and whenever possible suggest measurement techniques for the central process of change, loosely described as the "information revolution".

(2) To examine the dynamics of this change by noting its principal causes.

(3) To describe as specifically as possible the one or more scenarios of the Information Economy.

(4) To outline potential impacts in the socio-economic spectrum by designing the research that would be required to fully assess them.

The planned second phase of the study is to focus exclusively on these impact studies and their policy implications.

1.2 THE APPROACH

In order to realize these objectives, a seven-person team was constituted to produce technical papers leading to an integrating report for Phase I. The division of labour was as follows.

The first two papers focussed on conceptual and measurement problems. Professor Jeffrey Bernstein (Faculty of Management, McGill University) drafted a paper on the "Micro-Economic Aspects of an Information Economy", dealing with the information entity treated as a commodity which is traded in visible and invisible markets (Paper 1).

Professor Jouandet-Bernadat (Ecole des Hautes Etudes Commerciales and Research Associate, GAMMA) prepared a paper on the macro-economic aspects of our information economy. He focussed on problems of measurement using the national economic accounts and compared various estimation techniques used by other authors (Paper 2.).

The next three papers dealt with the causes of the information explosion. Professor Jean-Louis Houle (Ecole Polytechnique) produced as assessment of the best forecasts relating to the rate and direction of technological change in the computer-telecommunication complex. Mr. Peter S. Sindell (Senior Research Associate, GAMMA), evaluated the impact of government policies (and their absence) on the rate of informational change. Ms. Iris Martin (Research Associate, GAMMA) attempted in her paper to discover some of the reasons why an information society is needed (if in fact it is needed) by attempting a preliminary identification of social costs and benefits.

The sixth paper, written by Dr. Russell Wills (Economist and Communication Consultant) dwelled on the Research and Development capabilities within the Canadian information sector, the presence of bottlenecks, and what could be done to remove them.

This present integrating report has therefore attempted to synthesize the data and ideas produced in the six technical reports

and to pave the way for Phase 2. Moreover, it has gone beyond the mere integration of the other papers and has drawn on many other larger studies. Consequently, the views expressed there are the author's and do not necessarily engage the responsibility of every other member of the team.

The report is organized in two parts. Part One examines the characteristics of an Information Economy and constructs three scenarios describing it. Part Two attempts to identify the potential socio-economic impacts. The last chapter (10) offers interim conclusions and policy recommendations.

PART I

CHARACTERISTICS OF AN INFORMATION SOCIETY

In this first part of the Report, the basic characteristics of an "Information Society" are examined. Chapter 2 looks at the nature of information itself. Chapter 3 studies the causes of what we have called "informediation". Finally, Chapter 4 outlines three possible scenarios of the coming Information Society and its variants.

PART I - THE CHARACTERISTICS OF AN INFORMATION SOCIETY

CHAPTER 2

INFORMATION OR "INFORMEDIATION"?

IDENTIFYING THE CENTRAL PROCESS OF CHANGE

One of the features of the so-called "Information Society" accounting for both its richness and its ambiguity is the elusive character of the notion of "information" itself. As a result, the "Information" Society can be everything and nothing and is not easily amenable to scientific or policy-oriented analyses. In order to obviate this difficulty, it is advisable to initially focus on a simpler, more definable concept: the information economy. If this latter concept is in turn meaningful, it should be operationally verifiable and possess its own indicators. In the first part of this paper, we attempt to lay the foundations of what could be described as an information economy. This exploratory process will lead to the construction of three alternate scenarios for such an economy and the society it would support.

The first step however is to come to grips with the central process of change which is supposedly transforming our industrial economies into information economies. Here it is important to point out the existence of a significant shift of meaning between the English "information economy" and the French "société informatisée". The French word "informatique" was initially coined to denote the science of information. However, because information science grew out of and remains closely linked to computer science, "informatique" came to mean the latter, not the former. Hence "société informatisée" would literally mean "computerized society", instead of "information society". Yet the expression has a wider meaning even in France, but not as wide as the English "Information Society."

The difference is not merely linguistic. In the English sense, many societies, including past religion-dominated ones, could qualify as "information" societies. In the French sense, a special type of information is considered, that treated and processed by computers. Therefore, by definition, no previous historical examples of "sociétés informatisées" could be possible. The closest English translation of the French "informatisation" (i.e., the process of moving to a "société informatisée") is, we submit, a neologism: "INFORMEDIATION", which immediately conveys the meaning of treated or processed information. *

What we are experiencing is a growth in an activity called informediation which includes both the elusive primitive concept of information and the media (computers and communication equipment) used to process it. The growth in informediation is the principal dynamic characteristic of the emerging information economy.

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* This neologism was coined by Iris Martin, Research Associate, GAMMA, in her paper on social implications of the Information Economy (Paper No. 5 of this series).

To understand it, we must begin by understanding the characteristics of the concept of "information" itself.

The word "information" may be used in one of at least six different senses. First there is the scientific usage with its principal measure, the binary digit (bit). Second, there is the micro-economic usage where information may be treated as a factor of production or an economic commodity which is traded in visible or invisible markets. Third, there is the macro-economic usage with information perceived as an activity or a sector of the national economy with its appropriate indicator(s). Fourth, there is the philosophy-of-science usage of information as "in-forming" or "putting into form or order", with the attendant oft-quoted law that information is negentropic (i.e., it is anti-chaos or anti-disorder). This view of information stems directly from its scientific usage. Fifth, there is the common-sense or everyday usage which is at the same time comprehensive and ambiguous, since it may mean some or all of the above. Finally, there is "informediation", which we believe best describes the profound changes that are currently occurring.

2.1 INFORMATION AS A SCIENTIFIC TERM

The basic measure of information in scientific terms is the binary digit of bit. Broadly speaking, a binary digit implies the division of a universe into a set and its complement set represented by the binary numbers (0) and (1). This allows for the use of dichotomous branchings in tree-like diagrams which define a process that can be programmed into a computer.

The simplest way to understand the notion of the bit in non-scientific terms is to think of the game of 20 questions and the binary search that constitutes its optimum winning strategy. Assume A thinks of a number between 1 and 1,000 and B has to guess what that number is. Using a binary-search technique, B would divide his zone of ignorance in half and with every question to A, reduce that zone of ignorance by half. The object of the game is of course for B to guess the number by asking as few questions as possible. Thus, B should first ask "Is the number under 500"; then, if the answer is "yes", "Is the number under 250", and so on and so forth. There is an exact number of questions that are needed to mathematically find the answer. That number of questions is the number of bits that measure the informational characteristic of the problem at hand.

2.2 INFORMATION AS COMMODITY [1]

(Micro-Economic Aspects)

The computer-science notion of information is somewhat incomplete when applied to an economic problem. In fact, within the economic system information should ideally be perceived as a commodity that can be produced and consumed, bought and sold and transacted upon in visible or invisible markets. In practice, on the other hand, the information commodity is difficult to pin-point. As a "resource", information is quite exceptional because, unlike most other resources, it is infinitely renewable and does not entail a depreciation cost. [2] It is only when information is "scarce" (i.e., when it commands a positive price) that it becomes a commodity.

As a full-fledged commodity, information may be either a consumer good (when it is demanded for its own sake) or a capital good (when it is needed , not for its own sake, but in order to produce something else).

When information is a consumer good (as, say, in the case of a novel), it can be bought and sold in the market system. When, however, it is a capital good (what Mr. Uri Porat calls the "secondary information sector"), it is more difficult to identify. In this case, the cost of the informational input in a non-information final good cannot be assessed very accurately unless there is a visible input such as a consultant's contribution, an accountant's advice, etc. But many information flows tend to be non-market mediated, which is another way of saying that the transaction costs involved in such market-mediation would be too high to be worthwhile.

When information is bought and sold within the market, it may exhibit various characteristics. According to Professor Bernstein [3], the two polar cases of information may be described as "search" and "research". "Search" is a process of obtaining data to include in existing categories. Thus, a firm may ask an executive recruiter to "search" for suitable candidates to fill a particular position. "Research" on the other hand is the process of construction of new categories and involves a qualitative different type of information

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(1) Much of the material in this section is based on J. Bernstein's paper in this series.

(2) M. Porat, Global Implications of an Information Economy.

(3) See Technical Paper No.1

gathering. It is not information retrieval but information generation. A fuller understanding of the "search" and "research" aspects could facilitate the study of the structure of information markets and, in a more general sense, shed additional light onto the process of market-concentration where individual firms attempt to internalize (i.e., vertically integrate) the search and research functions which they were hitherto hiring from outside consultants.

A second related issue in the micro-economics of information is the question as to whether the withholding of information is profitable and can carry a price-tag. An analysis of that very plausible possibility could lead to the construction of an economic theory of "secrets" and to the understanding of the motivation for industrial espionnage and counter-espionnage.

A third issue, emerging from the first two, is the question of property rights associated with the information commodity. Can information properly be "privatized" and protected (e.g., copyright laws, patents, etc.), or are there externalities associated with it which make it in most cases a public good? It is interesting to note here that lighthouses, a typical information good, were, in the large majority of cases, constructed with private funds to serve a private purpose. However, the fishermen who built the lighthouses could not prevent any other ship from benefiting from their use, nor could they exact a payment for what had become, in essence, a public good.

Two contemporary examples in the communication field are worthy of note in this connection. The teletext, over-the-air broadcast systems which can be captured freely by consumers, are of course public goods (once the receiver is equipped with the properly modified television set). The videotext, cable-transmitted information, is on the other hand a private good that can be bought and sold per unit consumed.

In economic terms, the reason for the difference in the two cases is that in the broadcast case, the marginal cost of communication to a particular household is nil and at the same time, the cost of preventing free-loaders from receiving the broadcast is too high. As a result, the information that is broadcast becomes a public good. In the cable case, the cost of enforcement is low, free-loaders can be excluded, and consequently property rights can be imposed on the commodity. (4)

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(4) See G. Thompson, Memo from Mercury, p. 27

The public good/private good characteristic of the information commodity has an important policy-implication. If the public character of information is dominant, then the Information Economy is likely to be more collectivist than individualistic, with the State as representative of the collective public much more dominant. If on the other hand certain important information goods can be "privatized" and withheld from the public, the market-economy will flourish but will likely be dominated by State regulation in order to prevent the large firms controlling the information flows from abusing their power. In either case, there seems to be a presumption towards more state participation in the information economy. The participation can take the form of public monopolies (like the Post Office) or government-regulated private monopolies (like Bell Telephone,etc.). A free and perfect market for the information commodity therefore appears highly unlikely because of the very nature of that commodity.

When the information commodity is not market-mediated, it is administered via a "hierarchy" or a "constituency". The hierarchy is an organization where information flows according to the rules that have been laid down by this organization (i.e., information flows within the Federal government). The "constituency" mediates information flows through a system of votes (the democratic electoral system where voters communicate their demands via their representatives).

2.3 INFORMATION AS AN ACTIVITY (5)

(Macro-Economic Aspects)

Not only is information an economic commodity justifying a micro-economic analysis of its behaviour in visible and shadow markets, it is also an activity justifying a macro-economic study. The pioneers in this work have been Machlup and Porat who, by examining the national economic accounts, have attempted to identify and measure information activities.

In a very basic sense, the real pioneer was Buckminster Fuller when he suggested that in fact there were not four but only two factors of production: energy and information. Everything else could be reduced to components of energy and information. The traditional list of productive factors includes Natural Resources, Labor,

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(5) For technical details, see Professor Jouandet-BErnadat's paper in this series.

Capital and Technology. Natural resources are ultimately reduceable to energy terms. Human labor has a small energy component and a large information component. Physical capital (i.e., machines and tools) is similarly a combination of energy and information. Finally, technology is essentially information, at least in its disembodied soft-ware sense. That part of technology that is embodied in machines is hardware and is included in physical capital.

If there are only two factors of production, then there could be only two sectors in the economy: an energy-intensive one (extraction, agriculture, manufacturing) and an information-intensive one (design, education, research and development, cartain services, etc.). The energy-intensive sector would involve the transformation of energy and materials (simply illustrated by a "food-processor" which slices various vegetables to make a salad) and the information-intensive sector, the processing of information (simply illustrated by a word-processor that, instead of slicing vegetables, slices phrases and paragraphs).

Following Porat's monumental study on the Information Economy in the U.S. (6), it is possible to divide the economy into six sectors, three of which are information-based. Information is defined as "data that is organized and communicated". An information activity comprises a number of information workers using information capital to produce information goods and services. The types of information activities are outlined in Table 1 and the resulting division of the economy into the six sectors is described in Table 2.

Using the Machlup-Porat approach, it is possible to arrive at an aggregate measure of all information activities in the economy by choosing a suitable common denominator. In fact, at least three such denominators are found in Porat's work:

(1) Percentage of GNP or GDP (Gross Domestic Product) devoted to information activities.

(2) Percentage of labor force devoted to information activities.

(3) Percentage of salaries in the information sectors in terms of total salaries.

For each of these criteria, considerable computational work has been involved. The bottom-line yields results which have startled the intellectual community. As far as the percentage of GNP is concerned, the current estimates for the information sector

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(6) M.U. Porat, The Information Economy, U.S. Department of Commerce, 1977, 5 volumes.

TABLE 1

TYPES OF INFORMATION ACTIVITIES

(according to Porat and OECD categories)

1. *Information Generation* (act of creating information)

2. *Information Capture* (act of channeling information)

3. *Information Transfer* (act of "conveying" or "moving" information)

4. *Information Processing* (act of processing information at the receiving end)

5. *Information Storage* (act of placing information in storage)

6. *Information Retrieval* (act of recuperating and making available stored information)

TABLE 2

THE SIX-SECTOR DIVISION OF THE ECONOMY

(PORAT AND O.E.C.D.)

1. *Primary Information Sector* (market-mediated information transactions)

2. *Secondary Information Sector: Public Bureaucracy*
(information support activities in the public sector, i.e., public servants)

3. *Secondary Information Sector: Private Bureaucracy*
(information support activities of the private sector, i.e., private bureaucrats)

4. *Households*

5. *Private Productive Sector* (energy and material-intensive private sector production)

6. *Public Productive Sector* (energy and material-intensive public sector production)

TABLE 3

COMPARISON OF THE U.S. AND CANADIAN "INFORMATION" ECONOMIES:
EMPLOYMENT AND PAYROLL IN INFORMATION SECTORS

	CANADA 1971			UNITED STATES 1967	
	No. of employees '000	PAYROLL		PAYROLL	
		Amount $millions	% distribution	Amount $millions	% distribution
KNOWLEDGE PRODUCERS	432.77	3,666.9	8	46,964	10.3
KNOWLEDGE DISTRIBUTORS	489.43	3,077.8	6.7	28,265	6.2
MARKET SEARCH AND COORDINATION SPECIALISTS	763.59	5,425.1	11.9	93,370	20
INFORMATION PROCESSORS	1,515.50	4,383.3	10.6	61,340	13.5
INFORMATION MACHINE WORKERS	175.82	842.9	1.9	13,167	2.9
TOTAL INFORMATION WORKERS	3,377.11	17,846		243.106	
TOTAL WORK FORCE	8,510.53	45,569		454,259	
INFORMATION AS % OF TOTAL	39.7%	39.2%		53.5%	

Source: Department of Communications document based on a Statistics Canada figure.

in the U.S. and Canada range between 40 and 50%! Moreover, information workers account for around 50% of the U.S. and approximately 40-45% of the Canadian labor force.

The earnings of information workers account for over half of the total labor earnings in the economy.

The principal problem with Porat's approach is that it is too extensive. It is clear that his notion of information encompasses a great part of human activity. What is less clear is what is excluded. For instance, the inclusion of paper as an "information good" is both correct and misleading. What about Kleenex or toilet paper? Are these information goods? Similarly, it is not easy to separate information-based from non-information-based services. The tertiary sector is, in fact, a bundle of various types of activities and it is all too tempting to include them all under the name "information".

In a general sense, "information" is so basic to all our lives and our perception of the external world that, in a way, everything is information. Such a statement is of course of little pragmatic use but its plausibility is testimony to the all-pervasiveness of the idea of information and the concommitant danger that the Information Economy may end up meaning very little.

2.4 PHILOSOPHICAL AND COMMON SENSE USAGES OF INFORMATION

An examination of the philosophical meaning of the term "information", although normally out of place in a policy-paper, is nevertheless relevant because of the immense implications of the emerging information economy. Three questions may be raised here: first, what is the relationship between information and knowledge; second, what is the relationship between information and energy; and finally, can information really be created or destroyed.

Concerning the first question, information would appear to be equivalent to knowledge. However, many people resist such identification, reserving for knowledge a deeper meaning. It is customary to hear statements to the effect that "data" is not "information", "information" is not "knowledge", and "knowledge" is not "understanding". Crude data is presumably a set of figures or a list of things. Information is an organized set of data according to certain criteria and "knowledge" presumably would be a way of assessing and weighing information. Ultimately, "understanding" would be a way of assessing knowledge.

These distinctions are really quite arbitrary. It may in fact be better to distinguish between various types of information than to make such semantic separations. Thus "data" could be minimally organized lists or figures. At a higher lever of organization, we would have "knowledge" and at an even higher level, "understanding".

In other words, knowledge could be viewed as information about information and understanding, one level higher than that. Since at the basis of all concepts of information there is the notion of a question (to which the informational datum is the answer as in the binary digit which presupposes an initial question), it is essentially a matter of the level of questioning. To ask for a telephone number is a request for data. To ask for the causes of the French Revolution is to request knowledge. To ask for the meaning of life is presumably to request a higher order of understanding.

The philosophical concept of information is also closely linked to that of energy. The second law of thermodynamics, or the law of entropy, states that available energy is constantly diminishing even though total energy remains unchanged. In informational terms, entropy implies increasing disorder and a statistical or probablistic distribution of events. Information on the other hand is perceived to be neg-entropic. It creates order and diminishes disorder. In fact, in a strict etymological sense, to in-form is to be put into form or order.

This philosophical observation yields two interesting empirical possibilities. The first is that there is a long-term race between the information-seeking human society and the law of entropy. Either Order or Chaos will prevail. The final triumph of Order is viewed with religious fervour in Teilhard de Chardin's work and in the earlier Christian Gnostics. In a religious sense, the extreme partisans of the Information Society see it as the final redemption. The Neo-Gnostics claim that information will eventually save the Universe from the ravages of entropy.

Secondly, in a less cosmic sense, is the hypothesis, so far largely verified by empirical observation, that there is a trade-off between information and energy use in production and consumption. The use of more information leads to an economy of energy. This interesting hypothesis would mean that an Information Society is a Conserver Society. It is further elaborated in Chapter 7 of this Report.

A final issue in the philosophy of information that is of some relevance, is whether information can really be created or is really just "discovered". Similarly, can it be destroyed or is

it really becoming "unavailable" like a drop of water poured into the ocean? When reference is made to the growth of "information" or the "information explosion", which supposedly leads us into the Information Society, there is the assumption that information is actually being created. More probably, it is becoming re-arranged and presented in a new fashion. Is Einstein's famous $E = mc^2$ formula an invention or a discovery? Is anything ever completely new or is the notion of discovery more meaningful than that of invention?

If we tentatively advance the proposition that information, in a fundamental sense, cannot be created or destroyed, but only... communicated and processed, we have the seeds of what we consider the central change-process of our time: INFORMEDIATION.

2.5 INFORMEDIATION: THE CONVERGENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY

"Informediation" may be defined as a process, not a state. It is the increase in mediated information or, in other words, the processing and transformation of information through the use of media in the largest sense of the word. Media here refer to the high-technology computer and communication devices used to process information. An information system possesses six principal components:

- a code
- an encoder
- an encoding device
- a channel
- a decoding device
- a decoder.

A message which travels through the information system can either reach its final recipient or be stored somewhere within the system. In either case, it is mediated within the system.

Since all information other than direct speech or body language is communicated via a communication medium or other, we will reserve the term "informediation"* to refer to that information that is processed by high-technology media only. The revolution is one in informediation rather than in information because its principal cause is the series of technological breakthroughs in the computer and telecommunication fields without which the Information Economy would

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* Note: Other authors in this series may use the concept in a slightly different sense. The above definitions only bind this author.

not be possible. "Informediation" is somewhere between the French idea of "informatisation" and the English-language concept of an "information exclusion". "Informatisation" is too narrow because it emphasizes computers almost exclusively. "Information explosion" is too wide because it includes primitive societies that perform elaborate informational rituals. "Informediation" is, we feel, the more appropriate description of what is really happening that warrants the superlative title of a "revolution".

What then is the prime indicator of informediation? Porat's Information Economy is measured by the proportion of information-related activities in the GNP. It is a simple and, at times, simplistic measure. Informediation, on the other hand, a complex process, is far from simple and has no one indicator. Like "industrialization", it is a category of processes rather than a single one. The closest very tentative measure for informediation is, we feel, the Japanese use of the concept of "word-kilometer". The "word" is a finite number of bits (10 to 16) and "kilometers" are of course a measure of distance. Informediation involves the exponential rise of produced word-kilometers (and not necessarily consumed). Both the computer and the telecommunications dimensions are involved. We say "produced" and not "consumed" because, as we shall see in the next chapter, there is an amazing discrepancy between the information that is piped through the various media and the information effectively used by the recipients.

In a Japanese study performed for the OECD, the researchers set out to measure both the production and consumption of "word-kilometers" in Japan. The results are tentative, vulnerable and at best mere approximations. They can be attacked on the basis of their underlying assumptions - most notably that in information is a homogeneous good and that its consumers are homogeneous and "additive" units. Further, the question of when information is actually used is a delicate one with imperfect answers. The Japanese approach nevertheless is stimulating and innovative and it proposes a crude indicator to describe the right process - rather than construct an excellent indicator to describe a fictitious process - a temptation all too readily taken by other researchers.

We can now turn to a more detailed analysis of the causes of informediation.

PART I - THE CHARACTERISTICS OF AN INFORMATION SOCIETY

CHAPTER 3

THE 'CAUSES' OF INFORMEDIATION

Informediation, as a process of societal change, is the result of the interaction of many factors. Some of these are significant and positive. Others are negative and have a braking effect on the process. The three principal causal factors having significant effects (whether positive or negative) are, in our view, a) technology push b) demand pull, and c) government policy (and sometimes its absence).

3.1 TECHNOLOGY PUSH

The supply of new information hardware seems to be producing its own demand. The basic dynamics behind this process is as follows. Technological improvements are dramatically increasing the information-communication capacities of the hardware and the software. At the same time, average costs of production are falling almost as dramatically. The result is more value for the money on a scale probably unparalleled in history. Products that would not necessarily be intensely demanded by consumers are now desired because of the high ratio of value to price. Hence the new information commodities are rapidly absorbed by the market and the process of informediation is accelerated.

A third factor which complements the capacity-increase and cost-reduction is miniaturization. Not only is information technology allowing us to "do more with less" in a financial sense, it is also allowing us to "do more with less" in a physical sense.

Two oft-quoted examples will illustrate both improvements in cost-efficiency and miniaturization. Concerning the cost aspect, a million operations performed on a 1945 electrical calculator required approximately $1,000. In 1955, the first generation of computers reduced the cost for the same set of operations to $10. In 1965, the price-tag was down to $0.05, and in 1975, to $0.01. At the same time, the number of instructions that can be executed by a computer for only one dollar has gone up from 100 in 1955 to 10 million in 1970 - a rate of increase of 100,000 in 15 years. (2)

The "physical space aspect" has experienced comparable evolution. In 1946, the first electronic calculator ENIAC was composed of 18,000 vacuum tubes, occupying an area of 200 square meters, and consumed 175 kilowatts per hour of operation. Today, a computer with

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(1) For additional details, see J.L. Houle's Paper No. 3 in this series: Poussée technologique et coûts décroissants en télématique, GAMMA.

(2) I owe these examples to L. Brunel, Des Machines et des hommes, Les Dossiers de Québec Science, p.20.

the same capacity can be held in two fingers. The memory is inscribed in a 1/8 x 1/8 inch chip of silicone costing less than $10. (3)

A comparable cost-efficiency improvement in the automobile industry would have produced 1979 cars with a top speed of 160,000 kilometers-per-hour, and a fuel economy of 360,000 kilometers per liter. More dramatically, a Rolls-Royce which in 1979 has a price-tag of between 80 and 100,000 U.S. dollars would sell for $5.! (4) By 1985, according to the same projection, a Rolls-Royce would cost $0.25!

3.1.1 *THE STAGES IN THE EVOLUTION OF COMPUTER TECHNOLOGY*

A computer system is composed of three main units: a) a central processor; b) a storage-memory unit; and c) input-output devices or peripherals. Historical advances in the technology of each of these have led to cumulative changes in the entire system architecture. Progress in one function served to outline deficiencies in the complementarity functions which would then be perceived as bottlenecks. Intense pressure would then be exerted to invent devices to eliminate the bottlenecks. More often than not, not only were the offending bottlenecks removed, but the technological change involved was so great that the initial component's improvement would become rapidly insufficient and itself become a bottleneck!

This see-saw pattern of technological change parallels very faithfully what happened in the British Industrial Revolution of the 18th Century. Spinning, weaving, metallurgy, transport, all acted upon each other, creating mutual incentives for progress. A cumulative snowball effect of technological change was the end-result, both then and now.

1950 to 1965 witnessed the development of the first generation of computers. After difficult beginnings in the 1940's, computers were disseminated and used for commercial purposes. They were heavy, expensive and forbidding. From ENIAC in 1946 to UNIVAC 1 (June 1951) to the evolution of computer languages (Fortran 1956; Cobol 1959; Algol 1960), the industry labored on. The turning poing came in 1965. In that

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(3) R. Megarry, Towards the Information Economy. (GAMMA-Delta Series), 1978.

(4) L. Brunel, op. cit., p. 21

year, the IBM 360 used integrated circuits and allowed for a substantial improvement in performance/cost ratios. Further, machines became compatible and programmes simplified. However, the systems were still burdened by sequential access to memory banks and were still very much an elitist phenomenon. (5)

After 1965, the second generation of computers began to develop. These were characterized by significant miniaturization and non-sequential access to data banks. The latter provided the dual advantage of speeding-up access time and dramatically increasing storage capacity. At the same time, a simplicifation of computer languages made these much closer to everyday speech when compared to the earlier languages. (6)

Present technological change in the computer industry features the growing potential of semi-conductors. Silicon chips have been used to amplify, switch, and store electrical signals. They can convert light into electricity and electricity to light. These tiny ceramic objects 1/5 of an inch thick can store considerable information. This storage capacity, measured in number of circuits, is constantly increasing. The 16 k memory-chip, which is now standard, is being upped to 64 k (1979), 256 k (projected 1981), and then into the millions. (See figures 1 and 2 on pages 25 and 26). (7)

In addition, the storage potential of holofiche (clear pieces of wafer-thin plastic) can be apparently extended to reach 200 million bytes of information. (8)

3.1.2 *THE STAGES IN THE EVOLUTION OF TELECOMMUNICATION TECHNOLOGY*

The second aspect of the technological push comes from the field of telecommunications. The historical evolution of this sector begins with telegraphy and reaches the contemporary stage of fibre optics and satellite technology.

Telegraphy was developed in the last quarter of the 19th

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(5) S. Nora and A. Minc, L'Informatisation de la société, Documentation Française, pp. 19-21.

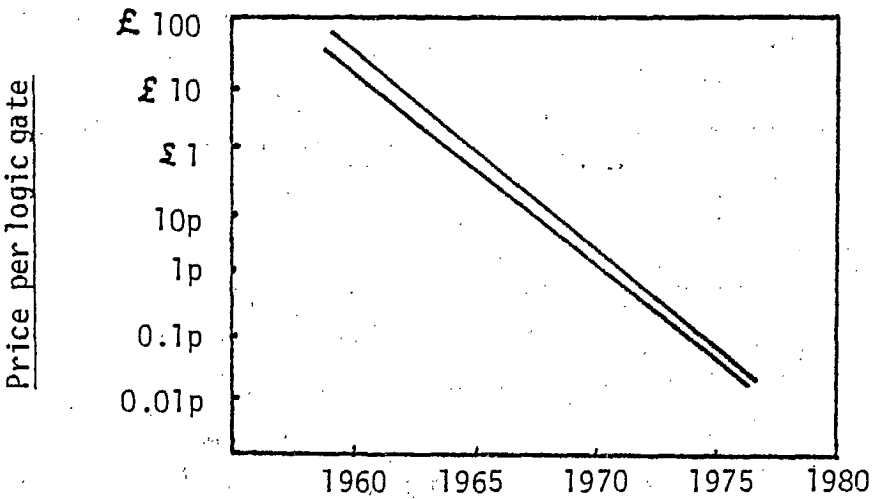
(6) Ibid.

(7) British Cabinet Office, The Application of Semi-Conductor Technology, HMSO, 1978.

(8) Megarry, R., op. cit.

FIGURE 1

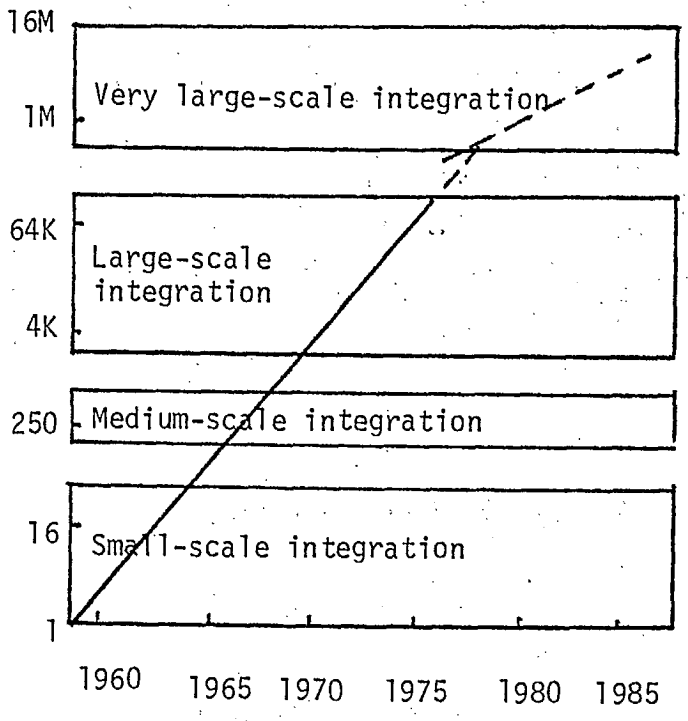
DECREASING COST OF MICROELECTRONICS



Source: British Cabinet Paper on semi-conductor technology. 1970.

FIGURE 2

INCREASING COMPLEXITY OF MICRO-ELECTRONIC CIRCUITS



Century to complement the railway network. In Canada, it was the principal business of Crown carriers such as CNT. Telephony evolved at the beginning of this century through the pioneering efforts of Graham Bell. Radio-broadcasting arrived in the second quarter of the 20th Century and has now developed into two competing systems, private broadcasting and the CBC. Cable distribution began about the middle of the 20th Century and coincided with the inception of TV broadcasting. (9)

Present communication technology is evolving around two important new systems: a) fibre optics and b) satellite technology. Fibre optics is probably the ultimate device to ensure the emergence of the wired city and wired country. It utilizes a light-source in the form of a laser or light-emitting diode passing through a hair-thin fibre of glass. Its technical advantages are: i) by using a high-frequency light, 10,000 times more information can be transmitted than through a conventional pair of wires; ii) it requires significantly fewer amplifiers than the co-axial cable and iii) it is immune to electro-magnetic interference. The technology is not yet at the full application stage since two problems have to be solved: the life of the light-source and the coupling of fibres. (10)

In a country already highly cabled (radio and TV in Canada are controlled by 240 enterprises, of which about 60 are TV carriers. There are 130 cable companies, of which 14 are responsible for 50% of the gross revenue of the industry. The overall cable penetration, at around 48.5%, is the highest in the world), fibre optics will allow even more complete wiring and channel multiplication.

Satellite technology is growing in leaps and bounds and has the considerable advantage over wire that it is cost-insensitive to distance. This means that an intercontinental satellite telephone call may be objectively cheaper than a cable-call for a much shorter distance. The proliferation of satellites and the increased diversity of their applications add an international dimension to the telecommunications nexus and move us closer towards McLuhan's Global Village.

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(9) J. Halina, Perspectives for Telecommunications 1985, Department of Communications, 1977.

(10) Megarry, R., op.cit., p. 7

3.1.3 THE PATTERN OF TECHNOLOGY PUSH

Some of the relevant data concerning the technological developments are summarized in figures 1 to 6 at the end of this section. A much more detailed analysis will be found in Professor Houle's technical paper.

The salient points concerning technology push as a cause for informediation may now be articulated as follows:

1) The hypothesis of decreasing unit costs seems to be confirmed in both the computer and communications sectors, creating a supply-push of considerable intensity.

2) According to the available evidence, the cost-reduction is not uniform in both sectors. Computer-costs are falling much faster than communications costs. This is due to the silicon chip revolution as we have seen. The slower rate of decline of communication costs, documented in Professor Houle's paper, is explained by the greater utilization of energy and materials in the communication sector. As energy prices continue to rise, and as labor-costs involved in the production of satellites, fibres, amplifiers, terminals, increase, inflation takes its toll and the reduction in cost is less substantial.

The result of this differential technology push is to favour micro-computers over large systems. The implications of this bias will be examined in the next chapter dealing with the various scenarios of the Information Society.

3.2 DEMAND PULL?

Is there a strong demand side in the informediation equation? Does the Information Society respond to a basic need for more information? We have established that the capacity to supply information has tremendously increased. But as Samuel Butler declared: "It takes two people to say something: a sayer and a 'sayee'". We must therefore look into the listening side of communication and examine if in fact there is "an insatiable thirst" for more information as some researchers claim. (11)

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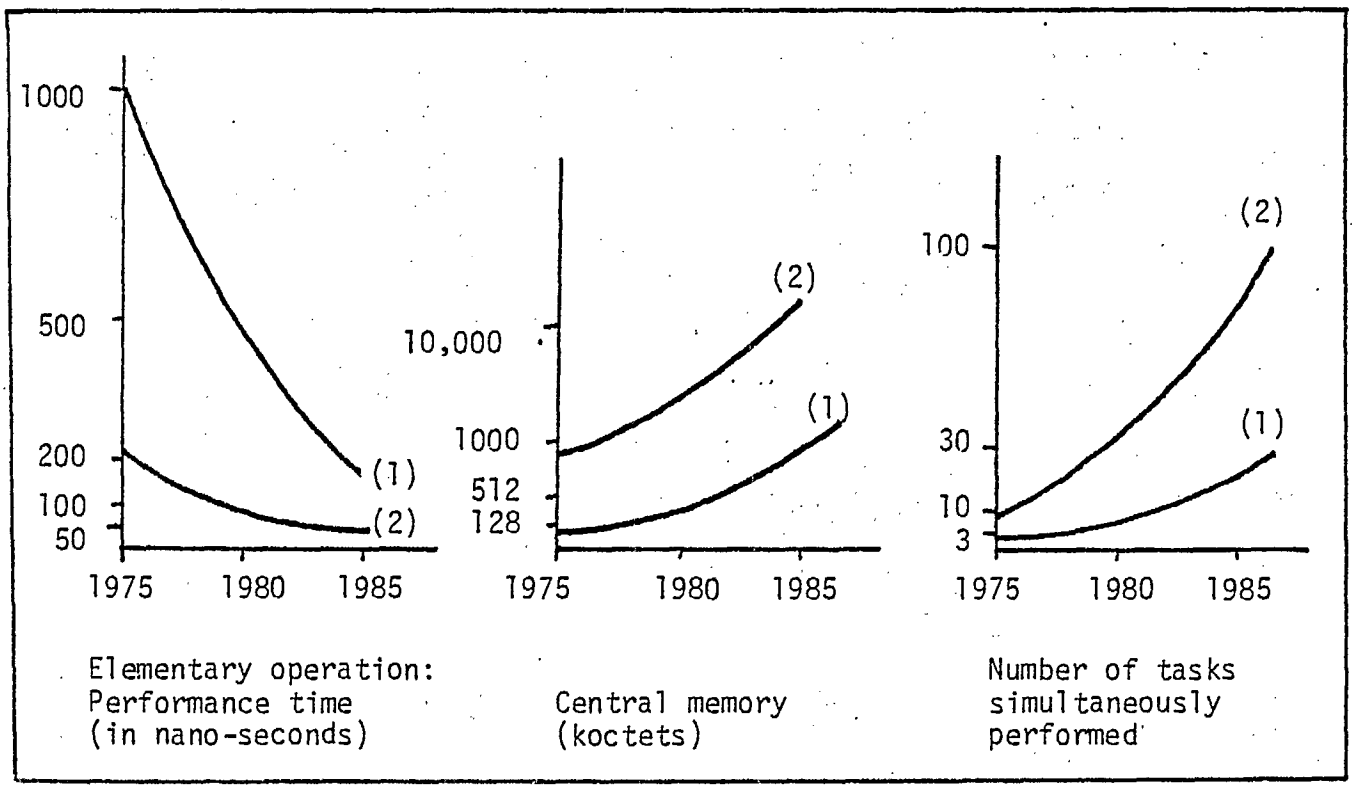
(11) For instance, G. Warskett in Role of Information Labor in Total Canadian Manufacture, Department of Communications Paper, 1978.

FIGURE 3

TECHNICAL EVOLUTION OF COMPUTER PERFORMANCE
1975-1985



(1) Central units 120KF of monthly rental

(2) Central units 120KF of monthly rental

FIGURE 4

ESTIMATE OF COSTS OF COMMUNICATION SATELLITES INTELSAT

INTELSAT	ANNEES D'UTILISATION	NOMBRE DE CIRCUITS	DUREE EN ANNEES	COUT TOTAL (MILLIONS DE $US)	COUT PAR ANNEE PAR CIRCUIT
I	1965-67	240	1.5	8.2	22,800
II	1967-68	240	3	8.1	11,300
III	1968-71	1,200	5	10.5	1,800
IV	1971-78	6,000	7	26.0	600
V	1978-85	100,000	10	18.5	30

FIGURE 5

PERCENTAGE OF FIBRE OPTICS PLANTS
PER COUNTRY IN 1978

Country	Percentage
Japan	31
U.S.A.	29
Canada	22
West Germany	5
France	4
Italy	3
United Kingdom	2
Others	4

In the previous chapter, we mentioned that information can be perceived as a commodity which is traded in visible and invisible markets. As an intermediate good, information is sought after in order to produce something else. But about the demand for information as a final consumption commodity? The definition of information is very wide and includes all entertainment or stimulation involving the five senses and/or the internal thought processes. We must however avoid the pitfall of meaningless abstraction and ascribe to everything an informational content. Although enjoyment of a car produces "information" of the pleasant variety, we shall not call a car an information good. Watching a hockey game is, on the other hand, clearly an information activity for the spectator.

It is important to distinguish between "need", "desire", and "demand". By "need", we can refer to a more or less intense state of disutility in the consciousness of an individual that requires satisfaction. The ultimate criterion for the existence of a need is that serious psychological or physical dislocation would occur if it is not satisfied. A "desire" is more fanciful, more capricious. If satisfied, pleasure is produced. If not satisfied, pain is not necessarily produced. Finally, a "demand" is a desire or need coupled with purchasing power. It denotes a willingness to buy a commodity at a certain price. Unless that willingness and capacity exist, a desire is not a demand.

3.2.1 IS THERE A BASIC "NEED" FOR MORE INFORMATION?

Between 1660 and 1970, the volume of scientific knowledge is said to have increased by a factor of 1 million.(12) Since 1970, the doubling-time of knowledge has been reduced to about five years. With informediation, there is no end in sight because of the basic characteristic of information itself: the more you have of it, the greater your potential capacity for more. (Information overload is a relative concept. The brain may reject certain types of information long before its absorbtive ceiling is reached). Today, there are about 6,000 , 7,000 articles and reports published per working day. The present stock of scientific articles is 20 to 30 million. As far as books are concerned, if one were to list all the available books in one-line entries in very small type, it would take 10,000 volumes of the size of the largest dictionnary to physically mention the existence of these books.(13)

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(12) De Solla Price, Derek, Little Science, Big Science, 1963, p. 9

(13) Ibid, p. 13.

As any contemporary researcher, bureaucrat, or academic will confirm, no amount of speed reading will ever allow him to keep up with the new publications in his own field.

If all this is true, how can we speak of "insatiable thirst" for more information?

In the Information Flow Census (14) study conducted by Japanese researchers for OECD and mentioned in the previous chapter, an attempt was made to measure the flow and stock of produced information and compare it to consumed information. As we previously indicated, that study comes closest to construction of an indicator of informediation by using the concept of "word-kilometer". Defining "information flow" as transmission of meaning via communication between human agents, it focussed on the word (10 bits) as unit of measurement. By comparing output of various media, the researchers arrived at a gross figure for information produced. They then compared this with information consumed.

The provisional results of the study were as follows:

1) Japan reached a saturation point in information consumption at about 1965. In that year, there were 18 million TV-sets covering 75% of the households with three-hours of broadcasting per day. There were also 10 million telephones.

   In 1960, the information flow census reveals a ratio of consumption to production of information of about 40%. In 1965, this goes down to 13%. In 1975, it is supposed to be 10%. In the interpretation of the researchers, 90% of the information produced in Japan is unused, therefore wasted. A "Gresham's Law" of information seems to apply: trivial information drives out valuable information. This turns people "off" the medium. *

2) Japan has already gone through "Information Ages". 3rd Century Japan (Yayoi Period) and 8th Century Japan

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(14) Tomita, Tetsumo, Information and Communication Policies in an Area Oversupplied by Information (Unpublished Study). OECD

* Care must be taken to decide when information is "wasted". Not to look up every home in a phone book is not wasting information because the telephone directory is not meant to be read from cover to cover. Not to read a novel that one buys may, on the other hand, may be legitimally called a "waste".

(Nara Period) satisfy the definition of "information society". When information is oversupplied in the historical as in the contemporary experience, it is simply rejected.

No equivalent information flow census has been attempted in the West. We feel that such a census would be a worthy endeavour. It is not unlikely that the oversupply of television programs in North America, for instance, may lead to rejection symptoms (see next chapter for a discussion of a Rejection Scenario).

It is interesting to note in passing that the British PRESTEL system, involving a videotext data-reception terminal using the telephone line, was originally conceived to allow greater use of these same telephone lines! Apparently, British telephone subscribers tend to use the telephone only for short succinct messages rather than long "chatty" conversations. The Post Office was therefore under pressure to make the subscribers use their telephones more extensively.

The contention that there is an "insatiable thirst for information", at least as a final consumption commodity, remains to be proven. A good criterion for the intensity of a need is the price-elasticity of demand for the commodity that satisfies the need. If the demand is inelastic, the objective need is great. If the demand is price-elastic, then it reflects more a capricious desire than a fundamental need. The demand for the vast array of information goods, especially those of the "gadget" variety, seems to be price-elastic. If the price is sufficiently low, people will buy them just because they are available. If the price is not low, they will simply not be bought.

3.2.2 *THE NATURE OF THE DEMAND FOR INFORMEDIATION: THE STAGES OF DEVELOPMENT APPROACH*

The demand for informediation is not only price-elastic, it is income-elastic. This means that as personal income rises, the demand for information rises, in some cases, more rapidly than the income rises. This high income-elasticity coefficient is best analyzed by reference to a stages-of-development approach which describes behavioral change on the basis of a hierarchy of needs.

The celebrated hierarchy of needs proposed by Maslowe and examined at length in Ms Iris Martin's paper in this series (15)

(15) Martin, Iris, Technical Paper No. 4, The Social Implications of an Information Economy.

argues that an individual wishes to satisfy his basic physiological needs first, then his security needs, and finally his "psychological" needs. When the level of affluence of a society is sufficient for the satisfaction of the biological and security needs, its individuals turn to more esoteric commodities. These may be conspicuous consumption-type manufactured goods (yachts, jacuzzi whirlpool baths, Patek-Philippe watches) and ultimately information goods (valuable paintings, bibelots, rare books, chess-computers, video-games, pornographic film cassettes, etc.).

All these information commodities cater to the psychological need for stimulation, because after a human being is well-fed, well-housed, and reasonably secure, he tends to feel bored. To alleviate his boredom, circuses, hockey games, spy thrillers and violent movies emerge to assuage his need-stimulation. Indeed, the regular stimulation of the nervous system or "positive stress", as Hans Selye calls it (16), is a necessary element in the overall mental health of homo sapiens.

The economic manifestation of this hierarchy of needs hypothesis was first articulated by Engel. In his celebrated Engel's Law, he contends that as the level of income rises, the proportion spent on food constantly decreases. An extension of Engel's Law can be made to apply to even higher needs. As income rises, the proportion spent on manufactured goods will eventually decrease and that spent on information goods, increase. Thus Engel's curves can be constructed to graphically illustrate that phenomenon (Figure 6) and to suggest that the Maslowe-Engel Progression of Need Satisfaction is a much more likely explanation of the demand for informediation than the naïve "insatiable thirst" for information approach.

What is argued in effect is that a society undergoes stages of development. The initial stage is geared to the satisfaction of the biological needs. The economic system to achieve that purpose is a pre-industrial society - either primitively-nomadic or sedentary-agricultural. The next stage in development is the industrial economy where comfort and convenience are achieved via the mass production of industrial goods - shoes and ships and sealing wax. The third stage of development is the post-industrial one which was long considered to be dominated by services. More likely, the post-industrial age is the information age, with information goods (both manufactured and abstract) dominating the economy. Most of the OECD countries have now reached that stage, and the proportion

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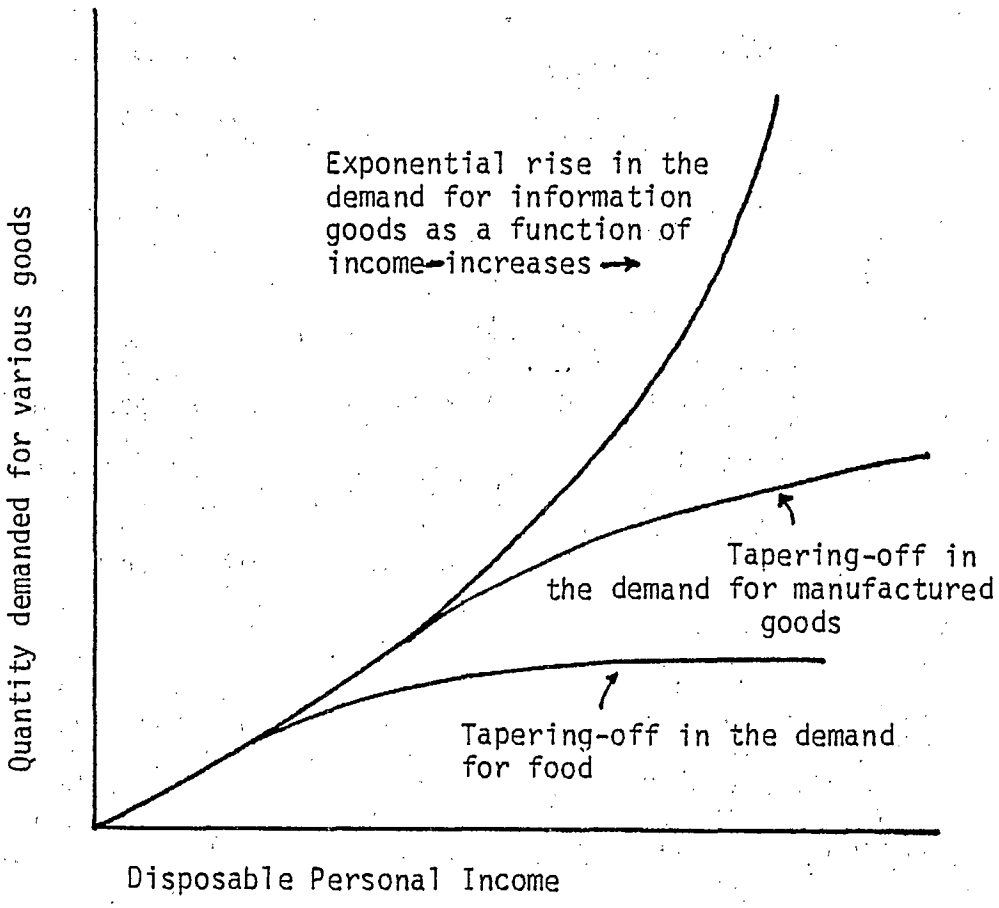
(16) Selye, Hans, Stress Without Distress.

FIGURE 6

AN ENGEL'S CURVE FOR INFORMATION DEMAND?



of information expenditures to total expenditure attests to that fact (see next chapter for Information Economy scenarios).

To put it in another way, the rich countries of the First World are now becoming toy economies. Homo faber (or Man the Producer) is giving way to homo ludens (Man the Player). A careful study of consumption patterns in the rich countries will confirm the toy-like qualities of many of the commodities we are consuming. Here are some examples:

- the proliferation of adult games;
- the toy-like qualities of cars which are no longer just means of communication, but extensions of the personality, replete with ego-boosting gadgets;
- suggestions for Christmas gifts including some absurd items such as:
  - . a $600 chocolate monopoly set where the victor eats the money he makes;
  - . monogrammed toilet paper
  - . empty cans sold for $5. and labeled "Air de Paris"
  - . the plethora of electronic and semi-electronic games
- the concentration of conspicuous consumption in what some people have called "R and T" (Restaurants and Tripomania). Restaurants do not offer food. They offer "atmosphere", "prestige", "enhanced self-image", and above all an opportunity for the overworked housewife to be served. Trips provide titillation, satisfy curiosity, and above all furnish cocktail-party conversation for months following the actual holiday or business journey;
- etc....

The toy economy is here to stay for the simple reason that we have run out of other things to buy. By extension, the demand for informediation is a function of this listlessness of consumers. But it is not an insatiable thirst. It is a highly income-elastic, price-elastic manifestation of a human behavior going through the stages dictated by the internal hierarchy of needs.

3.3 PUBLIC POLICY (OR ITS ABSENCE!)

The effect of public policy is likely to be less determining than either technology-push or demand-pull as long as we remain a free-enterprise economy. Nevertheless, government policies or their absence may accelerate or dampen the process of informediation. A detailed analysis of how this phenomenon occurs is spelled out in P.S. Sindell's paper in this series. (17)

The overall diagnosis of the impact of past and present Canadian public policies on informediation can be summed up in three ideas: 1) Canadian telecommunication policies have been avant-garde, innovative, and well-planned; 2) Canadian policies concerning micro-electronics and the computer side of the télématique equation, have been so far inadequate; 3) a lack of concertation and comprehensiveness characterizes Canadian public policy in both these fields.

For an elaboration of thie first two ideas, we refer the reader to Sindell's paper (No. 4) and J.L. Houle's paper (No. 3). We can now expand on the third idea as follows. "Concertation" has been lacking in at least three senses. First, the federal government set up a variety of units with similar jurisdiction in the broad field of telecommunications, and an overlap in mandates. The division of labor between the line departments (Communication, Industry, Trade and Commerce), the specialized departments (Ministry of State for Science and Technology, Secretary of State), and the federal research agencies (Science Council, National Research Council, Economic Council) is not quite clear. In addition, the various regulatory agencies (C.R.T.C. etc.) and Crown corporations (CBC, CN), all have a role to play in the formulation of a general information-telecommunication policy. Their actions are not concerted and sometimes in contradiction with each other.

Second, the federal-provincial relationship in the field of communications is at best an uneasy compromise. "Communication" is presently a federal responsibility. "Education" and "Culture" are provincial responsibilities. By extension, so is the large field of "Content" (i.e., what we put into the communication systems). This leads to a proliferation of provincial departments and ministries of communication and the pursuit of separate, often antagonistic policies.

Third, the much-needed cooperation of the public and private sectors in a highly competitive world is at its infancy. There is

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(17) Sindell, P.S., Paper No. 4, Public Policy and the Information Economy.

still much mutual distrust and suspicion. This hampers Canada's effort to become internationally competitive in this area.

Public policy has also not been comprehensive enough because the various levels of government have concentrated too much on particular problems and have neglected to examine sectoral interdependence. The existence of many competing, potentially incompatible and certainly not hierarchized goals had led to erratic policy formulation.

In a nutshell, Canadian public policy has certainly accelerated certain aspects of the process of informediation, but the absence of an integrated approach has produced a "telecommunications tangle" of competing policies that should be disentangled and rationalized in the near future if the full synergy of concertation can be tapped. (For specific proposals concerning the direction of future policy, see Chapter 6 and 10 below).

PART I - THE CHARACTERISTICS OF AN INFORMATION SOCIETY

CHAPTER 4

THREE SCENARIOS FOR AN INFORMATION SOCIETY

4.1 DEFINING THE INFORMATION SOCIETY

Having identified the central process of change and its principal causes, we can now propose a definition of the Information Society as follows:

> *An Information Society is a set of social relationships based on an Information Economy. In turn, the Information Economy exists whenever over 50% of the Gross National Product belongs within the broad information sector.*

This definition, inspired by the Porat-OECD approach, implies once again the division of the economy into a high-throughput sector (processing energy and materials) and an information sector (processing symbols rather than goods, bits rather than BTUs). It also implies a certain amount of economic determinism since it assumes that the configuration of society is largely influenced by its economic base.

The proportion "50%" is of course arbitrary but nevertheless meaningful. By this standard, most of the OECD countries are either already Information Economies, or very close to becoming so. Other than technology-push, the principal reason for this fact is the general evolution of economies through stages of development. This evolution seems to be unaffected by the dominant ideology of the country in question. In fact, it reflects an evolution of needs. As was pointed out in the previous chapter, an agricultural economy focusses on the satisfaction of the basic biological needs. An industrial economy provides for a series of more advanced needs that are best satisfied by material (i.e. industrial) commodities. A post-industrial economy satisfies abstract needs through more services and more information.

It must be once again emphasized that because of the generality of the Porat-inspired definition, many pre-industrial or non-industrial economies may also be considered Information Societies. Thus, all religious-based societies (where religious activity is an important proportion of total activity) would qualify. Religion is of course, by its very essence, an information activity. Many religions have Holy Books containing supposedly divinely-revealed knowledge which is dispensed by priests or elders. The very first page of the Bible, it will be remembered, states that "In the beginning was the Word..." Adam and Eve, it will be also remembered, were expelled from the Garden of Eden because they tasted the fruit of knowledge. Christian redemption (or, for that matter, the notion of redemption in many other religions) depends on Man recovering lost knowledge - either

through his own efforts or via a Messiah or Messenger of God. Finally, we may refer back to an earlier mention of Teilhard de Chardin in this report to note that this Jesuit theologian sees knowledge as Divinity and Man's quest for salvation as essentially an informational one. Man's attempts to elevate himself into the "Noosphere" is the culmination of Chardin's evolutionism.

If a religious society is an Information Society, does that fact necessarily imply that there must be high "informediation"? We think not. There is obviously more than one Information Society. To outline and distinguish the various alternate scenarios that such a society may take, we have constructed Table 4. We can now describe the contents of this table more fully.

4.2 THE "TELEMATIQUE" SCENARIO

"Télématique" is a French neologism which is a contraction of "télé-informatique" or computer-telecommunication. (The English equivalent, "compunication", is not particularly elegant). It has been popularized by the massive French report on the Information Society addressed to the President of the Republic.(1) In essence, the Télématique Scenario describes the society that would result from a high integration of the communication nexus and computers. It assumes the existence of a central "electronic highway". This so-called highway would include the cable (either telephone or television, and most likely both in Canada), and communication satellites. The cable would wire the office, the home, and the factory and create the long-awaited wired city, wired region, and wired country. Communication satellites would complement the wired country and create an international electronic highway (or airway) in this case. The net result would be a global village of a scale and of a dimension unthought of in McLuhan's early treatises.

At the base of the entire télématique system is the ubiquitous micro-processor without which this particular scenario would not be possible. The twin revolutions in communication and micro-electronics described in the last chapter will be ushering in a new world which is likely to revolutionize almost every sector of life.

To begin with, we can examine the changes that are likely to occur at three focal points: the office, the home, and the factory of the future. The télématique office will likely be almost "paperless".

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(1) Simon Nora and Alain Minc, L'Informatisation de la société, Documentation Française, Paris 1978, 163 p.

TABLE 4

THREE SCENARIOS FOR AN INFORMATION SOCIETY
IN THE NINETEEN EIGHTIES

GENERAL DESCRIPTION: 1) Over 50% of the GNP is involved in the information sector; 2) the entire organization of the society reflects that economic fact.

THE 'TELEMATIQUE' SCENARIO

a) A central electronic highway interconnecting offices, home, and factories. The home and office terminals become as commonplace as the telephone.

b) International interconnection via satellite.

c) The computer is omni-present in production, consumption, and personal life-style.

VARIANTS

- TELEMATIQUE ONE (All the above with trivial content)
- TELEMATIQUE TWO (All the above with totalitarian content)
- TELEMATIQUE THREE (All the above with socially-desirable content)

THE 'PRIVATIQUE' SCENARIO

Computer is omni-present but the interconnection via the electronic highway and satellites is de-emphasized. The computer becomes an instrument for decentralization and individual fulfillment.

VARIANTS

- PRIVATIQUE ONE (Individual symbiosis with computer)
- PRIVATIQUE TWO (Small-group local interaction with high technology)
- PRIVATIQUE THREE (Small-group non-territorial interaction with high technology)

THE 'REJECTION' SCENARIO

a) Rejection of high-information technology.

b) Return to simple information communication devices.

VARIANTS

- REJECTION ONE (Rise of cults and religious movements)
- REJECTION TWO (Low technology, small-group interaction. Communes, encounter groups, etc.)

Word-processors, data-bank terminals, "intelligent" computer terminals, high-speed facsimile printers, will probably drastically reduce office staff and fundamentally alter the whole concept of bureaucracy. The introduction of télématique to the office in fact gives rise to a new science, bureautics, or the study of automation in the office of the future. (2)

The home of the future has already been the object of countless articles in the popular press. In essence, the télématique home will be centered around the television set. Fed by the telephone wire and/or the CATV cable, it will be the instrument of two-way, interactive communication. The communication aspect of the home of the future can be visualized as follows. Already, with existing cables, the number of channels available in Canadian homes will be close to 35. These channels will be supplemented by custom-made entertainment via videotape recorders and the multiplying tribe of video-games. With the eventual introduction of fibre-optics, the channel capacity of home TV will increase to hundreds, if not thousands. Supplementing these increased channels will be teletext and video-text machines such as CEEFAX, ORACLE, ANTIOPE, TELIDON, or VISTA (3), bringing more data into the home and allowing the viewer to respond interactively.

The computer aspect of the home may be also described. At most stages in this communication process, a micro-computer will be involved. When the home terminal will become an "intelligent terminal" rather than a mere glorified television set (as is the case with some of the present technology), then many of the "thinking" presently done by individuals will be delegated to these home computers. Fed by international data-banks and interactive, the télématique home will be inexorably bound to the electronic highway.

The télématique factory will be highly automated like the office

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(2) For a description of such an office, see Robert Russel, The Electronic Briefcase: Office of the Future. (Institute for Research on Public Policy, 1979).

(3) A teletext machine is a television set adapted to receive specialized information (such as sports results, advertisements, etc.), broadcast via hertzian waves (over the air). A video-text machine is a TV set hooked to the telephone or other cable performing the same task. Examples of such machines are the British CEEFAX (BBC), ORACLE (CTV), PRESTEL (British Post Office), the French ANTIOPE, the Canadian TELIDON, and the Bell Canada VISTA.
For a description of operations, see I. Martin's study in this series (Paper No. 5).

and the home. Computers will not only assist in production, but also in design, a field hitherto reserved for human intelligence. Just how far the process of replacing men by machines can go is a matter of controversy. Some cling to the idea that there are limits to what a computer can do. Others will point out that whenever such limits are discovered, they are transgressed a few years later. The new science of robotics examines these questions and in a general way looks at the pattern of automation in industry. The prognosis seems to be that labor-replacing robots will be increasingly taking over almost every aspect of production.

Not only will the télématique office, home and factory of the future be fundamentally different from today, but even the office/home separation is likely to disappear. Whatever the residual bureaucrats do at the "office" they could probably equally well do at home. Better still, the complete communications-computer vehicle could be encased in an electronic briefcase possessing in miniaturized form all that is needed to "plug" the executive into the central electronic highway.

The list of further applications of télématique is long since is may include:

- electronic funds transfer (the cashless society)
- electronic mail (the letter-less society)
- tele-shopping
- tele-medicine
- tele-voting in instant referenda
- etc.

The date of effective commercial application of télématique in each of these sectors is of course not known, but it is a safe bet to contend that all the above applications may be in place by the end of the century and the great majority, in some form or other, within 10 years, that is, if the télématique option is given the full go-ahead.

One important final addition to the central electronic highway is the communication satellite. This satellite will extend the electronic highway across international borders to integrate the entire world. No area on Earth will be too remote to resist penetration via satellite communication. What the cable will do to wire the télématique city and country, the satellite can do to "wire" the world. In a sense, the feeling of a world electronic highway already exists with direct-dial intercontinental calls since with the same nonchalance as that involved in a local call, it is possible to communicate by telephone with the farthest corners of the globe. The world electronic highway will enhance that communication potential by allowing trans-border data flows on a scale unparalleled in history.

Ordinarily an account of the high-technology Information Society usually stops with the description of the various innovations and their applications. We disagree. An all-important additional element must be included, which has too often been conveniently omitted. It is the question of CONTENT. The central electronic highway is a very sophisticated communication system, but what will it communicate? What content will fill the airwaves, the cable, and the satellites? What messages will be piped into the home and the office? These questions are portentous indeed and admit to many answers. Such answers fall into three categories, each of which may become the basis for a variant of the Télématique Scenario.

TELEMATIQUE ONE
(Central electronic highway with increasingly trivial content)

The trend scenario (i.e., the scenario resulting from the projection of present trends) seems to indicate that the most likely version of the Télématique Society, at least in the short-run, is the trivial one. What this means is that the individual will be increasingly assaulted by trivial information or unwanted data. A few examples will illustrate this idea.

1) One of the best-sellers of 1978 was the so-called Book of Lists. This publication is a compendium of trivial facts of the type: "How many breasts did Anne Boleyn have" (answer: 3); "What were the 10 movies ever produced according to Truman Capote"; "The fourteen coincidences in the assassinations of Abraham Lincoln and John F. Kennedy"; etc.

   There is also the perennial Guinness Book of Records going through new editions every now and then. Then there are now various other compendia such as "The Book of Rules", "1001 Wise Saws", etc., purporting to be lists of famous system-laws such as Murphy's Law: "Anything that can go wrong will", Bentley's Axiom: "If a philosophy can fit in a nutshell, it should remain there..."

   Book of Laws, Book of Lists, Book of Jokes... The interesting thing about such lists is that they make fascinating reading and are deservedly best-sellers. Anne Boleyn's three breasts could feed many a cocktail party conversation and so can the latest Newfie joke!

   Interestingly, the data presented on existing teletext-videotext machines seem to follow the Book of Lists anecdotal pattern which is billed as "entertainment". For straight information, the data is communicated with considerable drabness. To read the present teletexts is as adrenalin-

provoking as studying a phone book! Ask the information terminal a question and you get a computer printout ...with one long list!

2) Trivialization of TV series. With the multiplication of TV channels and the constant increase in air-time, TV-plots, now frequently churned out by superficially programmed computers, seem to follow an increasingly standard pattern. The homogenization of content in the home entertainment of the future will thus become complete. Only, instead of seeing it on three channels, we will now be able to view the same plot on hundreds.

3) Trivialization of life-styles. The already popular characterization of the TV set as an "idiot-box" or "boob-tube" may well become a self-fulfilling policy. As the home TV will occupy a place of choice in the central electronic highway, the result may be a trivialization of life-styles with people increasingly imitating the trivial models that they view via the central electronic highway. The search for lowest common dominators and comic-book sophistication may lead the over-informediated society to a flight from quality in favour of titillating massages. Superman (the movie) may become the thought leader and Jaws IV the emotional summit.

TELEMATTQUE TWO
(Central electronic highway with totalitarian or socially-destructive content)

A far more ominous and not completely improbable possibility is the totalitarian control and utilization of the central electronic highway to promote a particular ideology. One shudders at the thought of a Hitler or a Goebbels at the controls of the c.e.h. penetrating into everyone's office and home. Already there are some "mild" versions of the use of the TV system to advance particular thought-processes. Here are some examples:

1) The televised religious revivals (Billy Graham, Maharishi Mahesh, Oral Roberts, the Reverend Moon, and the Moonie Sect). An interesting case of "télématique" religion is the Iranian experience in 1978-79. Although ostensibly the Iranian islamic movement is anti-western and by extension anti-technology, one method of crowd-mobilization by the Ayatollah Khomeni while he was in exile in France was the audio and video cassette. The opposition to the Shah, having

been eliminated from the streets and public places, could only thrive in the sanctuary of the Mosque. It was within the confines of the Mosque that audio-cassettes of the Ayatollah were heard with his instructions. In addition, secret meetings using video-recorders were held in private homes with video-tapes of the Ayatollah. Paradoxically then, one of the chief instruments of the 1978-79 Islamic revival in Iran was an avant-garde instrument of the télématique society.

2) The increased potential for advertising. In addition to the renaissance of religion (a phenomenon to be examined further at the end of this chapter), télématique both potentially increases and limits the power of advertising. The increase in the power of advertising stems from additional channels of communication (not only to people's homes, but more fundamentally, in people's minds). Skillfully handled, the c.e.h. becomes a prime vehicle for thought re-conditioning. This potential is, at the same time, limited by the very diversity and self-competitiveness resulting from channel multiplication and information redundancy. The network-TV viewer, hitherto a captive audience, may now escape by switching channels, playing his video-tape recorder or his programmable video-games.

On the other hand, if the same organization controls most of the channels, it may condition the viewer to a particular way of thinking in as many ways as there are channels. The diversity would be fictitious and the Orwellian dystopia of total control, at hand.

3) Objectionable or "evil" content. The multiplication of channels and universal access to data creates another, less ominous, but nonetheless real danger: that of piping into homes objectionable content. This content could be objectionable in the sense of assaulting privacy, avoiding censorship, presenting extreme violence, etc. The latter possibility is noteworthy. As a great number of content-producers are going to compete for a limited number of viewers suffering from an embarrassment of riches in home-entertainment, the competition will be fierce. Traditionally, violence and shock-value have been used to lure audiences back to a medium threatened by a sister-medium. When the film industry was threatened by TV in the fifties and sixties, it responded by escalating sex and violence to reconstitute its depleted audience. A replay of this tactic is already in the works as various TV-networks compete for viewer attention with more sex and violence. With the

proliferation of information channels, this war of escalation of shocking content may continue with the apparent consent of the viewer (who voluntarily switches on the high violence movie), but to his longer-term detriment.

TELEMATIQUE THREE
(Central electronic highway with ideal content)

This third variant of télématique is, by definition, the most desirable one, but there is no guarantee that it will necessarily come about. Obviously, the information travelling along the electronic highway should be in the "public interest". Unfortunately, no one has a clear notion of what the public interest is or should be (see later chapter on social costs and benefits). We face here a real and. at the same time, inevitable dilemma. We cannot ignore public interest as a policy-guide because if we did, there would be no criteria to assess public policy. At the same time, most nasty definitions of that elusive concept will in fact be promoting one or other special interests of particular groups. The task of public policy must be nevertheless to explicate that difficult idea and base itself on it, however monumental that taks proves to be.

4.3 THE "PRIVATIQUE" SCENARIO

An interesting counterpoint to the Télématique Scenario has been advanced in France by Bruno Lussato. (4) His thesis is that a) the future belongs to small computers and not to large ones, and b) that that is as it should be. An original contributor to the annexes of the Nora-Minc Report, Lussato both espouses high technology information systems and rejects télématique. His arguments are noteworthy.

First, as a communication engineer, he claims that we have now reached a limit to the economies of scale stemming from large computers and highly-integrated systems. In the early stages of computer development, of the two components of an information system, the central unit and the peripheral input-output connections, the central unit's cost was 75% of the total with peripherals accounting for the remaining 25%. Economic logic was therefore promoting large integrated systems since in fact the communication systems were cheap and the core computer expensive. The Télématique Scenario of a wired country with electronic

(4) Bruno Lussato and Jean Bounine, Télématique ou Privatique. Les Editions de l'informatique, Paris.

highways linking up a few huge computers is, he claims, an extension of that economic logic. This logic is now in the process of being reversed. The peripherals are following inflation or, at the very least, reducing their unit costs at a slow pace, while micro-electronics have led the computer world to dramatic cost reductions. The present cost structure seems then to favour a proliferation of central units and not peripherals. There is therefore an inherent techno-economic logic for small decentralized individual computers rather than the mammoth ones envisioned a few years ago. Time-sharing, once thought to be the way of the future, is, according to Lussato, slowing its rate of growth quite drastically. This general cost-disgnosis is convergent with that of J.L. Houle in his technical paper produced for this series, and seems to be confirmed by a substantial part of the technical literature.

Lussato's second argument is not empirical but normative. The télématique option is, he claims, a fighting option. It is either an aggressive one (imperialism by communication-control) or at best, a defensive one (the Nora-Minc Report favours a strong telematized France to resist the pressures of giant multinationals such as IBM. There is much talk in the Report of a "bouclier télématique" or télématique shield).

What he calls the "privatique" option is neither aggressive nor defensive. It is geared to cater to the needs of the private individual. The Privatique Scenario envisions a highly decentralized, highly individualized use of computers to enhance rather than stifle a person's potential. The micro-computer becomes an added instrument of human fulfillment and an extension of his personality - not unlike the calculator, the camera, the typewriter or even the paint brush. Therefore, in the privatique option, all citizens should be instructed on how to use computers to satisfy their needs. (This argument is reminiscent of Jean-Luc Godard's plea during the student dissent in 1968 in Paris, in favour of universal ownership of movie cameras. Give the camera to the people, said Godard, to allow them to reach self-fulfillment).

Once decentralization is accepted as desirable and possible, the privatique option may take one of many forms:

PRIVATIQUE ONE
(Individual symbiosis with a computer)

In this variant, the Jean-Luc Godard-type approach is maximised. The computer is a personal computer, almost as personal as a toothbrush. It is an auxiliary memory, a design aid, a thinking aid, a very private tool. Ultimately, a personal symbiosis with a computer could become

as commonplace as our dependence on eye-glasses, vitamins or tobacco.

PRIVATIQUE TWO
(Small-group territorial interaction)

Whereas the Privatique One variant is a movement to extreme individualism, Privatique Two could make the local territorial community the principal unit of informediation. Community cable systems, neighbourhood time-shared computers, local clubs, etc, can all be features in a system designed to foster and promote regional identity. The scale of the privatique unit could vary depending on the purpose but the overall criterion would be territorial.

PRIVATIQUE THREE
(Small-group non territorial interaction)

In that third variant, the unit of decentralization becomes, not the territorially-based group as in Privatique Two, but the non-territorial affinity group. Thus, groups of stamp-collectors, chess-players, poets, or Humphrey Bogart fans could communicate via interconnected information systems in order to promote their special interests. The TV channels could then be reserved for special purposes and used to further diversity rather than uniformity.

One example of what could be termed a cross between privatique and télématique is the computer-conferencing networks set up between scientists from various parts of the world. Computer conferencing allows communication between people via telex-type terminals in their offices or homes. This conferencing is not constrained by time or space. The space dimension falls since the participants are interlinked through the telephone cable and the time dimension falls because they can talk to each other at different times. Participant A in Britain enters a message to participant B in Canada. Participant B receives the message when he checks his own electronic "letter box", using his terminal to ask if there are messages for him. This could be done hours or days after the message was sent. He can then enter his answer which will instantaneously reach participant A, if A is in a receptive mood and has his terminal turned on. Computer conferencing allows an extended dialogue to take place between two or more participants which can potentially be as fruitful as a face-to-face encounter.

The selective grouping of certain people into affinity networks therefore becomes a third version of the individualized, diversified, high-technology Information Society, which can be generically referred to as the Privatique Option.

4.4 THE REJECTION SCENARIO

Both télématique and privatique have in common the full acceptance and utilization of sophisticated information technology. Télématique favours the full synergy of computers and communication. Privatique favours the micro-computer and is more selective regarding communication channels.

A third class of scenarios can now be identified which have in common the rejection of informediation in favour of a return to more traditional forms of communication. What is rejected is not the Information Society, but the high-technology version of it. A low-technology Information Society is instead chosen. This scenario would in fact be an analog to the intermediate technology movement in the economic growth vs no-growth debate. The intermediate technology advocates argue for a society at the human scale ("Small is beautiful") with soft and appropriate technologies. The appropriateness of technology is a function of its ecological harmlessness, its labor-creating rather than labor-destroying production-mode, and its use of renewable resources locally available. Its Information Society counterpart boils down to the privatique option minus the computer and the television set, big or small.

The Rejection Scenario is quite plausible, at least in the medium-run, for three reasons. First, the danger of trivialization of content resulting from over-production of information may have the effect of "turning people off the medium entirely". Already, there is a kind of snob-value in some circles in not owning a television set. Surprisingly, many communication experts either do not own or hardly use television. It is not uncommon to discover that a telecommunications specialist would much rather read a book than sit before the "boob-tube". Consequently, it is possible that a growing elite will take note of the growth of informediation instruments and yet look down upon them in contempt.

Secondly, quite apart from the trivialization threat, there is an adaptation time needed for consumer acceptance of new products. This adaptation-time may be much longer than originally supposed. One of the reasons why the much-heralded wired city did not yet fully materialize is because of consumer resistance to some of its technological components: what Alvin Toffler has called Future Schock is frequently the result of alienation caused by too rapid technological change. Impersonal airports, expressionless answering services, synthetic voices, the beep of the computer's keyboard, the strangeness of news read from a television screeen rather than in newspapers, the mythology surrounding robots - are all elements favouring a short-run Rejection Scenario. After all, there have been a sufficiently large number of science-fiction works (1984, Brave New World, etc.) or films (Jacques Tati's

Playtime, Kubrick's A Clockwork Orange, Woody Allen's futuristic satires, etc.) to discredit a humanless scientific future.

Thirdly, the development of these new information devices may trigger a new revival of quality in the traditional media such as books, ballet, live music, visual arts, painting. This phenomenon is not dissimilar to what is known in economic history as the sailing-ship effect. When in the 19th century the steam engine was introduced, it was mistakenly believed that steamships would immediately make sailing ships obsolete. What actually happened was the opposite. Faced with the competition of steamships, sailing ships became extremely efficient, inexpensive to operate and fast. The final demise of sail and the definitive introduction of steam was postponed a good fifty years.

Similarly, it is quite possible that because of the potential competition from hundreds of TV channels, novels and plays will concentrate on superior content and very high quality. The performing arts may experience a revival and the dozens of TV games, videotext-teletext, data banks, lie unused while consumers take time off to go to the opera - in perhaps the same ritual pomp and circumstance as in late Victorian times! The Rejection Scenario would still be an Information Society but of a very different sort from either télématique or privatique.

Like the other scenarios, Rejection can take on many variants, two of which are likely.

REJECTION ONE
(Growth in low-technology communes, encounter groups, person-to-person communication)

In this version, people begin to rediscover each other in non-informediated, "live", direct interaction. We experience a revival of the encounter group or sensitivity session of the late '60s. Emphasis is on physical touching, physical feeling, physical experimenting. There is a continual quest for mutual discovery. Simple unmediated art-forms such as mime, body-language, disco-dancing, shiatsu, ballet-jazz, yoga, martial arts, Tai-Chi Chuan, are favoured. The California-style informal commune becomes increasingly fashionable. The counter-culture becomes the dominant culture.

REJECTION TWO
(Growth in organized cultism, territorial affinity groups, structured ideologies based on low-level technology)

In this alternate version, the individual, one-on-one, unmediated

interaction develops into a cult with its cult-leader and a cult-followers. The main commodity transacted is information which is dispensed by the cult-leader. The information technology used is intermediate and will seldom go beyond public address systems or ordinary audio recorders. At times the cults can become religious movements. Some examples of these organized low-technology Information Societies:

- The People's Temple in Guyana, scene of the recent mass-suicide under the spiritual leadership of "Reverend Jones".
- The Apostles of Infinite Love in the Quebec Laurentians.
- Various California-based cults.
- The almost universal revival of religion in the world: the contemporary Islamic revival in Iran, Libya, Turkey, Afghanistan, and Pakistan is of course well-documented. The strength of Buddhism and Hinduism and other eastern religions is also easily verifiable. As for Christianity, the recent encyclical of Pope John-Paul II is almost a textbook example of a new religious doctrine, casting doubts the desirability of unbridled growth of technology, be it informational or otherwise. Entitled Redemptor Hominis, it warns against the evils of materialism, and calls for a return to spiritual values:

  "Man cannot and must not become the slave of things, the slave of economic systems, the slave of technology."

The inadequacy of a high-technology communication system with low-quality content to go with it is, in the final analysis, the greatest factor acting in the direction of a Rejection Scenario. The home terminal can give data but can it give meaning? And it seems to be meaning that the masses are increasingly looking for. This meaning is provided by the new and revived religions. Some of these choose to convey their message with traditional communication tools (the Bible is still more powerful than TV), others use the emerging télématique system to their own advantage. In either case, the existence of the various scenarios and their plausibility attests to the validity of the central diagnosis: the problem of the Information Society is not just a question of the medium. The message is of paramount importance. Unless meaningful content can be infused into the system, the Information Society can take many directions, not all of them desirable.

PART 2

SOCIO ECONOMIC IMPACTS

We now turn to the second part of the paper which outlines potential impacts. This part is intended as a framework for future research, not as a definitive statement of final consequences. It must be read in that light.

PART 2 - POTENTIAL SOCIO-ECONOMIC IMPACTS

CHAPTER 5

THE INFORMATION ECONOMY AND THE FUTURE OF LABOR

The displacement of human labor by machines is a process that started with the British Industrial Revolution. In the pre-industrial agricultural economy, unemployment was virtually unknown. With the growth of capital-intensive manufacturing in the 18th and 19th centuries, the demand for labor changed. The demand for skilled craftsmen declined drastically while that for unskilled machine operators on a production line increased. The advent of the high-technology Information Economy of the télématique variety is, by all accounts, likely to also profoundly affect the future of human labor. A full empirical study of its probable effects is a priority impact study, but to pose the right questions it is necessary to examine the various categories of such impact. We have tentatively identified four such categories as follows.

5.1 THE DISEMPLOYMENT EFFECT

The structural change in the mode of production brought about by micro-electronics is likely to reduce the demand for human labor. This primary job-destruction will undoubtedly also have secondary effects of further job-destruction. Calculation of the cumulative disemployment could ultimately involve the computation of a disemployment multiplier which could include one or more of the following:

- reduction of the number of workers in a specific industry;
- elimination of entire industries. An example of this is the virtual death of the Swiss mechanical watch industry as a result of the introduction of digital watches;
- the regional (or international) displacement of entire industries and the resulting displacement of jobs. (This raises the twin questions of industrial location and national competitiveness in the Information Economy, which are dealt with in the next chapter).

The domain of disemployment, or in other words the industries most likely to be affected, is another important question since the effect is not likely to be uniform. If we use the traditional division of the economy into the primary, secondary, and tertiary sectors, and add to those an information sector, it would appear that the magnitude of the displacement effect is likely to be in reverse order - the information sector being the hardest hit, and the primary the least affected. This hypothesis, which should be confirmed or disconfirmed by empirical investigation, rests on the following assumptions.

The nature of unemployment today is quite different from what it was in the 1930's. Whereas during the Great Depression unemployment-rolls included men in their prime, the contemporary unemployed are in overwhelming majority women and young adults under 25. To obtain a complete picture of unemployment, it is necessary to distinguish between hidden vs. overt unemployment, and also consider "misemployment". Overt unemployment is of course abundantly advertised in the press and it is no secret that the figure for Canada hovers around the 10% mark.

The case of hidden unemployment is less clear. Hidden unemployment exists whenever workers are paid "wages" for what amounts to fictitious jobs. A job is fictitious if its absence would not affect the level of production. In other words, the marginal productivity of the worker in this job is zero. There is mounting evidence that hidden unemployment is substantial, perhaps accounting for as much as 20% of all jobs in the economy. It tends to be concentrated in the service and especially the information sectors for the very simple reason that in these sectors, performance indicators are difficult to construct.

How are we to evaluate the performance of an information worker (bureaucrat, researcher, consultant, etc.)? The judgment of his peers tends to be intellectually incestuous in the sense that it is quite possible for a group of people to write for each other, patting each other on the back and at the same time produce nothing worthwhile for the outside world. Academic production is particularly vulnerable to zero marginal productivity that would nevertheless remain hidden for want of objective performance indicators. Similarly, the information bureaucrat whose principal output is to produce internal reports and attend meetings is engaged in an activity that is difficult to evaluate objectively.

Historically, the tertiary and information sectors have been the recipients of surplus labor from the primary and secondary sectors, not because they were genuine growth sectors responding to a new urgent demand, but because there was nowhere else to go for the surplus labor. That part of the tertiary sector beset by hidden unemployment has been described in the economic literature as the "tertiaire de refoulement", freely translated into the "residual tertiary", or, less kindly, the "garbage tertiary".

The introduction of micro-electronics is going to make hidden unemployment more difficult in the "garbage tertiary" because it will make the unemployment less hidden. Word-processors, data terminals, computers with accounting capability are likely to both make obsolete "real" jobs in the office and uncover the already "fictitious" ones.

Consequently, the emerging bureautic revolution will quite probably eliminate the traditional information sector and the garbage tertiary.

The effect in the secondary sector is likely to be slightly less pronounced, principally because the performance indicators tend to be more objective than in the tertiary. This means that there is less hidden unemployment in the secondary sector because there are fewer opportunities to camouflage fictitious jobs. Besides, the bulk of the secondary sector is in private hands, which means it is submitted to the discipline of the "bottom-line": if the firm shows a profit, it is doing well; if it shows a loss, then the axe will fall on the inefficient.

In contrast, the tertiary sector is, to a large extent, made of public bureaucracies. These tend to have no bottom-line, or worse still, thrive on deficits because of the way government fiscal years operate. If the public bureau thrives on a deficit, it can well afford to pay wages for fictitious work. There is no profit imperative to prevent abuse. It follows then that most of the jobs that are going to be destroyed in the secondary sector are likely to be "real" rather than fictitious jobs to begin with. Mutatis mutandis, the same is true for the primary sector.

Lastly, we must also consider the question of misemployment. Misemployment exists where a worker is doing a job he is not suited for while his real talents remain unused. The introduction of micro-electronics will most probably expose those cases of misemployment because the tremendous productivity jumps will make inefficiency less acceptable. Consequently, above and beyond job-destruction, the information revolution will bring about job-shuffling on an intra-firm, intra-industry, inter-industry, and even inter-regional basis. Significant frictional dislocations are therefore to be expected in all the sectors of the economy.

5.2 THE EMPLOYMENT EFFECT

The second effect of the information revolution will be to <u>create</u> jobs or, in other words, increase the demand for labor. For every industry destroyed, a new one may be constructed. The question is, however, whether the new ones are likely to be as labor-intensive as the ones they are replacing. The intuitive presumption is that they will not. The industries of the future are not likely to be labor-intensive because of the very nature of the information revolution which is labor-saving, not labor-enhancing.

This realization uncovers two fallacies that have crept into the Information Society debate. The first is the belief that the percentage of the total labor-force engaged in a particular economic sector is an indicator of the importance of that sector in the economy as a whole. This, of course, is one of the approaches Porat takes when he implies that we are moving into an Information Economy because over 50% of the labor-force is employed in information activities. Upon analysis, we feel that position is untenable because it misses the very point of informediation. Assume that the production of, say, food is completely automated. There is not one agricultural or other worker still producing food: yet, the efficienty level, because of micro-electronics, robotics, chemical fertilization, etc., has reached such a point that the country is producing great amounts of food and exporting it. A "percentage of the labor-force" approach will yield the absurd conclusion that food-production is no longer important!

Similar examples can be multiplied, of course. The message is clear. In the emerging mode of production, for good or for ill, the number of workers involved in an activity is not the crucial indicator of the importance of that activity. Quite on the contrary, it may be an indicator of structural weakness as in the case of the "garbage tertiary", beset by hidden unemployment and the recipient of unwanted labor from dynamic sectors of the economy.

The second fallacy is to believe that once an industrialized country like Canada will develop a micro-electronic industry, that industry will necessarily be one day exported, in toto, to Taiwan or Korea because "labor is cheap there". The "cheapness" of labor is significant only if we are dealing with labor-intensive modes of production. In the case of a completed automated factory, there is no danger of losing it to cheap labor because already the labor content is zero. Only if wages in Taiwan or Korea are significantly lower than the cost of operating the automated factory will that threat exist. More probably, the logic of decreasing unit-costs brought about by technological change will bring down production costs in the automated factory beyond the reach of even the cheapest labor-intensive competition.

Although in the long-run there is reason to believe that robotics and bureautics will reduce the demand for labor to almost zero, in the medium-run of the next 10 years there is still likely to be some degree of job creation in the new industries. Consequently, the total quantitative effect of the information revolution on the demand for labor is going to be the difference between disemployment and new employment. That figure may be computed, with some degree of confidence, for specific industries.

5.3 THE SUPPLY EFFECT

The information revolution will also affect the supply side of the labor equation. Some factors will tend to increase that supply (and worsen the unemployment problem). Others will have the opposite effect.

In the first category, we can mention the probable effects of the information revolution on education and re-training of the labor-force. Teaching, whether formal university teaching or informal on-the-job training, is going to become more efficient. This means that learning times to acquire degrees, diplomas or new skills, are going to be reduced. Teaching machines, televised university courses, interactive home terminals will greatly increase the quality and quantity of the labor-force, thus resulting in a positive supply effect.

The supply of labor may also be reduced by the information revolution. One of the effects of that revolution will be to increase the number and diversity of leisure activities. As a result, the demand for leisure may increase. The opportunity-cost of working will be high because of all the attractions of télématique or privatique entertainment. This could lead to reduction of work-weeks, increased holiday-time, early retirement and, in general, a withdrawal of part of the population from the labor market, thus reducing the overall supply of labor.

5.4 WORKING CONDITIONS AND THE WAGE

The question of working conditions and wage rates must not be ignored. In a sense, it is much more important than the mere computation of the net disemployment-employment effect. The presumption seems to be in favour of a general improvement of working conditions. With the blurring of the distinction between the office and the home, much work will be performed in the privacy of one's residence. In fact, the office may become nothing more than a conference room where people interact on a person-to-person basis. At the same time, since robotics will lead to factory automation, the drudgery of menial jobs will be a thing of the past. New jobs created will likely be more interesting than the ones destroyed.

What will happen to wages is less clear. On the one hand, there might be a decrease (or slower increase) of wages as labor becomes more redundant. Workers might have to accept less to compete with machines. On the other hand, it is more likely that powerful unions

will keep wages high. Employers will prefer to satisfy the unions by accepting high wage rates and recouping their losses by hiring fewer people.

5.5 THE EMERGING DILEMMA

The emerging dilemma of public policy facing the labor effects of informediation consists in having to choose between unpalatable alternatives (at least as far as we maintain our existing mind-sets which make these alternatives unpalatable). If the government chooses a job-creation policy objective as its first priority, it must logically halt or slow down the move towards a high-technology Télématique or Privatique Society. (A Rejection Scenario Information Society is, of course, not particularly threatening to labor since only intermediate technology and more traditional information tools will be employed). If however it halts or slows down robotics and bureautics, the country runs the risk of losing its international competitiveness to other nations who will have chosen to fully exploit the new information revolution. The result will be to lose the jobs anyway since the industries will become defunct.

Since the jobs cannot be protected, it might be argued that there is no dilemma. Canada might as well make the full plunge into the high-technology Information Economy. Logic however runs counter to powerful vested interests, especially pressure groups in certain vulnerable industries that may disappear altogether and labor unions. The political task of effecting a transition to an information-intensive mode of production becomes enormous and takes the form of a veritable public policy dilemma.

5.6 THE RESEARCH DESIGN FOR PHASE II

The identification of various types of problems potentially associated with the effect on labor of the Information Economy must now lead to a thorough empirical investigation of the actual effect for Canada. Here are some elements of the research planned for Phase II.

Task One: Construct a priority list of industries likely to be affected by the information revolution as far as labor is concerned.

This priority list must be put together in consultation with industry leaders and labor unions and must not be a government-only type of operation.

Task Two: Summarize and integrate the secondary literature available in this country and in the other OECD countries concerning the impact on labor of the new information technologies.

This comparative survey will allow Canada to benefit from foreign thinking on this subject and avoid unnecessary repetitions.

Task Three: Analysis of retrospective and present unemployment trends and projection of these trends into the future.

This involves a computation of the trend scenario concerning employment in Canada. A trend scenario answers the question: what happens if present observed trends are projected into the future? This task can be achieved by analyzing federal and provincial data from Statistics Canada, Manpower Canada, and provincial government departments.

Task Four: Direct-research on an industry-by-industry basis involving on-the-spot direct analyses.

Case studies at the level of the firm and/or at the level of an industry would be performed, enlisting the active cooperation of both management and labor in these industries. The case studies would examine:

- the disemployment/employment effect,
- the impact on the supply of labor,
- the impact on working conditions and wages,

by using a combination of

- carefully thought-out Delphi-type questionnaires,
- structured interviews and dialogues,
- meetings with management and labor, using the CONSENSOR machine to determine likely trends.

Task Five: Construction of policy alternatives to respond to the projected impact.

These policy alternatives would identify both what should be done, who should do it, and the time-frame involved in their implementation. Full concertation of industry, labor, and government is quite necessary to deal with this problem.

Task Six: Construction of an integrating report and presentation of results to the appropriate decision-makers.

The time period necessary for the successful completion of this impact study is approximately two years from its launching, with Task 4 taking itself about one year, at the end of which the integrating Task 6 would be completed.

PART 2 - POTENTIAL SOCIO-ECONOMIC IMPACTS

CHAPTER 6

GEOGRAPHICAL LOCATION OF INFORMATION ACTIVITIES: REGIONAL BALANCE AND CANADA'S INTERNATIONAL POSITION

6.1 The Centralization/Decentralization Issue

6.2 Canada's International Economic Position

6.3 The Research Design for Phase II.

The territorial or spatial impact of the Information Economy essentially boils down to two issues. First, will the new information technologies promote decentralization and the reduction of regional disparities within Canada, or will they on the contrary lead to more centralization? Second, will Canada's international competitive position suffer or be improved by the new technology? Will Canada export or import the vital information commodities of the future?

The two issues are obviously linked since the factors that determine industrial location work both within a country's border and internationally. However, an important difference remains. The patterns of industrial location within a country may be greatly influenced by the policies of the federal government in concert with those of the provincial governments. On the international scene, the power of the federal government of Canada is of course much smaller since it has to compete with other giants.

6.1 THE CENTRALIZATION/DECENTRALIZATION ISSUE

At the onset, two distinct meanings of decentralization must be made explicit. The first refers to the geographical decentralization of economic activity while the second refers to the decentralization of decision-making. The two are not necessarily identical. It is possible to have decentralized activity with centralized decision-making. For instance, the federal government can locate some of the branches of its departments in various provinces around the country without changing the centralized decision-making procedures. Conversely, it is possible to concentrate activity in one geographical area, yet allow the decision-making to radiate back to many other areas. For instance, the House of Commons is located in one place, yet its members are supposed to reflect the views of every part of the country. Ideally then, Parliament is an example of a geographically centralized institution reflecting decentralized decision-making power.

The new communications technologies favour geographical decentralization of activities while at the same time encouraging centralized decision-making. We have seen that the office of the future may be located in the home or even in the electronic briefcase. This in no way implies that the carrier of the electronic briefcase will have greater decision-making power, probably quite the contrary. To give an historical example, we can recall the comparative responsibilities of an ambassador before and after the invention of telecommunications. Before telecommunications, the ambassador had full freedom to represent his country as he saw fit until the diplomatic courrier would arrive with new instructions. After the invention of tele-

communications, the ambassador's freedom of action was severely hampered since he could always request instruction by cable. Today, the telephone hot-line effectively reduces an ambassador to the role of a glorified messenger.

In the Télématique Option of the Information Society, the central electronic highway obviates the possibility of significant decentralization of decision. There is instead a trend towards bigness and gigantic corporations with central offices making decisions concerning remote areas. In the Privatique version, where the telecommunication dimension is de-emphasized, the scope for effective decision decentralization is much greater. In both cases however, geographical activities will be decentralized and a possible effect of that is to reverse the long-term trend towards excessive urbanization. The downtown core of cities may become redundant. Instead of the executive who commutes two hours every day to go to his office in order, as McLuhan points out, to make phone calls, he will use the telephone in the comfort of his home.

Urban sprawl, which has radiated out of the downtown core and enveloped the countryside may change its pattern. It would no longer depend on an urban nucleus but instead distribute itself evenly along the lines dictated by the telecommunications nexus. This may mean the growth of medium-sized cities.

6.2 CANADA'S INTERNATIONAL ECONOMIC POSITION

At the international level, the question becomes one of comparative advantage and competitiveness. Canada's international economic position is likely to be influenced by the following four dimensions of the global information society:

- the increased international mobility of factors of production;
- the vertical and horizontal integration of international production and the emergence of the multinationals;
- the "game-plans" of Canada's competitors;
- the crucial role of entrepreneurship.

6.2.1 THE INCREASED INTERNATIONAL MOBILITY OF FACTORS OF PRODUCTION

Since World War II, a basic premise of the theory of international trade has ceased to be true. The classical theory of

international trade and comparative advantage, as formulated by the late 19th Century economist, envisaged a world where factors of production, namely resources, labor, capital and technology, are mobile within a country and immobile between countries. Since comparative advantage depends on comparative costs, the stable factor endowment of a country would give it a stable comparative advantage. Thus, Britain would be better at the production of woolens because her climate favours sheep rearing, Portugal would produce better wine, and Canada, maple syrup.

However, the post-World War II improvements in transport and communications technologies changed all that. Today, factors of production are mobile internationally. Oil is transported in super-tankers to be refined far from its geographical origin. Food can be processed thousands of miles away from where it is grown. Physical capital in the form of machines can be readily imported. Financial capital, in an era of euro-dollars and petro-dollars, is very mobile internationally. Most important of all, the new super-star among productive factors, information, can be instantaneously transported across international borders.

The result of this factor-mobility is to create an economic system with a highly unstable structure of comparative advantage and frequent shifts in the international division of labor. Countries producing and exporting commodity X may overnight find themselves importing and consuming that same commodity: industries become footlose and a country or region may be pleasantly or unpleasantly surprised by sudden locational shifts. The probability of such shifts has been greatly enhanced by the microelectronic silicone chip. The celebrated "silicone valley" in California, where silicone chips are mass-produced, could have been located in dozens of other places around the world. There are no longer safe abodes for any industry, let alone the mercurial information industries.

"Here today, gone tomorrow" seems to be the motto; or, conversely, "absent today, here tomorrow".

6.2.2 *VERTICAL INTEGRATION AND THE RISE OF THE MULTINATIONALS*

The international mobility of factors of production has led to the vertical integration of international production under the aegis of the multinational corporation. The latter, straddling many countries, is reorganizing the international division of labor to suit the pattern of its own organization. It may move

factors, almost at will, between nations and shift its production lines. As a result, countries tend to stop specializing in products and instead produce components. The structure of international trade, which was hitherto a trade between "nations", is now increasingly a trade between branch offices of multi-nationals. Indeed, at least 40% of international trade now involves intra-firm exchanges.

The components of the information industries are particularly vulnerable to these locational shifts for the simple reason that the principal factor of production in this case is know-how (or technology or software). The know-how can be shifted to where the labor is cheap (Taïwan for instance) to where the resources are located or to where the climate is particularly pleasant (California and the sun-belt in the U.S., the Riviera in France), etc.

The challenge for Canada then is to find itself a viable, reasonably stable niche in the new international integration of production.

6.2.3 *THE GAME-PLANS OF CANADA'S COMPETITORS*

Canada's traditional comparative advantage has been in resource-based industries. We have however developed considerable expertise and a certain degree of international leadership in some forms of transportation and communication. Indeed, as far as communications in concerned, Canada is sometimes used as a model by other countries. (1) Nevertheless, in the emerging field of télématique and micro-electronics, the competition is wide open and becoming more and more intense. It makes sense therefore for Canada to develop its own industrial strategy after a thorough study of the "game-plans" of Canada's major competitors.

The competitors fall into two general categories. The first includes nation-states who either have or are on the point of developing comprehensive strategies in the field of information-communication. The second includes non-Canadian multinational corporations who are cornering a great piece of the tele-communications market. The first group includes the U.S., Britain,

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(1) See for instance: Philippe Lemoine, Les Arbres de vie, Analyse de l'expérience canadienne en télécommunication (Annexe au rapport Nora-Minc sur l'INformatisation de la société).

France, Germany, and Japan. The second group features a dozen corporations headed by I.B.M.

The game-plans of the advanced nation-states which are entering this field in earnest varies from a laissez-faire free-market approach to detailed comprehensive planning. The U.S. strategy is essentially to let the market decide. Since most of the information-communication multinationals are American anyway , the U.S. free-market approach is also a strategy for foreign penetration. The principal asset of the American approach has been the use of the U.S. government's considerable leverage as a purchasing agent to direct research and innovation towards the industries of the future. The greatest triggers for this government-sponsored private R and D have been the space program and the military program. These two areas of expenditures have led to considerable spin-offs and spill-overs which have been instrumental in accelerating the information revolution.

The U.K. has, for its part, only recently been sensitized to the potential of micro-electronics and telecommunication. The central feature of its "game-plan" is the allotment of 400 million pounds over the next five years towards the development of a competitive British micro-electronic industry. High-level committees that report directly to the prime minister's office have been set up to oversee the implementation of this strategy.

France has opted for a much more dirigiste attitude than either the U.S. or the U.K. The massive Nora-Minc Report on the Information Society is leading towards the construction of a large "indicative" plan to make that country a leader in télématique. The plan is "indicative" in that it provides information orientation and guidance to the private sector which is to work as a partner with the public sector. The "Mission à l'informatisation de la société" in the ministère de l'Industrie is providing leadership. The French avowed objective is to secure the number three position in world micro-electronics and communication (presumably conceding numbers one and two to the U.S. and Japan). Great importance is attached to satellites which the French see as modern-day counterparts of the 19th Century railways. It will be remembered that in the late 19th Century, railways were perceived by the great powers as offensive and defensive instruments of international influence. Railway-diplomacy dominated the turn of the century and the French feel that satellite-diplomacy will dominate the last years of the millenium. In particular, France wants to develop a French-controlled "télématique shield" against the U.S. multinationals, in particular I.B.M.

Germany has so far been less overt in its planning for the télématique era but doubtless as earnest as France and Britain. It has studied foreign experiments and purchased apparently both the British PRESTEL and the French ANTIOPE systems. Its attitude is characteristically thorough, but the overall objectives and strategies are not as explicitly formulated as in the French case.

The push for dominance in the information-communication field seems to be strongest in Japan. That country has extended its highly successful industrial strategy to the télématique sector. Its main ingredients are as usual: a) careful study of foreign experiences; b) creative emulation of international technology with the Japanese initiatives eventually surpassing their models; and c) a concerted plan of action involving close teamwork between the public and private sectors. The closeness of that teamwork has led to the oft-quoted characterization of that country as "Japan Inc.". Exaggerated or not, the key element of the Japanese approach has been concentation and comprehensiveness. It has so far been a winning strategy. (2)

The game-plan of the leading multinational corporations as exemplified by I.B.M. is simple. I.B.M. has 50,000 computers in the field and places another 12-13,000 per year. It is a highly lucrative field. However, there is at stake a multibillion dollar industry in business communication system now controlled by telephone companies. The cornering of the telecommunications sector is the logical next step for computer-based firms in the same way that communication firms have to get into the computer market. Consequently, there is a powerful trend towards vertical and horizontal integration where firms try to take over other competitors. The threatened competitor is not necessarily a resisting victim since horizontal integration increases everyone's profits. The challenge for the medium-size nations like Canada is to successfully compete with the international marketing networks of these new corporate giants which, by the logic of vertical and horizontal integration, tend to become even bigger.

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(2) For a short summary of some of these foreign experiences, see M. McLean, The Impact of Micro-Electronics, I.R.P.P. Occasional Paper, February 1979.

6.2.4 *THE CRUCIAL ROLE OF ENTREPRENEURSHIP*

In a world of intense competition and free movement of factors of production, the ultimate determinant of industrial location in any particular geographical location becomes... entrepreneurship. No longer constrained by the location of resources or of markets of final consumption, the firm may decide to settle in any one of a dozen areas and be equally efficient. If the senior executive is relatively indifferent to industrial location as far as hard economic criteria are concerned, he becomes more sensitive to the soft locational criteria.

This is where entrepreneurship comes in. If a micro-electronics component manufacturer is to choose between locating in, say, Ontario, Québec, Southern California or New Mexico, the general socio-economic climate of each of these candidate areas will weigh heavily. The sunshine of the southwest will be opposed to the snowbound north. The attractiveness of cosmopolitan cities like Montreal may weight the other way. Conversely, misguided provincial policies by Québec or Ontario governments, the existence of high sales or income taxes, linguistic politics, non-tariff barriers, etc., can also affect the ultimate attractiveness of a particular geographical spot by attracting or repelling investors.

The international competition for the footloose télématique industries will require dynamic and innovative entrepreneurship. A good metaphor here is to consider that some people always find a parking spot when driving downtown and others never do. Theoretically, parking spots are equallly available to all. Yet, in order to obtain one, a certain amount of cunning, knowledge of traffic patterns, and timing is necessary. The successful entrepreneur, whether he be an executive in a firm or a government civil servant, must, like the parking-spot seeker, know when to seize opportunities. Better still, he should create them.

The stakes are after all quite high. If the "parking spot" is missed by Canada, then the new industries will locate elsewhere. This will once again relegate Canada to the much-dreaded role of primary resource producer - the hewers of wood and drawers of water image that the country's leadership wishes so intensely to escape.

6.3 THE RESEARCH DESIGN FOR PHASE II

The overall objective of the next research phase as far as the dual question of internal location and Canada's competitiveness is concerned, may be articulated as follows: *develop a game-plan to ensure Canada's competitiveness in the emerging global information economy.*

The tasks to be performed in order to arrive at this game-plan can be briefly described.

Task 1 *Study and evaluate the game-plans of Canada's major competitors*

This, in essence, is the Japanese approach and, in our view, it makes eminent sense. Most of the "game-plans" of Canada's competitors are public, heavily advertised documents that are certainly not considered secret. A careful study of these is a necessary pre-condition to the construction of a Canadian plan.

Task 2 *Determine the sectors where Canada can develop a viable comparative advantage in the medium-run*

The choice of sectors for the development of competitive industries must take into account three important dimensions: the technology life-span, product cycles, and technology generation.

A technology life-span may be described as the stages of evolution of a particular technological development. Briefly, these are:

Stage 1 - Discovery
Stage 2 - Invention
Stage 3 - Innovation
Stage 4 - National dissemination
Stage 5 - International dissemination.

Successful entrepreneurship would require that the choice of where to enter the technology life-span be carefully thought out. For instance, it may be inadvisable for a country like Canada to attempt "discoveries" and "inventions". It may be more profitable to seize upon existing technology having completed stages 1 and 2, and concentrate on innovation and dissemination. This, once again, has been the Japanese approach, at least in the early stages of Japan's drive to industrial dominance.

Product-cycles, closely related to technology life-spans, refer to the life-cycles of products which are both in an advanced country, are then exported to other countries from the advanced country, and finally manufactured in other countries and imported by the advanced country that developed it. The consideration of product-cycles will allow Canadian entrepreneurs to know when and where to "strike", i.e., which product is ripe for development and manufacture and export from Canada.

Technology generation refers to the obsolescence of various technologies. For instance, the British and French teletext-videotext systems are in Technology-Generation One. The Canadian Telidon is a second-generation system. A third-generation system may be in the offing. The successful entrepreneur will gage the life of each particular generation and plan his competitive entry accordingly.

The consideration of these three factors leads to two important policy-implications: a) planning for the medium-term (rather than the very short or the long-run) and b) developing leap-frog strategies.

The need to plan for the medium-term is the result of uncertain comparative advantage, technological obsolescence, and product cycles. To plan for the long-run may be self-deflating because conditions may change quite drastically. In addition, the inherent logic of this strategy may also discart leap-frog technologies where one or more technological generations are deliberately skipped.

Task 3 *As a consequence of Tasks 1 and 2, develop a comprehensive industrial strategy*

This industrial strategy must, of necessity, be comprehensive and spell out the various interdependences between sectors. However, it must not be a government-only exercice. The business and labor sectors must be actively consulted and take part in the conception of the industrial strategy.

Task 4 *Determine the internal location implications of the comprehensive strategy*

The impact of the industrial strategy on geographical location within Canada must be carefully assessed in consultation with the provincial governments. The issue of centralization-decentralization as discussed in section 6.1 must be fully explored and corrective actions envisioned if the pattern of location becomes undesirable.

Task 5 *Develop implementation strategies that would stress concertation between the public and private sectors*

Once again, we stress the importance, nay inevitability, of concertation if Canada is to have a fighting chance against its international competition. The mechanisms for such concertation must be flexible, yet sufficiently directed to allow a time-table to be established for implementation.

PART 2 - POTENTIAL SOCIO-ECONOMIC IMPACTS

CHAPTER 7

THE ENERGY IMPLICATIONS: IS THE INFORMATION ECONOMY A CONSERVER SOCIETY?

7.1 Relevance of the Issue

7.2 An Agenda for Research

7.1 RELEVANCE OF THE ISSUE

We have seen in an earlier part of this report that it is conceptually possible to divide the economy into two sectors, the first, energy-intensive, and the second, information-intensive. It would appear that a common denominator between the two is conceivable in economics but not in physics.

From an economic point of view, it is possible to reduce everything to the common numéraire : money. From a physics point of view, energy is reduceable to BTUs (British Thermal Units) or kilocalories, and information to BITS or clusters of bits (bytes). Further reduction seems to be presently impossible. There is no positive correlation between energy and information. More bits do not necessarily imply more BTSs and vice-versa. In fact, there is reason to believe that the very opposite is the case: namely, that there is a trade-off between bits and btus or, in other words, that there is a substituteability between energy and information.

As we have briefly indicated in Chapter 2, the underlying foundation in physics for such a trade-off is the counterpointing of the law of entropy with the law of information. In one formulation of the anti-entropic character of information, reference is made to "Maxwell's Demon". The reasoning is as follows:

> "...Maxwell supposed two compartments, A and B, to be filled with gas at the same temperature, and to be separated by an ideal, infinitely thin partition containing a number of exceedingly small trap-doors, each of which could be opened or dosed without any expenditure of energy. An intelligent creature or "demon" possessed of unlimited powers of vision is placed in charge of each door with instructions to open the door, whenever a parcicle in A comes towards it with more than a certain velocity... and to open the door, once again, whenever a particle in B approaches it with less than a certain velocity... By continuing this process, every unit of mass which enters B will carry with it more energy than each unit which leaves B and hence the temperature of the gas in B will be raised and that of the gas in A lowered, with no heat lost and no energy expended: so that by the application of intelligence alone, a portion of gas of uniform pressure and temperature may be sifted into two parts in which both the temperature and the pressure are different and from which, therefore, work can be obtained at the expense of heat..." (1)

(1) Quoted in D. Hawkins, The Language of Nature: An Essay in the Philosophy of Science, N.Y., Anchor, 1967.

In other words, given perfect information, one could theoretically get free energy, i.e., available energy without increase in entropy. This speculative hypothesis has led to the characterization of information as negentropic and has become the intellectual foundation for many a philosophical theory.

Without dwelling further into physics and metaphysics, it is reasonable to contend that, other things being equal, the application of "intelligence" may save energy. In examining the potential of the ubiquitous, micro-electronic chip, it is striking to consider what it can do with trivial energy expenditure. One can only marvel at the chess-playing computer going through intricate variations of the Queen's gambit declined, using less energy than is needed for a human player to take one breath. Thinking itself, it will be noted, is an energy-efficient process. It consumes only minute amounts of energy - much to the chagrin of overweight bureaucrats...

The resulting information/energy trade-off is most definitely a relevant policy issue, for the simple reason that, with energy prices skyrocketing, information technology may, as yet, save the day.

The Conserver Society, a policy-option previously developed by the GAMMA group (2), may find expression in the Information Economy. The objective of "doing more with less", of promoting growth with conservation, of having one's cake and eating it too, becomes plausible in the age of semi-conductors.

7.2 AN AGENDA FOR RESEARCH

In order to test this hypothesis, it would be necessary to construct the following research agenda:

Task 1 *Energy savings through bureautics*

An examination of the energy-savings resulting from the introduction of word-processors, computer terminals, and business communication machines in the office of the future.

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(2) The GAMMA Report on the Conserver Society, in 4 volumes, or K. Valaskakis, P.S. Sindell, J.G. Smith and E.I.Martin, The Conserver Society (N.Y., Harper and Row: January 1979).

Task 2 Energy savings through robotics

An examination of the energy savings in the automated factory with robots substituting for human labor. The energy-saving may not be as evident there unless total energy-accounting is used. For instance, in computing the energy cost of using human labor, it would be necessary to count the energy expended in commuting by these human workers. In fact, the "energy multipliers" of alternate production modes could be calculated and compared. Almost surely, the conclusion will be that the automated factory saves energy. The question is, by how much?

Task 3 Energy savings in primary production

The application of fertilizers, sophisticated electronic equipment and a better understanding of energy-chains in agricultural transformation may lead to considerable energy savings. Empirical research concerning the application of micro-processors to mining should also be conducted.

Task 4 The trade-off between travel and telecommunications

This, of course, is the intuitive area of trade-off between energy and information. It may work in two ways: a) by allowing telecommunications (video-phones, computer conferencing, teletext, etc.) to reduce, in absolute terms, the amount of travel and b) by allowing the new information technology to slowdown the natural increase in travel demand. Many observers erroneously conclude that because travel-demand has not decreased in absolute terms, telecommunications has had no impact on it. This is a fallacy. It may well be the case that the demand for travel would have increased more sharply without telecommunications. The new technologies have applied a brake on the natural growth of travel-demand.

Task 5 General analysis of energy saving through greater organizational efficiency

An analysis of energy-saving through improved organizational efficiency (which is a form of information) would also be necessary. For instance, a car-pool system of commuting, a rental scheme to equalize the load-factor in the use of certain consumer items, a better management of time to avoid peaks and throughts in consumption (such as rush-hours) would all be energy-conserving. New information technologies could greatly assist the planner in devising such systems.

Task 6 Integration of results

An aggregate estimate of projected energy-saving through information-technology could then be computed. This would give an order of magnitude to the changes in the rate of growth of energy-demand resulting from the widespread use of micro-electronics. If the results are significant and the conserving characters of information technology are established, the process of informediation, whatever its other advantages and disadvantages, may prove to be the cheapest source of new energy. Instead of spending millions developing, say, nuclear energy, the accent could be on painless conservation without reduction in the standard of living by accelerating the move towards the Information Society.

PART 2 - POTENTIAL SOCIO-ECONOMIC IMPACTS

CHAPTER 8

SOCIO-POLITICAL IMPLICATIONS

8.1 THE NEED FOR EVALUATION CRITERIA

The Information Economy, like the industrial, pre-industrial, or post-industrial economies, are not ends in themselves. The ultimate end is of course an improved quality of life, or welfare, or felicity, or whatever it is that people pursue. The various economic and social modes are means to that end. Eventually then, the various scenarios of the Information Society will have to be carefully assessed in terms of their compatibility or incompatibility with higher individual and social objectives.

An assessment is impossible without assessment criteria. If an evaluation is attempted without making the criteria explicit, the evaluator's personal biases dominate it, yet remain hidden and undefined. If the criteria are explicated, then, although subjectivity remains, th evaluation standards may be submitted to scrutiny.

To explicate our sets of criteria, we believe that these should fall in three categories. First, they may be drawn from a study of individual needs. Second, they may be defined in terms of collective or social needs. Finally, they may also be examined in terms of a special category of collective interaction: the political process involving changes in the power equation. The subject is, by its very nature, extremely vast and complex. Yet, to exclude social costs and benefits from our Information Society study would be singularly short-sighted since it is clear that these very costs and benefits, together with the economic aspects, will determine the ultimate desirability of that societal option.

8.2 THE "INDIVIDUAL NEEDS" APPROACH

If we focus on the individual, we can assess the Information Society in terms of its contribution to his fundamental needs. In this connection, it may be useful to borrow the approach used in another project than this research center is involved and which is sponsored by the United Nations University in Tokyo. (1) It distinguishes between three cases of consumption: under-consumption, over-consumption, and optimum consumption.

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(1) Goals Processors Indicators of Development Project (GPID). An international project sponsored by the U.N. University.

Given that an individual has a structure of basic needs (whether these needs are innate or acquired, biological or psychological, good or bad, is another set of issues) and a probable hierarchy of desired satisfaction of these needs, he may either achieve his objectives or miss them. Under-consumption would describe a state where certain material needs (say, for food and manufactured goods) are not satisfied. Over-consumption, on the other hand, is the situation where, in the process of satisfying certain needs, other needs are frustrated.

There are two possible cases of over-consumption as used in this context:

1) The needs of individual A are only satisfied by frustrating the needs of individual B;

2) The satisfaction of some of the needs of A implies the frustration of other needs of A.

These cases are not mutually exclusive. Examples of the first case arise whenever the phenomenon of scarcity if present. If, for instance, information is demanded with exclusive proprietary rights (trade secrets, technological know-how, information leading to a competitive advantage), then from a social point of view, the satisfaction of that demand for individual A implies the frustration of individual B's demand for the same information. This analysis could be the basis of an economic theory of secrets explaining why information is withheld.

An example of the second case is when the availability of information leads to unhappiness or distress for the person who has received it. For instance, when a patient finds out he has an incurable disease, although a part of him demands this information, another part of him would rather now have it. Similarly, the premature discovery of a sports result, while the game is replayed on television, robs the spectator of the suspense. On the one hand, he wants to know the result. On the other, he wants to be kept in the dark.

A third example is when a surprise birthday party ceases to be a surprise for the birthday person. The latter both wishes to find out if something is planned for his birthday and also wants to be surprised.

Information can be a commodity to some and a discommodity to others. It may also be a commodity and a discommodity to the same person at the same time. The Information Society certainly satisfies a whole range of needs and desires but, simultaneously, frustrates many others. The satisfaction of increased access to data through the central electronic highway also carries its costs. These may take any of the following forms:

- Threats to privacy
(Unless the flow of information can be shut off in either direction, loss of privacy results. The present telephone system is a potential threat to privacy since, in the majority of cases, it is not possible to choose not to receive a call. Devices however are being marketed to allow selection of calls in the future. Junk mail is another assault to privacy. The music from someone else's radio or television falls in the same category).

- Threats to confidentiality
(Confidential information will become more difficult to protect since any one could obtain such information from the interconnected computer networds).

- Objectionable content
(Uncensored TV with schock-value, gory violence, etc.... With pay-TV, the consumer will have the choice to see private programs. Once again, a part of him would demand to see the objectionable content, another would reject it).

- Dehumanization of communication
(Mediated communication is increasingly replacing live unmediated communication. In a télématique society, it is entirely possible for one individual to go for weeks without communicating with another human being. Robotics, bureautics, home computers, data terminals, etc., could provide for many of his overt needs. The need for live, physical contact with another human being would however be frustrated).

One striking image of the coming Information Society is the contemporary Penny Arcade. A solitary individual may amble through such an amusement park and play the various pin-ball machines, highly realistic video-games, have a dialogue with a holographic image, play chess with a computer, be massaged by a robot. The range of simulated informediated experience is rapidly reaching science-fiction proportions. Already, there are simulated sex computers (CYBERSEX), which monitor the various physiological reactions of an individual experiencing orgasm. This orgasm can be "replayed" and the individual taken through a mental "trip" almost at will.

At the experimental stage is also a so-called Arnold Palmer jacket which, when worn by Arnold Palmer, would register

everyone of his muscular movements when playing golf. The jacket could then be worn by someone else who would rapidly condition his own muscular movements to emulate those of the champion golfer.

The Information Society as House of Illusion where robots replace men and minds is an ominous, yet singularly attractive proposition. No one has so far studied the deep psychological effects of prolonged living in a simulated world of images. The long-term effects on the individual psyche of deprivation of human contact should be the subject of a close study.

- Opportunity costs
(As more and more information devices become available, one limiting factor comes into play: time. There is simply not enough time in a 24-hour day , a seven-day week, and a 52-week year for an individual to fully enjoy the thousands of TV-channels which will become available, the video-games, the video-cassettes, the FM music, his audio-records, audio-cassettes, etc. The opportunity foregone in order to be plugged into the electronic highway may be costly indeed. Already, it is difficult to pry children away from the television to come to the dinner table. Family life, physical activity, interpersonal live communications, are all threatened by informediation. While the child's consciousness is massaged by the Saturday monring cartoons, he may be frustrating his body's need for exercise and fresh air. Again, we have a case of potential over-consumption with deleterious results).

It is obvious that, at the individual level, the Information Society is a mixed bag of considerable costs and benefits. The process of sorting these out has barely begun. It must, in our view, be continued and expanded.

8.3 THE "COLLECTIVE NEEDS" APPROACH

The sum of individual needs does not necessarily result in a collective need. Moreover, a collective need does not necessarily imply the satisfaction of an individual. A phenomenon of emergence occurs. Both the fallacies of composition (what is true for the part must be true for the whole) and division (what is true for the whole must be true for the part) must be avoided.

Collective needs crystallize around collectivities and in Canada there are many competing collectivities. Ideally, they should merge into the notion of the "public interest", without which public policy would have no object. But what is the public interest in Canada? Is it what the Prime Minister says it is? Is it what Parliament proclaims it to be? Is it what the provincial governments want? Is it what vested interests - business, labor, consumers - are interested in? None of these descriptions of the sources of "public interest" are satisfactory, yet the notion cannot be shelved. What in fact can be said is that there are levels of public interest depending on the collectivity one would like to focus on.

At the national level, it would appear that the public interest, as far as the information sector is involved, comprises at least three elements:

- Canadian "sovereignty" (which is a political concept)
- Canadian "identity" (which is a psychological concept emphasizing the difference between Canada and the U.S.)

and National "unity" (which is a political cultural idea).

We have excluded the economic objectives, which are well-known and which include: growth, better distribution of income, low inflation, low unemployment, and balance of payments equilibrium. The three "social" objectives mentioned above reasonably correspond to what the central government and the House of Commons, as articulators of public opinion, believe this collective interest to be.

Canadian sovereignty is threatened, not aided, by the information revolution, for the same reason that all sovereignties are challenged by this process. The idea of sovereignty is linked with the capacity of a nation-state to control what is entering and what is leaving its borders. The world electronic highway with satellites, etc., will make trans-border data flows so easy that their control would become practically impossible. When information travels freely across international borders, the possibility of existence of "secrets", industrial, national,

or otherwise, becomes very low. This favours technological transfers, but robs the nation-state of its freedom of manoeuver. It is like playing a poker game with all the cards showing!

Canadian identity is similarly threatened because of the relative size of the U.S. and Canada. The reception of U.S. TV, a process which is likely to become more and more widespread with the eventual introduction of pay-TV, will rob the airwaves of "Canadian content" which, for good or for ill, keeps the country culturally together. What constitutes "Canadian content" is of course a question of almost metaphysical proportions. In some interpretations, anything "made in Canada" is Canadian content, even though it might be a U.S. western with U.S. actors etc., but located in Saskatchewan rather than Montana. In other stricter interpretations, "Canadian content" must reflect Canadian culture. Since Canadian cultural traits are not that dissimilar to American ones, especially as far as English Canada is concerned, Canadian content on the media is an elusive proposition at best.

The situation is quite different as far as French Canada is concerned. Because of the natural barrier of language, the Québécois cultural indentity is less threatened from the English Canadian one. There are authentic Québécois traits that can be amplified by informediation. This both strenghtens the separateness of Québec's life-style and poses a challenge to national unity,at least on the cultural side of it.

In sum, the Information Society is likely to pose a severe and serious threat to the unity, identity, and sovereignty of the Canadian nation. The non-additivity of individual needs, the sum of which is not identical to the collective Canadian need, is illustrated by the following example. If a referendum were held throughout the country asking voters whether they believed that Canada's cultural identity should be protected, the result would most probably be a massive yes. If the same voters were asked on whether more U.S. channels should be available for their individual consomption (through pay-TV, for instance), the answer would also probably be a resounding yes. Yet, it is clear that the multiplication of U.S. channels is inimical to the preservation of Canadian content. The individual need demands greater diversity and choice. The collective need favours the protection of cultural identity by reducing foreign content.

8.4 THE POLITICS OF THE INFORMATION SOCIETY

Quite apart from identity and unity needs, the Information Society will most likely profoundly alter the political equation. "Politics" is, in its quintescence, a power relationship between various groups within society who articulate their demand on the political system by votes, lobbying, pressure, etc. The national political equation is the balance of forces between competing pressure groups. The Information Society will probably affect the political equation in three distinct ways. It may lead to a) increased oligopolies and monopolies; b) more state intervention in economic affairs and c) a fundamental change in the political process itself by alterning the ground rules.

a) The trend towards industrial concentration is the result of the logic of decreasing costs. We have seen that horizontal and vertical integration makes sense, economically speaking. If the merger trend is allowed to proceed, enormous corporate giants will emerge controlling the various relay points of the central electronic highway. The resulting monopolics or oligopolics will wield enormous market and, by extension, political power.

   If, in addition, the "carriers" operating the electronic highway also acquire a monopoly or oligopoly on "content", then the "totaliarian" version of the Télématique Scenario becomes possible. Only the restraint, gentlemanliness and self-discipline of the new corporate giants would prevent the emergence of potential mind-control of the masses, through informediation.

b) The threat of excessive industrial concentration could lead to a matching threat of excessive state-control. A monopoly, if allowed to emerge, is nowadays immediately regulated by the state. This regulation may be mild or severe, depending on the particular instance. In either case, the free interplay of market forces is no longer operative.

   In addition to regulation in order to control monopolies, the state is likely to intervene more massively in economic affairs because of the very nature of the information commodity. As we have seen, it takes the form of a quasi-public good, often difficult to "privatize" and inviting state intervention.

   The effect of these two factors could be to create an over-regulated, over-bureaucratized, state-controlled system. A

state-controlled central electronic highway is at least as potentially dangerous as a private one because of the increased scope for totalitarian control.

c) Finally, the political process itself is likely to change. Informediation will become a more important factor in electing governments that the objective worthiness of the candidates. It is not what the candidate says or feels or does that will be important, but how his image is packaged by informediation. Here are some examples of this phenomenon:

i) Media-image as a determinant of electoral victory or defeat

- Already in 1960, it was said that Richard Nixon lost the U.S. presidential election to John F. Kennedy because of his "five o'clock shadow", embarrassingly visible during their televised debates. The importance of TV-image is now fully appreciated. Candidates for office will not debate each other on TV unless the seating (or standing), the podiums, the make-up and the lights are to their best advantage.

- The introduction of television in the House of Commons has transformed politicians into performers, catering to the television viewers rather than to fellow-members of Parliament.

- On the whole, the media-image factor is a potentially distorting political reality. An unworthy candidate with a good media-image will best a worthy candidate who has the misfortune of not being telegenic.

ii) The possibility of "instant referenda" and "direct democracy"

The technical possibility of instant referenda will exist when the interactive home terminals enter the average Canadian household. There are both positive and negative implications to this eventuality.

The positive aspect is the fact that instant referenda will allow more "direct democracy". Representative democracy via Parliament is theoretically second-best to direct democracy, which exists because it is inconvenient or impossible to consult the population over every issue. In ancient Athens, direct democracy existed at the Agora where all the citizens

would meet to vote on an issue. With interactive home terminals, it could become possible for individuals to vote on various issues (2) from the comfort of their own homes and at the mere push of a button.

The negative aspect is that direct democracy may lead to populism and crowd-pleasing. In the British and Canadian democratic systems, it is Parliament and not the people which is endowed with sovereignty. The reason for this is the belief that the duly-elected representatives of the people, rather than the people themselves, will analyze an issue with the objectivity and thoroughness that is needed for a rational vote. This implicit mistrust of direct democracy is one of the reasons why the referendum-system is the exception rather then the rule in British parliamentary tradition. When used, it has only a consultative effect.

Instant electronic referenda could lead to populism and crowd-pleasing. Bandwagon effects, crowd-manipulation by an eloquent orator (à la Marc-Anthony in Shakespeare's Julius Caesar), might carry the day in spite of the unsoundness of their arguments, which would only be discovered later on. If excessive direct democracy is to be feared, a highly informediated political scene must become the source of some apprehension.

8.5 A BLUEPRINT FOR FURTHER RESEARCH

On the basis of the above, it is recommended that empirical studies be conducted to fully identify the social costs and benefits of an Information Society. A tentative blueprint for further research could be organized as follows:

Task 1 *Implications of the Information Society on individual and family life*

Empirical investigations on the effect of informediation on the psychology of individuals and on the viability of the primary social institution, the family.

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(2) A version of this electronic voting is the CONSENSOR machine, marketed by Applied Futures Inc., a U.S. company.

Task 2 *Implications of the Information Society on the satisfaction of Canada's national needs*

A full explication of Canada's "utility function" or statement of hierarchized objectives, and an assessment of the Information Society in terms of these. The analysis in section 8.3 would constitute the starting point.

Task 3 *A full description of the political costs and benefits of informediation*

The empirical description would take section 8.4 above as the starting point.

PART 2 - POTENTIAL SOCIO-ECONOMIC IMPACTS

CHAPTER 9

THE ISSUE OF VULNERABILITY

9.1 RELEVANCE OF THE ISSUE

The question of "vulnerability" is rarely raised, perhaps because of a natural inveterate optimism bred by belief in the existence of fail-safe, fool-proof, infallible systems. However, like the "unsinkable" Titanic which nevertheless sank, and the Three-Mile Island nuclear accident in Pennsylvania (1) which should not have occurred but nevertheless did, blind optimism in a particular system is a perillous affair at best. If everything goes according to plan, a good system is designed to work quite flawlessly. If, on the other hand, Murphy's Law applies (2), then system breakdown or other disasters may be envisioned. The mere possibility of large-scale accidents may greatly affect the overall cost-benefit calculus used to evaluate a particular policy option.

Very little is known about the vulnerability of an Information Economy. The issue has not been given high-priority status, except in the Scandinavian countries where a senior-level government task-force has been put together to examine this question and make recommendations. We believe that this issue should be carefully examined in a systematic and comparative way.

At the onset, it seems clear that one of the overall costs associated with economic development is increased vulnerability. With affluence comes the danger of losing it and much else besides. There are at least two factors behind this phenomenon. First, economic growth is ordinarily achieved through increased efficiency which is usually obtained by a greater division of labor. That division necessarily reduces self-reliance since individuals, families, regions and countries cease to be self-sufficient. Second, the logic of industrial concentration and economies of scale lead to the creation of large integrated systems which are, by virtue of their very structure, as vulnerable as their weakest link.

What economic development does is to decrease the number of baskets holding the eggs to a very small number. The vulnerability of this situation is illustrated by the following examples:

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(1) March 1979 near Harrisburg, Pennsylvania, U.S.A.

(2) "Anything that can go wrong will" and its corollary: "Murphy was an optimist".

Example 1: North American dependence on the electrical grid is at times awesome. Our reliance on electricity is dramatically illustrated when power-failures occur. Lights go off. Home-heating systems, either electrically-based or triggered by an electrical motor, also go off. The tea kettle cannot be turned on. Radio and television fall silent. The refrigerator stops cooling, everything seems to come to a standstill. If the power-failure is prolonged, then irreparable damages may occur - pipes freezing, food spoiling, etc.

Paradoxically, the chances of survival after a major ice-storm which breaks electrical wires and causes a long power-failure are better in a country cottage equipped with a wood-burning stove or chimney, than in a modern high-rise apartment.

Example 2: The possibility of a nuclear accident of the severe "melt-down" variety is statistically very remote. Yet the consequences of only one such accident in a generation are terrifying since the worst case scenario can involve the death of hundreds of thousands of people. Statistical remoteness must be balanced by the implications of the occureence of even one such event.

Example 3: According to the biologist Paul Ehrlich, the chances of a world pandemic (i.e., an epidemic of global proportions) are much greater now, in the jet-age, than in the more primitive societies. The quick transmission of disease from airport to airport is, in his view, an extremely dangerous threat and a substantial cost of civilization.

To our already very vulnerable societies - societies that can be menaced by both natural and man-made malevolent events, we now propose to add a "central electronic highway" to become a télématique economy. The question of increased vulnerability cannot, in our view, be ignored. Yet, in dealing with it, two arguments seem to intuitively emerge - one, discounting the danger, the other, acknowledging it.

The argument to discount the danger is based on a simple proposition of comparative risk by in effect saying: "The level of vulnerability in a télématique society is smaller than that of a nuclear-based society". In turn, we can argue on the basis of statistical risk that nuclear power is "safer" than coal, that more people die in traffic accidents than in war, and that life is a risky proposition anyway. Although this argument has considerable merit in introducing the idea of comparative risk, it omits to consider the effect of cumulative risk. Thus, the counter-argument is to contend that because we already live in a dangerous world of nuclear and traffic accidents, mysterious "légionnaire" diseases, terrorist attacks, and and plane hijackings, we should seek not to increase our vulnerability further.

In essence, the counter-argument suggests that there may be an upward limit to the degree of cumulative risk that is socially desirable to accept and balance that potential risk with the expected benefits. For instance, if the Télématique Society will bring about individual fulfillment and mental liberation, then it is worth taking considerable risks to achieve it. If on the other hand we conclude that the central electronic highway will now allow us to be assaulted by trivial information, it may not be worth the risk of vulnerability that it entails.

9.2 THE RESEARCH DESIGN FOR PHASE II

What in fact is the risk involved in an Information Society? This is what should be empirically determined in the second phase of research of this project. The investigation could pursue the following lines:

Task 1 Assessment of the "natural" threats

If there are natural disasters that may befall one or other of the Information Society scenarios, they should be identified. In addition, the degree of the threat (the damage involved) and the probability of occurrence also determined.

At first glance, natural disasters in a Télématique Society could relate back to the electrical grid and to malfunction of system-components. The dependance of the Télématique Society on the electrical grid poses problems having to do with the consequence of power failures on data-banks, computer terminals, etc. In addition, the possible malfunction of a component may trigger undesirable system responses. The science-fiction spectre of computers "taking over" (the computer HAL for instance in Stanley Kubrick's "2001: A Space Odyssey"), although exaggerated, may occur in a limited fashion if computers are endowed with decision-making power, as indeed they would be.

Secondly, possible damage to the environment resulting from the construction of the world electronic highway could be identified (pollution or other ecological effects). The presumption is that such effects would be low because of the very nature of the information revolution, which does not involve heavy material throughput. The possible exception to this is the environmental cost of placing satellites in orbit.

Task 2 Identification of human threats

The malevolent intent of human beings is another factor to consider. This threat could be external (a foreign power may want to disrupt the North American Télématique Society or control it) or internal. The external threat becomes a defence problem or a national sovereignty issue. In particular, trans-border data flows are a potential threat to the sovereignty of a nation-state. Internal threats may range from organized terrorism to the limited, yet devastating action of an irate union of bank clerks wishing to cause havoc in the electronic funds transfer system.

Task 3 Vulnerability comparisons

The comparisons could include analysis of the vulnerability implications of each of the Télématique, Privatique, and Rejection Information scenarios. A comparative index of vulnerability could be constructed along the following lines:

In simple form, it could be the product of the degree of damage expected, multiplied by the probability of occurrence of this damage. In more complex form, it could compare the various security threats of alternate scenarios, informational and conventional. A series of vulnerability indices could be computed.

Task 4 Outline of policy options

The computation of vulnerability indices must lead to the identification of policy options from which the decision-maker can chart an optimum course of action.

CHAPTER 10

CONCLUSIONS AND RECOMMENDATIONS

10.1 PANDORA'S BOX OR PROMETHEAN HOPE?

The Information Society brings with it an assorted bag of impacts and consequences, some of which are very attractive and others, very frightening. It is Pandora's Box and Prometheus' Hope all rolled into one. The Pandora aspects come from the visions of 1984, the dehumanization, the robotization. The Promethean Hope lies in the ultimate liberation of Man and his accession to higher realms of consciousness in the Teilhard de Chardin sense. Marc Uri Porat probably summed it best when he said: "As with life itself, the prognosis for an Information Society is mixed, the remedy, inconclusive". Rash is the optimist who sees only electronic highways, home terminals, and symbioses with computers. Unnecessarily timid is the neo-luddite who believes that all technology is bad, and information technology, the worst.

On balance, the potential benefits outweigh the potential costs for the simple reason that the costs can be controlled. Besides, it is reasonable to assume that the Information Society is now as inevitable for the EOCD countries as puberty is for an adolescent. To wish to stop it is to arrest development. What is certainly not inevitable, on the other hand, is a particular version or other of the Information Society. That the enlarged information sector will account for over 50% of national economic activity is a safe forecast because of the nature of societal development. Barring a war or other catastrophe which would set the OECD countries back in the production of material goods, it is natural to expect consumption to shift increasingly to information. This is the Maslowe-Engel effect, as we have called it.

But to assume necessarily that the Information Society must be of the "télématique" variety is not justifiable. The "privatique" or "low technology" options may prevail. There is room for choice, for combinations, for optimum selection of various aspects of the principal scenarios we have presented.

10.2 THE POLICY OPTIONS

The problem is: how are these choices going to be made and who is going to make them? Generally speaking, we may argue that the optimum Canadian public policy vis-à-vis the Information Society would be governed by two principles:

1) Make Canada competitive in the new global Information Society and

2) Minimize the disruptions and other social costs that will accompany the transitions while maximizing benefits.

To implement these principles, three broad policy options are available.

10.2.1 "LAISSEZ-FAIRE" (AND HOPE FOR THE BEST)

The underlying strategy of the laissez-faire option is to rely on market forces to satisfy the first objective of making Canada competitive and on the restraint of producers and wisdom of consumers to satisfy the second objective of easing the socio-economic transition.

Reliance on market forces to make Canada competitive faces three major difficulties. First, Canadian entrepreneurs are facing concerted and well-planned efforts by other nations. No foreign competitor is a push-over. On the basis of past experience, there is little reason to suppose that Canadian firms will establish and maintain competitive advantages in world markets without help from the public sector. Second, some Canadian firms are linked to U.S. multinationals which hampers and reduces their research and development. The innovativeness needed to compete could in this case be lacking since the Research and Development is conducted elsewhere. Third, the Canadian market is too small to sustain competition from individual Canadian firms. We cannot afford three or four different home terminals, or dozens of word-processors. Some degree of product integration and the avoidance of duplication are essential.

The U.S. has managed to retain leadership in the information field via the laissez-faire route because a) it used the immense purchasing power of the U.S. federal government to orient R and D in the information sector; b) it possesses a strong network of leading world multinationals in this field, and c) it can afford to experiment with various product lines because of the immensity of the U.S. internal market. Such conditions are not replicated in Canada.

Concerning the traumatic socio-economic adjustments that will become inevitable as we move towards the Information Society, it is unrealistic to believe that market-forces alone can do the job. The dislocations caused by disemployment , by changes in regional economic balance and vulnerability, will have to be dealt with by public policy.

10.3 RECOMMENDATIONS

We conclude this study with two major recommendations, which flow from the above analysis.

RECOMMENDATION 1 *The federal government of Canada must take the leadership in outlining a concerted and comprehensive development-plan to make Canada a competitive and viable economy in the increasingly information-dominated world system.*

The steps to the construction of such a development-plan are in our view as follows:

(i) Identification of clear-cut objectives for the medium-and long-run.

(ii) Establishing mechanisms of concertation between the various Canadian actors in this field.

(iii) Studying the "game-plans" of Canada's major competitors.

(iv) Allocating development funds that are of a magnitude comparable to those allocated by the U.K. and France.

(v) Construction of a Canadian "game-plan" to achieve the chosen objectives.

(vi) Construction of a time-table for the implementation of the "development plan".
(See Chapter 5 for details)

RECOMMENDATION 2 *The Canadian government should conduct or commission complete impact studies concerning the various potential consequences of the Information Society, along the lines suggested in Part II of this report.*

In addition to the development-plan which is to help make Canada competitive in the information world, the process of assessment of the various consequences of informediation must be continued. In particular, empirical studies should be conducted, following the research design suggested in each of the chapters of Part II, specifically:

- employment effects
- geographical location
- energy use
- impact of individual and collective needs
- political effects
- vulnerability issues

must be examined carefully.

The implementation of Recommendation 2 should take place at the same time as that of Recommendation 1. Indeed, the development-plan must be constantly revised and amended in the light of the socio-economic consequences it would entail.

Unlike the British Industrial Revolution of the 18th Century, whose existence was discovered only a century later, we have the privilege today of being capable of assessing the major consequences of the current information revolution before they happen.

We should not squander this privilege.

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