THE TWENTY-FIRST CENTURY IN THE REAR VIEW MIRROR:¹ A CRITIQUE OF THE DOC’S 1987 DISCUSSION PAPER

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Introduction

Canada’s federal Department of Communications is charged with developing public policy for both 1) the cultural industries, including broadcasting, and 2) telecommunications, within the same planning compass. When, as is now occurring, telecommunications and computing are blended into a single frontierless technology manifold, and when, as well, the latter is in turn increasingly integrated into the creative arts, the issuance of a major discussion paper by the Department is bound to be a significant event. After all, the Department is getting on for its twentieth anniversary and the TeleCommission report Instant World, remarkable in its time, has been in many respects overtaken by the intervening technological evolution. We are accordingly within our rights in expecting a historic document: a fresh look at the present and, if a title means anything, a bold new vision of the future. This is not quite what we are offered. Instead, the paper which has been issued is deeply flawed and, more importantly, its flaws index a national dilemma in policy making.

"Communications For The Twenty-First Century"

Let me begin with a brief (and impressionistic) résumé of the discussion paper’s content. For a country of disparate regions and vast expanses such as Canada, the maintenance of its communicational infrastructure is essential—indeed a sine qua non—to its continued existence as a nation. While we have historically met this challenge, the paper points to present danger signals: 1) a weak information producing industry, 2) a fragmented set of jurisdictional arrangements in tele communications which makes the reform of the system, in spite of the need, inordinately difficult, 3) a certain national conservatism in the take-up of new technologies and 4) a thin and under-funded research effort. Given this assessment of our weaknesses, the paper focuses on four kinds of industry: 1) information producers/marketers, 2) networks, 3) users and 4) research agencies.

The traditional "information industries", as the report defines them, include publishing, broadcasting, film, video and sound recording (with revenues of $11 billion in 1985). To these are added two new categories which the report makes much of, i.e. the "contents of computer memories, which are commonly called databases", and packaged software. The information industries, it is claimed, regularly outstrip the rest of the economy in revenue growth, and, not surprisingly therefore, "information
workers", in the broadest sense of the term, now make up more than fifty per cent of the labor force. Here is the rub: while the telecommunications and electronic data processing industry as a whole has grown as rapidly in Canada as elsewhere, much of that growth, when one looks a bit closer (although this is never made quite clear in the paper), takes the form of a negative contribution to our balance-of-trade. What we buy in the way of technology, it turns out, we tend to buy from abroad. Our "information industry", inasmuch as we may want to equate that term with commercial databases and packaged software, is so weakly developed, in spite of some honourable exceptions, as to be practically non-existent.

When we think telecommunications, traditionally, we call to mind message traffic (telephone calls, data exchange, telexes, facsimile transmission) and not-for-broadcast programme delivery systems. The discussion paper argues, with conviction, that the evolutionary pattern of information development and use is putting severe strains on the established set of arrangements which characterize the Canadian system. The system has traditionally been predicated on two long standing principles: 1) telecommunications constitutes a kind of natural monopoly and 2) there is a clear conceptual distinction between the carrier of messages (the monopoly part, and hence subject to regulation) and their content (which is by its nature unregulatable). To these two overriding "axiomatic" principles, one could perhaps add a third of almost equal importance (in Canada, at least), namely that networks responsible for local and long-distance traffic must be treated as one coherent system, the regulation of tariffs, with its implications of regional disparities, being as much a political as an economic problem.

These basic principles no longer look quite as "basic" as they once did. What with satellites already available in profusion, and the accelerating introduction of fibre optics, telephone lines and cable installations are no longer the only game in town, and in the United States, as a result of what is euphemistically called "deregulation" (it is really re-regulation), the customer now has a choice of competing systems, for long-distance traffic. Similarly, the development of what are called "value-added services" has, as the discussion paper points out, blurred the distinction between content and carrier: you may want to subscribe to a complete financial network, or education network, or health network, or agricultural information network (the examples which are mentioned in the report) or indeed any other specialized network of combined communication and information processing functions, merchandised as a complete package and not available to the general subscriber as part of the basic service.

In the United States, a sequence of events involving Congress, the FCC (the Federal Communications Commission) and the courts, and culminating in a critical court divestiture decision, resulted in the 1984 breakup of the American giant, AT&T (the old "Ma Bell"), into, on the one hand, a new AT&T dedicated to long-haul traffic, in competition with other long-distance transmission companies (MCI, US Sprint) and, on the other, seven regionally based companies, known as "Baby Bells", who take
care of most of the local traffic (along with companies such as GTE). While the issue of the precise benefits and inconveniences flowing from deregulation remains controversial, it is clear that, overall, the volume of traffic has been stimulated (with resulting scale effects) and the development of innovative business services promoted. The reform of the American system puts, in turn, pressure on policy-makers in Canada to extend competition here as well.

No agency in Canada, including the DoC, has the clout to move unilaterally to a comparable reform of the system. Jurisdiction over telecommunications in Canada is fractured into a mosaic of public and private, federal and provincial, without any easily visible underlying logic. As a result, there has been no similar opening up to new services and to competition. Policy reform proceeds at a snail’s pace, and given the post-Meech Lake atmosphere, there is little likelihood of any important breakthrough in the near future. There are potential negative effects of this immobility: the risk is that the greater spectrum of services now offered south of the border will put the Canadian system at a disadvantage in attracting corporate customers, some of whom are already discovering the advantages of establishing a short-haul link with an American border point and routing even their message traffic destined for other points in Canada through the American system.

According to the DoC paper, the business issue presented by the new technologies can be summed up in a single word: automation. Automation, we are told, is "well advanced" in North America and most OECD countries. Mind you, automation is costly, it has proven surprisingly difficult to implement ("...more difficult and complicated than anticipated..."), its benefits are elusive ("...automated factories have proven less efficient and productive than their less automated counterparts...") and its contribution to national competitiveness is suspect ("...there is growing evidence that productivity is a management problem, not a technological question..."). Never mind: the real issue, we soon learn, is elsewhere, namely the "sluggishness" with which business in Canada has adopted office and process automation: "Canada’s persistent lag in information technology diffusion is a serious problem of national proportions. The diffusion of these technologies is too slow." We have, apparently, a cultural deficiency: "We do not have a culture that promotes the use of new technology."

Outside of automation, we are presented with a short shopping list of isolated instances of creative uses of the technology by dedicated and gifted individuals to solve local problems in telemedicine and tele-education. There is no evidence as to the overall pattern of technology use in Canada.

The section on research is a rehearsal of material which anyone familiar with the Canadian context knows well: we stack up badly with our international competitors in the matter of research (barely ahead of Austria and Finland on a per capita basis) and, furthermore, our performance is deteriorating, comparatively speaking. Although telecommunications is an honorable exception to this rule, in that Bell Canada, Mitel
and B.C. Telephone have invested heavily in research, and companies such as IBM Canada and Xerox have located laboratories here, we still lag far behind our international competitors. Unlike Japan, the United States and the European countries, there has been no concerted national effort in Canada to develop a programme in areas such as artificial intelligence, superconductivity, high-definition television, computerized graphics, parallel processing computer technologies, etc. The Department’s own research programme has been drained of resources in recent years (a process that had already begun under the last Liberal government and has, if anything, accelerated under the Conservatives); "...since the end of the Telidon program in 1985," we are informed in a tone of admirable understatement, "Communications Canada’s research activities have been oriented primarily toward the needs of clients in the Department and other federal government departments."4

The Image On Which The Paper Is Constructed

In this section I present what I conceive to be the Department’s underlying image of informatics, its relationship to telecommunications and the policy alternatives which now confront us. I argue that 1) if we credit the image as being accurate, then the policy questions which are thrown up are in fact rather different than those which are stated (in other words, the paper lacks internal validity) and 2) the image itself is seriously flawed (the paper also fails, in other terms, on grounds of external validity).

Figure 1 shows graphically what we take to be this underlying image.

Figure 1

The Underlying Conception of the Discussion Paper
In this conception, there used to be two autonomous domains, one called the "information industries" (publishing, broadcasting, film, video and sound recording) the other called "telecommunications" (telephony, telegraphy, telex, facsimile, data transmission). Each had its own technology and practices, its own institutional arrangements, its own dominant organizations, with relatively little overlap between the two universes. The two distinct domains constituted the two principal areas of responsibility of the Department of Communication. The policy issues thrown up by the two sectors have traditionally been quite different: in the information industries, the problem is how to sustain a set of fragile national industries, whose economic viability can never be taken for granted, given the openness of our frontiers and the reality of ever-present foreign competition (for which one can usually read "American"). In the field of telecommunications, where a Canadian monopoly could be guaranteed by fiat, if not by fact, the issues have been ones of equity, since the telecoms have been immensely profitable and have even (in the case of Northern Telecom) proved themselves quite capable of holding their own in international competition. To simplify, the Department saw itself, in the first instance, with its hand on the throttle, and in the second, with its foot on the brake.

Technological change is now complicating this idyllic situation: the neat division of the world is becoming messy as a result of such things as on-line databases, value-added services and digitization of telecommunications. On the one hand, the technologies of telecommunications and the information industries (including computing) have become indistinguishable; on the other, the conceptual distinction between content and carrier, in a world where artificial intelligence, in the form of software, is inscribed into the hardware network, no longer applies so well.

The problems, as the Department defines them, are accordingly the following: 1) the "new" information industries (on-line databases, packaged software, such as educational material) are weak in Canada and should now be added to the list of cultural domains to be actively fostered (departmental policy-making Mandate # 1), 2) institutional arrangements governing telecommunications have been slow to meet the new situation with the result that Canadian enterprise is in danger of being discouraged and an opportunity for innovation and growth missed (departmental Mandate # 2), 3) Canadians generally are not picking up on the new technology as quickly as they should (a kind of unofficial mandate of prophet and promoter of the new technologies), and 4) we are failing to invest in the development of further new technologies, through research, at a level which would allow us to keep pace with our international competitors (Mandate # 3 of the Department, and the only one where its role is outright operational).

How we are to deal with these problems is much less clear. On the first of the issues, we are admonished that "...we must significantly strengthen our database industry" and "...we must ensure the future vitality of the packaged software industry" but the paper is unenlightening as to how these most admirable goals are to be achieved
other, presumably, than by an extension of present departmental programmes applicable to the older, more conventional fields. On the question of telecommunications policy, we are enjoined to be patient and to have faith in the on-going federal-provincial negotiations. As for applications, the Department would plug into regional development programmes by the promotion of delivery systems for health and education. On the issue of research, the paper lapses back into its wistful mood of hoping against hope that somewhere out there there must be an embryonic informatics industry into which the Department’s research programme could be plugged.

The Problem Of Internal Validity

Let us turn to the problem of internal validity. To begin with, consider what the paper says (or rather, does not say) about databases. Suppose we start by taking the paper at its own word: databases are a significant new phenomenon in our society; they generate important revenues; we should, as a nation, be strongly represented in this new commercial sector. This is a plausible enough argument, on the face of it, except that it ignores one salient fact: most databases are not for sale at all, and are certainly not available to the general public! The services for sale (the "information industries") are just the tip of the iceberg. Most databases are managed as privileged property, with the equivalent of "Do Not Trespass!" signs posted everywhere you look.

Look a bit more closely at some of those new databases. For example, policemen now have immediate access to a vast network of electronic information sources. Why should this be a matter of concern? The answer is that isolated facts are one thing; interpretation is another. These databases not only allow the forces responsible for public security to store information; they also permit the construction, through inference, of personal profiles. You might not agree with the reasoning processes employed to create a profile of you (assuming that you knew about them, that is) nor about the conclusions at which the reasoners arrive, but you will in any case never have the luxury of contesting them, because they are not accessible. Such profiles can be used to solve crimes; they provide clues to recurrent patterns of behavior. They could, of course, be used for less benign purposes: to classify your political beliefs, for example, or to exclude you from a position to which you aspired (without your ever knowing why your candidature had been rejected) or to prevent you from visiting a certain country. These databases put immense power in the hands of a few individuals, and, in Canada, without any very clear set of laws to govern the use of them. The potential for abuse is real: the need to develop legislation has, for example, been recognized by practically every European country.

These kinds of databases are not just used by police forces, or by the tax collection departments of governments, or by the immigration service. There is an industry out there, based on databases, but not quite like the one described in the discussion paper. It again exploits massive quantities of accumulated data about ordinary people - you! They can be built up in quite simple ways, by following, for example, your
patterns of credit card purchases. These mushrooming clandestine databases have been written up by a magazine not usually associated with radical positions, *Business Week:* people denied access to housing on the basis of confidential databases, whose material was based, not on fact, but on hearsay, or denied access to credit because of guilt by association. *Business Week*'s point is that there is no established set of canons of responsible business practice covering the operation of these intelligence services—for sale, but not to everyone.

There are other questions involved, such as the location of these databases, which contain information about Canadian events and people. When the *Montreal Gazette* reported the sequence of events following a disastrous fire which put the main computer of a large Quebec food merchandiser out of operation, it included the story of a high company official crossing the border in the middle of the night, carrying computer tapes, on his way to the company's database in *New Jersey.* Does it matter that so much of our data is stored in the United States? Possibly yes, possibly no. Our purpose here is not to argue the pros and cons of this, or any other database-related question, but simply to observe the total absence in the DoC discussion paper of a very large set of questions about the potential for abuse of databases, which has been recognized as an important issue of public policy in Europe and is admitted as a matter of concern by responsible business leaders in America.

Let us turn to another curious omission in the paper. According to the chapter which deals with the users of communications technology, the big payoffs will come from automation, which will improve both manufacturing productivity and administrative performance. I will not dwell here on the results of an accumulating body of evidence, compiled internationally (and which includes, incidentally, the results of the Department's own assessment programme of its office communication systems trials), which shows with surprising clarity that the technology, in and of itself, has no particular impact on performance, either positive or negative, other than that which can be explained by factors of managerial practice. Let us ignore this evidence, however, and let us suppose for the moment that the paper is right, and that automation is the answer to many of our administrative and manufacturing problems. Automation, by definition, succeeds by substituting machinery for people. The implication is clear: if we were really to succeed in making automation work, the result would be a considerable disruption of the labor market! Yet this effect of technological implementation is never mentioned in the paper.

Fortunately, I think the paper is quite mistaken in its assumption about the way technology is integrated into the workplace. Whatever is happening, it does not much resemble the pattern which was predicted at the beginning of the decade—neither "productivity gains" (for which, read "personnel cuts") nor massive layoffs. However, our purpose here once again is not to argue the pros and cons of the transformation of the work place but the absence of any reference in the working paper to the human
dimension, even though questions of worker displacement are implied by its own arguments in support of automation.

Consider a third example of the bias of the paper. Communications and information technology, we are informed, "...if properly deployed and used," can assist in the development of Canada's regions. "It is here that the 'distance-insensitive' character of the technology offers the greatest potential for revitalizing traditional industries and creating new opportunities." The problem, it seems, lies in provincial regulatory regimes that are more restrictive than those in federal territories, and which have the effect of limiting "...the range of equipment and services available in the western and eastern provinces in comparison with those offered in Ontario, Quebec and British Columbia." It follows that: "...information-intensive firms will be reluctant to locate in regions that do not offer a competitive range of communications services, while the information-based firms that are already there will operate at a competitive disadvantage" (p. 74). We must therefore ensure that "...advanced communications facilities continue to develop in all parts of the country at more or less comparable rates."

I have no quarrel with this argument either, as far as it goes: access to communication is an essential component of the competitiveness of a modern enterprise. But there is another side to the coin. The thing about a highway (and this applies as much to electronic highways as to any other kind) is that the traffic it opens up is bidirectional. It is perfectly true that this means someone in Moosejaw, or Rimouski, or Sydney can more easily access the great metropolitan centres, and this represents, from the local perspective, an enhancement of competitive advantage. But it is equally true that someone in Toronto, or Vancouver, or Montreal (or New York, or Chicago, or Los Angeles, let us not forget) can more easily access the smaller town. "Insensitivity to distance" is a sword which cuts two ways. In assessing the potential impact of innovation in communications on regional viability, it is therefore imperative to keep in mind questions of comparative competitive advantage. It is possible, of course, that some little bank in Orillia could grow to national status because of the outreach which better telecommunications provided; it is probable that the large existing central banks will find their hold on towns like Orillia consolidated. It is possible that a small publisher of specialized material located in Fredericton can use the opening up of the communications network to reach a world market (and in fact I know of such a case); it is probable that the great publishers in New York and Paris will extend their operations into new and more profitable areas. It is possible for a successful broker to work out of Wawa in the wilds of Ontario (an instance cited in the discussion paper); it is probable that the stock markets of the entire world will be stitched together into one immense seamless system, with the scale of large, international brokerage operations reaching unheard of dimensions. When Wall Street grows; Wawa shrinks--relatively.

The most elementary kind of logical analysis tells us that the very large centres of the world have two inherent built-in advantages over the small: variety and scale.
Because they draw to them the products of the entire world, the metropolitan centers become leaders of style: customers tend to prefer the freshness (for them) of the metropolitan import to the staleness (again for them) of the traditional local. This is the advantage of variety. And because they supply a larger market, they can exploit economies of scale to produce goods and services at a more competitive price. Thus improvements in communication give a built-in natural advantage to the metropolitan center over the local and regional. Not that this is an inflexible rule: history is replete with instances where the little region used its skill in communications to transform itself into a global power. It is just that the odds are against it. What improved communications does is to make it more probable that the region will become increasingly dependent on the metropolis, and that smaller nations will become branch plant economies, functioning at the margin of the larger. To reverse this pattern is perfectly possible, providing the circumstances are right, but reversals are not the natural course of things, which is what the paper would have us suppose. They are the special case.

In all this paper, you will find no reference to the fact that, since the publication of Instant World, that most messianic of technology prognostications, regional disparities have not noticeably diminished and, even more shocking from an economic point of view, technology spending in Canada has contributed negatively to our balance-of-trade, to the point where we now face an annual shortfall in the high-tech sector of many billions of dollars. In other words, there is an unaddressed issue, not just of regional competitiveness, but of national competitiveness. When all of these omissions are added up, a picture begins to take form. It is a picture in which only the positive is accentuated. Whenever quite real and possible negative human and social effects of the computerization of communications are concerned, there is deafening silence. The end-result of such unrelenting optimism is to make the paper read as if it had been put out by the PR department of a large technology firm—a curious position for a Department of Communications in a nation with such a weak electronics and software manufacturing industry to protect. The sociological dimension is not simply underplayed; it is absent (other than in the occasional rhetorical flourish). The result is a distortion of perspective—a distortion which comes from ignoring the inevitably discriminatory impact of change in a society where there are already discrepancies: regional, occupational, ethnic, sexual, educational, which, cumulatively, mean unequal opportunity to benefit from innovation when it comes. To ignore these discrepancies is to create a trap for oneself: which translates into indiscriminate technology push.

Technology Implementation as a Meta-Problem: "A Problem Which Cannot Now be Addressed" (The Problem of External Validity)

Michel Chevalier of York University and the Université de Montréal has written extensively on what he calls "meta-problems" or "problems which cannot now be addressed". What he means by a meta-problem is one which cannot easily be circumscribed within the established sectoral domain of some existing institution.
Problems of the environment, which are what he has been most preoccupied with in his professional career, tend to fall into this category: they spill over municipal, provincial and national boundaries; they have all kinds of functional ramifications—scientific, industrial, agricultural, employment. They are hard to break down into neat compartments; they resist easy analysis. They are often associated in our minds with dramatic—even catastrophic—change, yet we find it hard to focus on them, either conceptually or in the form of concrete action.

The technological transformation which we are now undertaking is of this order. It is a meta-problem. On this point, we can do no better than quote the DoC discussion paper itself:

Like all industrialized countries, Canada is in the midst of a profound shift in the foundations of its economic and social life.... As a steady stream of government reports and popular bestsellers has told us, we are rapidly becoming an information-based society. Most observers agree that this shift is of comparable historical significance to our earlier transition from an agricultural to an industrial society. Underlying this shift is a new communications infrastructure which is as important to the information age as were rivers, railways, and highways to earlier eras. It is made up of machines for creating, storing and exchanging information.... These machines are tied together by complex telecommunications networks, the central nervous system of the information society. In recognition of the role these machines and networks will play in Canada's future, the Science Council has called this new computer-based communications infrastructure a transformative technology, and has stated that it will have the greatest impact of all emerging technologies on societal change between now and the end of the century.

Communications for the twenty-first century, p. 6

[Emphasis added]

The term "transformative technology" is employed both in the introductory and the closing chapters of the discussion paper, but not exploited in the substantive sections of the essay. Defining a "transformative" technology is of course not easy but on one point it seems to me there would be general agreement: transformative implies non-linear. That is to say, whatever it is that makes a phenomenon "transformative", it must include the sense of a break, a rupture with previous trends (or as the mathematicians might put it, a change of parameters). To be transformed is to change one's phase space (in the language of engineering), by which is meant that the kinds of responses, the sorts of behavior, the varieties of policy, which were appropriate to yesterday's world may not any longer be adequate. It is at this point that the most profound inconsistency in the discussion paper appears: while it says, explicitly, and in so many words, that the new technology is transformative, it asserts, in all its
analysis of problems and how to respond to them, that the old policies will do, even though they may need a little fine-tuning: databases are just a new kind of information industry, to be tucked in with the old; value-added services are really just a new kind of telecommunications function, which the old system can incorporate by a little bit of change here and there: "...the evolutionary approach of Japan and the United Kingdom rather than the more radical U.S. line." The effect is to reduce the issues of communication in the information society to a sectoral problem: rather than being seen as a meta-problem, constrained within the strait-jacket of a departmental mandate. What I would like to do now is to take the idea of "transformative" seriously and ask in what sense, if these technologies really are transformative, we might need to revise our ideas about how to develop public policy. We will explore, in other words, the sense in which it is legitimate to think of the transition to an information society as a meta-problem.

Communication and the Question of Scale

Scale

The question we are asking ourselves here is simply this: "In what sense are the new communication and information-processing technologies transformative?" The answer is quite simply, I believe, that they alter the scale of things. A "scale" is simply the means by which we measure something (its etymological origin relates the word to the concept of steps). There are two kinds of scale, those by which we measure space and those by which we measure time. When we claim that a technology is "transformative" in its effect, we mean not just that the radius within which we function, in space and in time, is changing, but something a bit more radical: the scales by which we measure things are themselves undergoing change.

That the concept of "scale" is itself relative is very much the product of developments which have taken place (and are now taking place) in intellectual spheres of the twentieth century, particularly in modern physics and mathematics. Our contemporary popular occidental notions of scale are historically rooted in the technology of an earlier period: we measure time by the revolution of the hands of the clock, space by the revolution of the circumference of the wheel and ideas by the linear standards of the printing press. While these images still hold a powerful grip on our imagination, their theoretical basis has now been fatally eroded.

Consider the following finding: there is no ultimate scale for measuring spatial extent. Nature, as far as we can tell, is essentially fractal: no matter what level we meet it on, its processes seem recursive, by which we mean that processes encountered at one level of observation and analysis re-appear at quite different levels, when we increase the power of magnification (to either the very small, as in quantum physics, or very large, as in astronomical systems). Until this century, it could be believed that there existed one basic, non-divisible level of reality (atom, electron, quark, or
whatever), out of which, by processes of composition, all more complex matter could be built up. The whole metric system of measurement incorporates this view of an elementary sub-stratum: a fundamental scale provided by Nature from which all our secondary measures could be derived. It is this assumption of one elementary standard which has been irrevocably shattered, with consequences which we have hardly yet begun to grasp, but which extend far beyond physics.

What we now know is that the determination of "scale" cannot be made independently of the "scaler": scale is not there, present in Nature, independently of some observer, but in the interaction between Nature and the observer. What determines, in turn, the interaction between man, the observer, and Nature, depends on the communicational means at the disposition of the former, for it is in the nature of communication that it determines how man experiences Nature. When people walked, Nature was measured by the number of paces stepped; when they rode, we moved to miles. We measure time in the same way, by those crucial boundaries of our own waking and sleeping lives (hours and days) and by the revolutions of objects that are apparent to our unaided senses (months and years).

The Bias of Communication

It was an idea of Harold Innis that every communication technology has a built-in bias, in that it creates its own scale by which to measure the extent of things, either in time or in space. What Innis also perceived is that the flourishing of the institutions of a society reflects directly the operation of the scalar principle: theocracies (in our contemporary world, the universities and the intellectual community) span time; nations and empires (in our time, multinationals) span space. The combined reach, over time and space, determines the available frontiers for future growth of human institutions—the practical limits of power, if one prefers the latter manner of thinking. Societies exist in immanence before they exist in fact.

When we introduce new communication technologies which seriously affect our perception of the scale of things, then we have also created the underlying condition for spontaneous, institutional evolution. Technologies do not, in and of themselves, determine social structures, but they make things possible that were not possible before. They change, in other words, the parameters. From this we are led to ask about the new technologies: what is (or, more properly, "are", since we are in fact talking, not about a technology, but about a family of technologies) their inherent bias(es)? There are, it seems to me, two answers (corresponding to the two poles of the technology, telecommunications and computing). The first bias is, to employ the language of the paper, to reduce our "sensitivity" to distance. Practically speaking, this is to say that many people (not all) have come to take for granted wearing what used to be seven-league boots, our radius of communication vastly extended. Translated into an institutional reality, this implies the emergence of an integrated world economy. It no longer means anything significant to claim, for example, that a company such as
Northern Telecom is "Canadian": all the big firms of today (and a surprising number of the smaller) are multinationals. The financial universe of today, likewise, is global, no longer constrained within the boundaries of any single country. Big money owes allegiance to no nation.

Were the discussion paper to have addressed the implications of this bias of the new technologies, it would have had to do something which neither it, nor the Telecommission, was prepared to contemplate: the situation of Canada within an international context. Communications for the Twenty-first Century, like its predecessor, Instant World, prefers to talk about communications in Canada as if they stopped at the border! Nowhere in this present discussion paper will you find any reference to the increasing integration of Canada into international networks. Nowhere, in other words, are issues of national sovereignty to be discovered and since the issue is never raised, we cannot, accordingly, ask how best to sustain our identity in a world whose frontiers are less geographical than social and economic. It cannot then occur to us, therefore, that the problems of our manufacturing industries are not so much due to an invasion of off-shore competitors as the exportation of their operations by our own companies.12

It is almost impossible to pick up a business magazine these days without being reminded of the trend to globalization (Fortune, March 14, 1988; U.S. News & World Report, March 7, 1988), that is in large part attributable to advances in telecommunications and computing technologies, which lower transactional costs for international trade, lead to global strategies for business, in particular manufacturing, and have resulted in an integrated financial marketplace.

Globalization creates spectacular opportunities for some enterprises, simply because the size of the market is so much greater. Canadian firms with the right kind of products to sell, and the right kind of management, will prosper as never before. On the other hand, globalization opens up competition, and removes protections. The effects of this sudden permeability are nowhere to be felt so strongly as in the labor market: the North American worker finds him- and herself today in direct competition with labor in other countries, prepared to work for less remuneration and less security of employ. The same thing applies to regional industries, which now face the buffeting of a competitive storm, international in its reach. The textile industry illustrates the pattern: as a manufacturing sector, it is in trouble, yet Dominion Textiles prospers, precisely because it has itself become international in its scope. This is the phenomenon of globalization, mention of which is nowhere to be found in the DoC paper.

The other bias of the new communication technologies has also to do with scale, but in a different way: the scale of operations of a single work unit or individual. It is what has been called the "augmentation" effect of personal computing. The modern computer user may have little idea of the science of computing. Instead, the new
applications software furnishes a tool by which the otherwise unaided individual can accomplish what used to take a small army of clerks to do. The spreadsheet provides a manageable view of the operations of quite a complicated enterprise; the desktop publishing system liberates the writer from many of the past constraints of the manufacture of documents; computer-aided design makes available to the engineer and the architect something like the equivalent of a drafting department; the mini-supercomputer 3-dimensional graphic workstations are altering the scale of scientific research. (It cannot be emphasized too strongly how recent these developments are: a phenomenon of the eighties—the past five years, in fact.)

The total effect of this change of cognitive scale is to give the small-to-medium enterprise the power to manage operations and to process data which used to require the setting up of a large establishment. Let us now put these two "biases" of the communication technologies together. We should expect to find the growth of new organizations beginning to manifest certain characteristics: 1) to be globalistic in their orientation, 2) to be smaller than previously, even while manoeuvring in more complex environments, and 3) to be skilled in management and what might be called "intellectual services". We should also expect these effects to be recent. All of these predictions are confirmed by recent analyses. David Birch (1987) calls the trend which we have just described the "atomization" of America: "Neglected amid much of the talk about our economy's changes...is a simple and underlying statistical fact: the American economy is breaking into pieces. More and smaller businesses now do what fewer and larger ones did before. Our economy is 'atomizing'. "13 In 1985, he points out, 700,000 new companies were formed in the United States (compared with 200,000 in 1965; 90,000 in 1950). To these we can add 400,000 new partnerships and 300,000 newly self-employed people, for a total of 1.4 million new enterprises created in that year alone (about the same as the number of total private-sector jobs created in the same year). This degree of atomization, Birch argues, is a relatively new phenomenon (basically, when charted against the GNP, since the mid-1970's) and represents "...a major structural change in the way America does business." It coincides with 1) the decline of agricultural jobs (now only 2% of employment), 2) the decrease in importance of manufacturing as a source of employment (9% of the work force is actually to be found in factories although the percentage usually quoted for manufacturing is closer to 20%) and 3) the flattening out of employment trends in wholesaling and retailing (down to just under 25% from its earlier level of about 27%), 4) a decline in those working in construction (about 5%), 5) stability in the numbers employed in transportation, communications and other utilities, and 5) growth in finance, insurance and real estate (to about 10%, from about 5% a couple of decades before). It is the service industry which has exploded: (from 15% of the work force in 1960 to almost 40% in 1985). Large companies are getting smaller: 2.2 million fewer people worked for the Fortune 500 companies in 1985 than in 1980. Between 1970 and 1981, about 30% of Fortune 500 companies had vanished. Start-up companies are smaller.14
The Institute for the Future\textsuperscript{15} has analyzed data going back to 1970 which shows that the percentage of employment accounted for by the Fortune 500 companies in the U.S. has dropped from 18.1% in 1970 to a predicted 11.6% by 1990, and should level out at approximately 10.4% by the year 2000. It is the big companies which make and sell things, while the rest of the economy is involved in creating and trading information, servicing each other and supporting the flow of goods. There is an important side-effect of this change. The smaller firms, now the predominate model of enterprise, are, the Institute points out, footloose: freed from locational dependence on an immobile resource base, and no longer constrained within a heavy transportational infrastructure, they follow people, and their choice of location depends on factors that used to be secondary: availability of communications, proximity of educational institutions which form the cadres of the future, climate and the general quality of life of a region.\textsuperscript{16} When manufacturing becomes organized on an international scale, these companies migrate abroad too. They compete with larger firms less by giganticism than by the formation of alliances of small players who join together to "behave as if they were big". The keyword becomes "connectivity": in a dispersed network organization, hierarchies are flatter, chains of command more fluid and functional structures more volatile.

In the past, when we have thought "export" we had in mind the products of our primary industries (agriculture, fishing, forestry, mining) and our secondary industries (manufacturing). We conceived of "service industries" as domestic functions, not sources of export income. Yet in 1986, according to Birch, the United States exported no less than $145 billion worth of what he calls "thoughtware": high-tech and professional skills. Fortune Magazine (June 8, 1987) states, in journalistic style, that it is the service industry, and not manufacturing or resource development, that "...will make the U.S. competitive again": revenues of overseas subsidiaries of advertising agencies, investment banks, insurers, consultants etc. alone accounted, in their estimation, for something in the order of $100 billion in 1983. Export of other services, according to the same source, probably reached the same figure. While I do not have comparable figures for Canada, I know that Canada is also active in the export of professional services, banking, engineering, scientific and management skills.

This is a far cry from the vision we had of the new communication and information processing technologies as little as a decade ago.\textsuperscript{17} And far from the vision of the world being created by the new technologies projected the DoC discussion paper: more far-reaching than commercial databases, packaged software and value-added services for telephone subscribers, more fundamental than automation. I don't know if David Birch is right, or if the trend to globalization described by U.S. News & World Report, Business Week and Fortune Magazine is more than a journalistic pipe dream. But I feel that the evidence of atomization and globalization of the economy is all around us, and I find it distressing that a major discussion paper, which expresses the policy perspectives of the Canadian government, should be totally silent on a matter, which,
even if these people are half right, has to be the single most devastating consequence of the new communication technologies.

Consider: what we once thought of as "soft", the things of the mind, are now what we have to sell. Software is just what it says--ideas for sale. Software is no longer just instructions for a computer, nor even a new kind of educational experience; software is our acquired professional and management skills, developed in a complex society, and translated through informatics into a marketable commodity, to be sold in countries who want to understand how we did those things. Those of us trained to be practical people of affairs in an earlier era find it hard to reconcile themselves to the idea that the techniques of some social scientist or the creative ideas of an artist might be easier to sell than wheat or cotton shirts; those of us who were trained to be the custodians of an intellectual and artistic tradition may find it equally hard to see ourselves transformed into today's version of shakes and shingles. But, like it or not, that seems to be about the size of it. The time when we led in hard-ware is behind us, migrated to the third world, the time of soft-ware just begun.

The Challenge to Public Policy

I am not trying here to take a position either for or against the commercialization of our intellectual life. That is a matter for public debate, a question which has no simple answer. What I find objectionable in the DoC discussion paper is the failure to examine the options which are now, realistically, open to us. There is no prospect of sustaining industrial sectors that we once thought inviolate in the face of mounting international competition for which we are ill prepared, even though it was stimulated by organizing activities of our own multinationals, other than by desperate measures of protectionism whose ultimate effect is to further reduce what remaining advantage we may have and soon degenerate into permanent disability allowances. Technological advances in communication have created an environment which favors new kinds of enterprise. We can decide to move into that environment or not, but no nation, certainly not one of our size, can do much to determine what the rules of competition of the future will be. We are like someone who learned to play English rugby and now finds himself in the midst of a game of American football: we must either learn the new rules or find a way to extricate ourselves gracefully from the game. But what "extricate ourselves" could possibly mean, I for one cannot imagine.

Here we face the dilemma of the new technologies. These technologies are not—the discussion paper to the contrary--the means by which we will recover our national competitiveness in resource development, manufacturing and the delivery of health and education. Automation, and its supposed benefits in enhanced productivity, has turned out to be a chimera. Not that automation cannot be used to improve workers' performance, but rather that if it should so prove its value then it still makes more sense, economically, to locate one's automated factory in one of those areas of the world where the local labor supply is abundant, motivated, skilled enough—and prepared to
enough--and prepared to work for less. In the century before ours, machinery was heavy, factories were immobile and it was labor that had to be relocated from one country to another (leading to the great wave of immigration into North America); nowadays, machinery has become lighter, and with automation, very much so, and it makes better economic sense to export the factory than to import the labor. It is no longer even just a question of "cheap" labor: the quality of workmanship to be had in the developing world has also become better.18

The truth of the matter is that the new communication technologies are middle-class technologies. They are not an autonomously intelligent substitute for cheap labor (the endlessly receding dream of artificial intelligence); they are extraordinary tools placed in the hands of literate, highly educated and creative individuals. The social consequences of that "bias" of these technologies are far from uniformly ennobling. Look again at those employment trends: a decline in the family farm, a decline in all those areas where worker security was the greatest (and unionization was a major factor), an increase in the middle-class and professional sectors--but also an increase in sectors of the service industries characterized by minimum security, minimum wages and minimum opportunity for individual growth. It is in some sense a formula for a bi-polar society, where the well-to-do get better-do and the poor stay poor while the middle gets thinner. This is the prospect Communications for the twenty-first century never addresses.

The Limits Of Bureaucratic Policy Making

If we had hoped for a new vision of the next century we have, it seems, been deceived. Perhaps there is a reason. I have already alluded to the body of research dealing with the impact of the new technologies on organizational structure and practice. A finding of this research is the surprising conservatism of large organizations. Child, Gunter and Kieser,19 reporting on a six-nation study of the implementation of new technologies of information-processing and communication, sum up their conclusion as "little organizational change". Apart from external constraints, it turned out that how technology gets implemented is decided by the political realities of organizational life. Among the main players are the technical departments whose jurisdiction over the high-tech budget is a source of considerable power, and a claim to legitimacy. According to Child et al., the technical department is typically guided by an image--a "template", in the authors' words--defining what organizations are (and how technology fits into them), based on long-established principles of volume of production, reduction of unit costs, substitution of machinery (or low-wage labor) for highly-qualified (and hence scarce) labor--all the properties we associate with the era of manufacturing, which the statistics now tell us is in decline, domestically. This image, or "template", is inconsistent with a notion of organization based on highly-qualified professionals, translating their knowledge into saleable software, and using technology to augment their own translation process, both in creating the software and in marketing it. By its indifference to the cultural dimension, it also ignores the
extraordinary interaction between the user and the technology, through which technology is in fact recreated, and instead emphasizes an artificial separation between the technical part (the domain of the expert) and the user part (which is thought to be irrelevant to the utilitarian definition of the task). The political process that surrounds the implementation of technology in the organization is based on the defense and extension of organizational positions: if, as we have seen, technology keeps on being bought, that is a recognition of the entrenched power of the technology department; if its effect on actual organizational practice is minimal, that is because the user community of professionals has an over-riding discretionary power to decide how its tasks will be carried out. The technology nevertheless becomes, as Kraemer and King point out, a powerful tool for either facilitating structural changes determined for other reasons or more probably for reinforcing existing structures—"...a powerful tool of the status quo". Technology policy thus becomes a pawn in the ongoing game of organizational politics, and a kind of index of the profile of power of the decisional hierarchy.

I find it impossible not to see in the recent DoC publication evidence of Child et al.'s "template". The department, having played for so long the role of missionary for the new technologies, before "high-tech" had entered the public consciousness, now risks being trapped in its own mythology, at a time when we need a more balanced view of what Dunais et al. call the "two-way" causality of technological change. The question is no longer just how technology transforms society; we need to also look at how society transforms technology.

In intensely political environments such as Ottawa, questions of a general order-meta-questions--are not infrequently transformed into questions relating to the department’s place in the bureaucracy. Questions of national policy come to be subsumed under the heading of departmental policy. Though it claims to be a contribution to a national debate, in a real sense Communications for the twenty-first century may not have been written for a general audience at all. It is part of a process whose dynamic is fixed by the negotiated realities of bureaucratic influence. The Department of Communications has traditionally straddled the domains of economic policy (through research, telecommunications, new technology development) and of social policy (through broadcasting and culture). This division—so reminiscent of Snow’s "two cultures"—has tended to support a stereotype: that technology is profitable, but only secondarily social (in that one must do a "needs" analysis, and something about "impact"), while culture is social but unprofitable. What now confronts the Department is the realization that technology without sociability is not profitable: it doesn’t even work. To judge from the paper that has been issued, it would seem that the problems of people still come out as an inconvenient side-effect of technological change, rather than the only way to benefit from it.
Footnotes

1. I wish to acknowledge the support of the Institute for Research on Public Policy, in the form of a sabbatical scholarship, which has permitted the writing of this essay. I would also like to thank the University of California at Berkeley for its help.

2. See, for example, Faulhaber, 1987 and Tunstall, 1986.

3. I hope it is not necessary to point out that this is "value-added" commentary on the part of the present author, based on an assumption of the reality behind the paper, and not an indirect quote of the content of the paper.

4. I must again emphasize that I am here interpreting the paper freely and not reproducing directly the material therein, which is impeccably discreet in its formulation throughout. I am again making some assumptions about the context within which the report is issued with which the authors of the report might well disagree.

5. "'Big Brother Inc.' may be closer than you thought; The latest threat: Personal 'profiles' compiled from the widening web of data bases," Business Week, February 9, 1987. Closer to home, the Montreal Gazette of May 12, 1987 reported that "Private data banks leave Quebecers open to abuse"; among other things, the Quebec Justice Department sells information to the Montreal Credit Bureau, even before a verdict on a trial is reached. The New York Times (Markoff, 1988) reports that "...just about everyone is at risk." One man was arrested five times for crimes he did not commit (his birth certificate had been stolen); he had to sue to have his name removed from the F.B.I. database used widely by police forces. One commercial database, used by creditors (not marketed to the general public) has information on more than 138 million names in roughly 84 million households. The latest technique is computer matching, which involves merging different databases to create profiles on individuals; between 1980 and 1984, some 15 American government agencies had matched more than 2 billion records.

6. This issue has also received extensive treatment in the literature; perhaps the best known example being Heather Menzies (1981) Women and the Chip.

7. I am indebted to Barry Lesser of Dalhousie University for this idea, which is developed in a paper for the Department of Communications on the regional implications of communications development. Naturally, Professor Lesser must be absolved of any responsibility for the version presented here.

8. One of the most surprising lacks in the paper is the absence of any realistic discussion of research priorities: what should we be doing in research to keep abreast of purely technological developments in superconductivity, high-definition television, parallel processing, artificial intelligence, and so on,
for the whole spectrum of current international research trends. Considering that, even starved, the Department's resources are among the most important concentration of research skills in the country, this indifference to the setting of national priorities in technology development is regrettable.

9. See the quotation in the next section, for an example of a "rhetorical flourish".

10. See for example Chevalier, 1981.


12. According to Keniche Ohmae (1987), the favorable Japanese balance of trade with the United States is explained by the operations of American-owned companies in Japan: if one were to compute only the figures related to strictly Japanese companies, the ratio would be in favor of the United States!


14. Communications for the twenty-first century quotes somewhat similar figures for Canada: between 1946 and 1986, the percentage employed in resources has gone from 29% to 7%, in manufacturing from 30% to 23%, in services from 41% to 71%. In other words, in 1946, three people out of five were engaged in resource development, including agriculture, and manufacturing, only two in the service sector. Today, less than one in three (30%) labors in a sector which we have tended to think as "productive", while seven people out of ten are in the service category. Considered differently, it is estimated that about 45% of the labour force can be considered to be engaged in "information work", as defined by OECD, which breaks down by percentage as follows: 10% in the resources sector, 32% in manufacturing and 52% in the service sector. The apparent discrepancy between these figures and Birch's is accounted for by the difference in how administration is categorized (included under "services" in the DoC figures, not in Birch's); otherwise, they reveal identical trends in Canada and the U.S., as we would expect. Curiously, although the discussion paper asserts initially that "only by understanding the long-term nature and direction of change can we chart a course for the future" (by which it refers to the figures on changes in the economy and the work force which we have just cited), it never returns in subsequent sections to the theme.

15. 1988 Ten-year Forecast, the Institute for the Future, Menlo Park California.

16. IMB's decision to locate its 1500-person software operations in the Toronto region illustrates the logic: excellent communications, a dense network of universities, outstanding quality of life, commercial "synergy", concentration of intellectual

17. The industry development exercises of the federal government, in the mid-seventies, ignored the whole software phenomenon. Where electronics and computing were concerned, they were lumped in with electrical products. Statistics Canada had, for years, no category by which to measure the growth of anything resembling "thoughtware". The products of intellectual effort seemed to the planners of the time too esoteric to be counted in a serious assessment of national industrial activity.


22. When this was being written, the Montreal Gazette published an article entitled "Computer blues" (Bryan, 1988). What it recounts is that the "world's most profitable" bill-collection company experienced "plummeting" profits when it installed a "massive computerization program". The culprit: the computer system which represents "...a ballooning expense." The company is confident that eventually they will benefit from computerization but at this point, 18 months behind schedule, they have become uncomfortably aware that their experience "...is one that, with small variations, has been played out in many other companies across North America."

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