The Information Society: Vulnerability and the Research for Security

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The title of this conference: "The Challenge of the Information Society: Human implications" points to a vast and largely unexplored field. Since in any reflection on the challenge of what we have chosen to call the information society the individual and the social environment are inseparable, this presentation will focus on two interrelated aspects that do not seem to be given the attention they deserve and that affect individuals as much as groups, institutions and societies: new dimensions and perceptions of vulnerability related to developments in the communications and information field and the attendant research for security. An attempt will be made to set these phenomena in the larger context of vulnerability in modern societies and the recent extensions of the concept of security.

A. Background: the Information Society, What does It Mean?

The expression 'information society' is a curious one. It is as if we had suddenly discovered the role of information in society and decided to use this expression as a suitable label for what we perceive to be a major trend or feature in current developments. We seem mesmerized by the rate of technological development and the rapid introduction of new communication and information services that pervade our lives, and have therefore hastily adopted a new perspective. Implied in what now have become almost over-worn cliches, e.g. the information society, the communications revolution, the advent of an information economy is that they all represent a fundamental change in our attitudes to the entire information/communications complex. It is the first time that we interpret society in terms of communication patterns and informational relationships, the first time we set information concepts at the centre of explanations of living systems and political processes. It is significant that despite the diversity of approaches and the

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variety of interpretations, there now seems to be agreement on at least one point: communication and information flows are a prerequisite for organized, dynamic patterns, whether among cells, animals or humans. Without communication there can be no community. But then we must also admit that in this perspective all societies have been information societies. Throughout history, societies have evolved practices and rules for organizing the generation of knowledge and their information flows. All societies have accumulated stocks of knowledge and transmitted this stock through space and time. All have also been to varying degrees aware of the power of communication and information, whether expressed in the awe before the creative power of the sacred word, in the safeguards surrounding rituals and priestly texts or in the famous incident of the 'burning of the books' during the first Chin dynasty in China.

However, communication and information do not seem to have been perceived as problems *per se* but rather have been taken for granted, seen as embedded in society and placed within other social activities whether those were expressed in religious, economic or political terms. It is only in recent years that somehow something called information has to be extracted from the processes of social life and examined in its own right or that communication by itself has become an issue in society, the national level.

What has caused this change in perspective? Why have we suddenly begun to perceive of ourselves as living in an information society when in a historical perspective we have always done so? We still seem very unsure about what all this really means and here only some features of this complex situation can be mentioned.

The first feature which is still far from being generally recognized except than in a vague and rather nebulous manner concerns not the usual fascination with the sheer variety of new technical gadgets that clutter and occasionally decorate our environment but rather the nature of the technologies that we define as information and communication technologies. These microelectronic-based technologies are fundamentally different from traditional industrial technologies, different primarily in the sense that they no longer concern what might be seen as brutal configurations of material and physical energy but directly embody basic scientific advances and are seen to represent technologies of knowledge and organization. They have therefore rapidly become pervasive as a basic technological infrastructure in modern society,

whether in industrial production, in public and private administration, in scientific work, or in entertainment.

The second feature is the extent to which metaphors, similes, images and concepts drawn from the information and communication field have invaded our conceptual apparatus. Communication patterns and information flows are used as basic or crystallizing concepts in the interpretation of natural phenomena (e.g. genetics, evolutionary theory), of political life, of social organization, even of the structure of scientific revolutions. They are seen to affect social relations within countries and among nations, the nature of work and leisure, patterns of spatial movement and arrangement, the processes of learning, knowledge and culture.

This fundamental change in attitudes and perceptions is so recent that we still seem very unsure about what it means and ill-prepared to deal with it. Even at the conceptual level, we face a paradoxical and contradictory situation. One the one hand, each discipline, each profession, even sub-groups within professions, has developed approaches of its own, as often have different government department in so far as they have paid attention at all. Social responsibility and accountability is ill-defined and dispersed and the result is confusion, ill-conceived policies and increasing inequalities within and between nations. On the other hand, we have the grand schemes through which everything in nature and society is explained in terms of communications and information paradigms to the point that we face utopian visions of 'intelligent' machines providing the next evolutionary stage in 'huamn' development.

Thus, we face the risk which often seems real enough that the 'information society' becomes a catch-all but empty expression of technological determinism to cover newly perceived complexities, that we exchange 'economic man' of ill-repute for a new reductionism in the form of 'communication man' or the new species 'homo informaticus' and that we disregard the natural limitations of communication: we still cannot feed ourselves on information and micro-processors will not solve all the problems of the world.

The images of the utopian advanced information society which increasingly in one form or another occupy analysts, governments and corporations in the industrialized world must be set against the apparent fact that the heralded global village is in reality becoming a village of global elites: despite all protestations to the contrary, we seem intent on adding to the

old division between the haves and have-nots, within and among nations, a new division of knows and know-nots, of information haves and have-nots. Current patterns of communication and transport, to say nothing of a pervasive commercial culture imparted chiefly by the mass media, have aided a new stratification of the world's people into two classes that share very little information, experience and common concern. The wealthy transnational class is thus assimilated into a universe of communication and information that is not shared by the majority of humankind. "The psychological distance between these two strata is in imminent danger of reaching the point where the only form of discourse between the top and the bottom is violence, punctuated by occasonal spasms of charity" (Soedjatmoko, 1986).

The third feature concerns the issues that confront the nation-state particularly in the field of communication and information, issues and pressures from above, i.e. from developments at the international intergovernmental and the transnational corporate level and from below, i.e. from the self-assertion of ethnic and religious communities, issue-oriented groups and grass-roots movements. These pressures are closely connected to another process: the increasing interlinkage between national and international issues which is conditioned by and reflected in modern communications. This interlinkage has gone far enough to warrant the description as the growing internationalization of domestic issues and the domesticization of international issues. Events ranging from the fight against apartheid, a vote in the US Senate or the eruption of Sikh extremism are examples of both.

B. Vulnerability

Analyses of the emerging 'information society' cover a gamut of attitudes into which perceived trends and characteristics are fitted. They include the grand historical overviews according to which we are now moving towards a post-industrial or even technotronic sciety; there are the economist's analyses of trends in production and employment leading to the concept of an 'information economy' and also the utopian visions of the future advanced information society where computers in combination with modern forms of communication will usher in a new era of prosperity and conviviality.

There are though also more critical and searching voices which we should listen to more carefully. In this vein of more critical analysis, a number of

interlocking issues can be seen as clustered around the concept of vulnera-
bility at the local, national and international levels.

New forms of vulnerability are often coming to be seen as inherent in the
conditions of modern society. Some kinds are obvious and have been dra-
matically demonstrated: a minor technical error can plunge a large region
into an electric black-out as happened in and around New York in the
1960's; the chemical explosion at Sevosovo in Italy caused the evacuation of
an entire region, a similar accident caused the tragedy of Bhopal and the
international repercussions of the nuclear accident at Chernybol are still
difficult to evaluate. It is obvious that the development of nuclear weapons
has caused acute perceptions of vulnerability world-wide which have been
further increased by more recent developments such as the militarization of
outer space. Terrorism has contributed to a sense of increased vulnerability
and in our minds lurks the figure of Dr. Strangelove, the madman in a
position to unleash the ultimate catastrophe.

New dimensions of vulnerability have also to a large extent been linked
to developments in communications and information. I will therefore start
with some reflections on these aspects and then put them into the context
of reflections on the vulnerability of modern society generally.

In the communications and informmation field, the reasons for a sense of
vulnerability among developing countries faced with the overwhelming do-
minance in hardware and software by some industrialized countries should
be obvious even though many in the North have refused to marshall the
required understanding and empathy. Thus, a sense of vulnerability underlies
much of the debate on the new information and communication order and
the perceived needs for national policies in areas ranging from broadcasting
to informatics. However, there are other and perhaps more insidious forms
of information vulnerability that have been expressed by technically advanced
nations and that point to vulnerability features inherent in the 'information
society' itself. Analyses of these issues are therfore important to all coun-
tries, if nothing else for the general lessons and warnings they provide.

A good entry point into this field is offered by the analyses set out in
official inquiries and public debate in three countries which have paid special
attention to these vulnerability issues: Canada, France and Sweden.

In Canada, the well-known Telecommission studies did already in the
early 1970's deal with issues that clearly revealed a sense of national vulner-

ability caused by trends and practices in the communications field. They have been followed by an almost continuous debate of the perceived vulnerabilities in the field of broadcasting and were topped by the appointment of consultative committee on 'Implication of Telecommunications for Canadian Sovereignty' which became known after its chairman as the Clyne Committee. The perceived risks and new kinds of vulnerability in the communications and information field examined by the Committee particularly concerned issues arising from the storage of data abroad and included:

—to reduce Canadian control over disruption in services resulting from technical breakdowns or work stoppage in another country;
—to reduce Canadian power to ensure protection against other events such as invasion of privacy or computer crimes;
—to risk greater dependence on foreign computer staff which would result in lower requirements for Canadian expertise and thus the human and technological resource base upon which systems specifically geared to Canadian requirements could be developed;
—to jeopardize the exercise of Canadian jurisdiction over companies operating in Canada which store and process data abroad;

Some of these vunlerability concerns have been expressed in terms which would well suit representatives of developing countries: just change the name of the country and it is the same reasoning which many Westerners have found so unpalatable coming from Third World countries. The same reversal of position has happened in other contexts (e.g. in the discussion over legal principles for satellite broadcasting via satellites from one country to another).

The concerns expressed by the Clyne Committee are shared in other countries. The similarities are striking between the Clyne Committee report and the report on 'L'informatisation de la societe' prepared at the request of the French President by Simon Nora and Alain Minc. A major theme of this report is the assertion that the main risks of the information-oriented and computerized society are not individual in the form of, for instance, abuse of privacy, but rather the fact that society as a whole has become so much more vulnerable and fragile. A modern, industrialized society depends on the smooth working of numerous small units. The failure of one part can cripple the whole. An information culture that is centralized and hierarchical might push society beyond the limits ef tolerance. The present trend

towards increased vulnerability is conditioned by technological developments and even more by the manner in which we have chosen to use the new technologies. Although 'chosen' is not the right word since one of the main conclusions of the report is that we have arrived at the present situation by default, through a lack of analysis, choice and policy.

The conclusions of the Nora report show great similarities with another analysis specifically dealing with the vulnerability of the computerized society. The emphasis of the report by a Swedish Government Committee on automated data processing and the vulnerability of society is that the computerization of society seems inevitable, that the use of computerized systems to a marked degree contributes to the increasing vulnerability of modern highly industrialized societies, that the level of vulnerability in Sweden is unacceptably high and that it will become even higher if counter-measures are not taken.

The degree of vulnerability is seen as conditioned by numerous factors both internal and external: the dependence on foreign sources of hardware and software; the centralization and concentration of data systems; the dependence on the few trained operational staff; and the sensitive nature of certain information. Terrorist activities and other criminal actions, threats, sanctions and acts of war have greater effect through these vulnerability factors which also increase the effects of natural catastrophes and accidents.

The specific vulnerabilities caused by large-scale use of interlinked computerized information systems must be put in a wider context. The Swedish Secretariat for Future Studies has undertaken exhaustive studies of what is simply called 'the vulnerable society' as the title for a series of reports.

One approach mentioned in these studies is represented by the work of the Italian mathematician Roberto Vacca who analyzes society and its technical systems from a systems management point of view. Vacca regards vulnerability as a built-in property of the great techno-economic systems that permeate the whole of society and affect everybody's daily life. Such systems are, for example, the electricity, transport, food distribution, water supply and sewage systems. The more extensive and complicated the systems become, the more difficult they will be to direct and control. The various systems also inter-lock with one another in such a way as to make them unstable.

In the Swedish studies it was decided to broaden the perspective and to

include social and psychological systems in the discussion. In these studies, different systems have been used as a starting-point and their vulnerability described. Such systems may be technical-administrative (data processing systems), ecological (the Baltic Sea is cited as one good example) or social (a local population or a linguistic minority in a country). Thus, a society is vulnerable when it consists of systems that, if disturbed, give rise to harmful consequences, in the short or long term, for large groups of people. Vulnerability has no direct connection with how often such disturbances occur. It indicates that a possibility of extensive damage exists, i.e. that society in some respect is unprotected against extensive damage, crisis or catastrophe. The problem also involves analysis of the threats that may initiate a harmful course of events.

The vulnerability of a system can be described as a relation of dependence. If you are dependent, you are also vulnerable. Therefore, analysis of a society's vulnerability is concerned with its dependence on the operation of its internal systems and functions and the maintenance of external relations necessary for that society. As examples of external dependence in the case of Sweden, the study specifically mentions two sectors. Swedish agriculture is dependent on external factors; consequently the whole of the Swedish food supply is vulnerable. In the computer field, there is also a high degree of dependence on the outside world; thus Swedish industrial production, administration and research are all vulnerable to any disturbance in foreign relations that affect the computer sector.

A major cross-cutting issue concerns the relationship between efficiency and vulnerability. The efforts to achieve ever higher levels of efficiency have a number of implications which increase the level of vulnerability: a series of traditional stabilizing and self-regulating functions has disappeared without being replaced by others; the demands for short-term economic efficiency may put pressure on the environment towards less diversified and therefore more vulnerable eco-systems which can have drastically negative effects on productivity in the long term.

The Swedish reports pay particular attention to the problems of size in organizations and the increased use of data systems. With reference to the recent concept 'small is beautiful', the analysis focus on the vulnerability inherent in the growing size of organizations which is seen as a dominant trend in modern society. When a system grows in size there is a corres-

ponding increase in the need for information for control and regulation, i.e. a need for rapid processing of large amounts of information. This trend has resulted in an increased use of computerized information processing. Among the various kinds of vulnerability associated with the large-scale use of computers are mentioned the effects on employment, the dependence on the few experts who design and control the systems, the difficulty of adequately coding information on complex phenomena for computer systems and the inflexibility introduced into social organization through computer systems, which make organizations vulnerable to unanticipated changes in their environment.

Concern in Sweden over the vulnerability of an increasingly computerized society led to the establishment of a Vulnerability Board. In a recent statement, the head of the Board emphasized one characteristic of the computerized society: small and simple disturbances may create great and sometimes devastating results.

Interestingly, an American analysis of part of the Swedish studies and activities from the point of view of applicability to the United States focused on the 'resiliency of the US information society', with a warning, however, of the neeed for further vigilance. A warning that needs to be taken seriously even in the United States where the degree of vulnerability of computerized data systems has been proven by the increase in computer crimes and by groups of teenagers using personal computers to 'break into' major data banks.

C. The Search for Security

In one perspective, much of social development could be analyzed in terms of a search for security—security to off-set the dangers arising both from nature and fellow human beings, and security as a basis for increasing the quality of life. The modern welfare state is there to provide a security net for its citizens. And security is a key element in the images, the analysis and conduct of international affairs which here will be used as the entry point.

Originally, security in international relations referred to a state of safety from the effects of aggression. A nation that possessed security was considered to protect itself through economic, political or military means from

foreign aggression. This notion of security is still widely used, referring to military security; thus the term 'collective security' generally refers to military alliances such as NATO, or the Warsaw Pact.

As with so much else in international relations, the concept of security has recently changed and expanded. Scientific knowledge and technological sophistication have gained in importance as elements in dominant positions and security safeguards. Recently, attention has been drawn to the central role of non-weapon technology in the new era of geopolitics conditioned by nuclear capacity and the opening up of outer space. "Over the last decade, the harnessing of information technology to military tasks has emerged as the principal driving force in the evolution of weapons design and the shaping of the strategic balance" (Deudney, 1983, p. 27). With the world-wide networks of military sensing and surveillance, of computerized command, control and communications, the ability to identify targets and to direct nuclear weapons has become planetary in scale, and demands a rethinking of the traditional security policies.

The changing structures and concerns of international relations have pushed both practice and theory beyond even new politico-military dimensions of security. In 1973 Mahdi Elmandjra, in a study on the United Nations system, declared unequivocally: "As a purposive function peace is not limited to collective security in the political and military sense. It englobes international economic security, international social security and international cultural security". (Elmandjra, 1973, p. 319).

The link between international security and economic development has been stressed since the 1960's, and this approach paved the way for extending the security concept to the economic field. One of the bases for the demands of developing countries for a new international economic order is the concept of 'economic security'. The Charter of Economic Rights and Duties of States, adopted by the United Nations General Assembly in 1974 explicitly refers to "collective economic security for development" (preambular paragraph seven). In the Charter the emphasis is on co-operation for the purpose of development, as the shared goal and common duty of all states.

The notion of security may be further extended. The international debate and negotiation on environmental issues may well be analyzed in terms of efforts to provide 'ecological security'. Since the Stocholm Environment Conference in 1972, the goal of achieving a wider [degree of such]security] has

become a permanent feature of the international agenda. The security-promoting measures have included anti-pollution agreements to safeguard the marine environment, protection of eco-systems and wildlife and liability for nuclear damage, as well as such more general agreements as the Nordic Environment Convention of 1974 and the Barcelona Agreement on the Protection of the Mediterranean of 1978.

A number of the grand international conferences organized by the United Nations in the 1970s have dealt with issues that are well defined by Elmandjra's expression 'international social security'. This is particularly obvious in the case of the conference which led to the establishment of the World Food Programme as the basis of 'food security' for the needy countries. Similarly, international concern over employment and the human habitat can be seen in the light of applying the security concept to other aspects of social life.

That outer space activities have a clear security dimension is quite evident but this enlarged concept of security can also and most usefully be applied in the communications and information field. Once communications *per se* had become an issue in society, at both national and international levels, it was easy to perceive a definite trend towards policies and action designed to establish or increae 'information security', even though the expression itself was rarely used. The strong linkage between traditional security concerns and information issues at the Conferences on Security and Co-operation in Europe (Helsinki, Belgrade, Madrid, Stockholm) is in itself a clear pointer in this direction.

Another example of the quest for 'information security' is represented by the demands of developing countries for a new international information order. The terminology used in this respect seems almost to recall earlier notions of security in the use of such expression as 'aggression', 'violation', 'imperialism, and 'neo-colonialism' to describe the present practices. The reasons stated by the developing countries in support of the changes which they demand in present systems and practices, explicitly refer to the harmful effects of hardware and software dominance by the industrialized countries and the negative impact of an untramelled uni-directional flow of technology and information. In the perspective adopted here, the demands by the developing countries can easily be understood as efforts to achieve 'information security', which could be related to the 'cultural security' mentioned by

Elmandjra.

To a large extent international public debate on 'information security' has focused on a relatively limited aspect of information, i.e. the journalistic dimension of news and information. A number of analyses have decried the alleged cultural domination exercised in the media field generally, but much of the discussions in UNESCO, the UN, the Non-Aligned Conferences and various non-governmental bodies have concerned information in the form of news.

However, other kinds of information flows have also been discussed in terms of 'information security'. In most cases they are related to international data transmissions of various kinds. Particularly interesting in this context are the discussions in the UN Outer Space Committee on international legal principles to govern remote sensing of the earth by satellite. The fears and misgivings expressed by many countries concern the collection and use of data about their national environment and natural resources, obtained by other countries. If, for example:

transnational companies have better reconnaissance data than developing countries, they are in a position to bargain more effectively for initial exploration privileges. In addition, to the extent that remote-sensing data contributes to a better monitoring of crop developments and improved yield forecasts, the ability to utilize these data, may, for instance, make it possible for users to position themselves effectively in anticipation of market developments, through spot and forward transactions in commodities. (Remote-Sensing Data: Element in National Resource Negotiation, in Transnational Data Report, Vol. VI, No. 5).

It was soon agreed that the prevention or restriction of space activity, i.e. the collection of data via satellites would have negative effects on a kind of international co-operation in which all countries have an interest. The controversy has rather turned around the treatment, dissemination and use of data. In this respect, a distinction has been made between 'primary data', meaning data acquired by satellite-borne remote sensors as well as pre-processed products (processed data) derived from the raw data and 'analyzed information', which signifies the end-product resulting from the analytical processes performed on the primary and processed data. Thus, some states maintain that permission even for the collection of data must be given by the 'sensed' state, others focus on authorization of the dissemination of

analyzed information while still others oppose all restrictions concerning the distribution of data and information. These issues thus lend themselves well to an analysis in terms of the balance to be struck between 'information security', and mutually advantageous flows of information.

D. ...and beyond

But even should we manage to alleviate problems of information vulnerability through measures to provide security of the kinds mentioned earlier we would still face vulnerability challenges that go far beyond security concerns, that are in fact located at another level altogether. Two aspects warrant particular attention in this context.

The first aspect is linked to a series of interlocking and complex conceptual and even epistemological issues which can only be given a summary discussion in this context.

One of most interesting American scientists in the computer field has pointed to the beliefs about the need for computers in the management of large corporations and of the military, and about the impossibility of pursuing modern science and modern commerce at all without the aid of computers (see Weizenbaum, 1976: 28). Thus, the computer becomes an indispensable component of any structure once it is so thoroughly integrated with the structure that it can no longer be taken out without fatally impairing the whole structure. The obvious but rarely discussed danger is the possibility that some human actions, e.g. the introduction of computers into some complex human activities may constitute an irreversible commitment—and lock us into one specific form of organizing human activities. As Weizenbaum says, "The computer was not a prerequisite to the survival of modern society in the post-war period and beyond; its enthusiastic, uncritical embrace by the most 'progressive' elements of American government, business and industry quickly made it a resource essential to society's survival in the form that the computer itself had been instrumental in creating" (idem. p. 28). The consequences are serious. One aspect which was also considered in the Swedish vulnerability studies has by Weizenbaum been expressed in the following terms: "...a computing system that permits the asking of only certain kinds of questions, that accepts only certain kinds of 'data', and that cannot even in principle be understood by those who rely on it, such a com-

puting system has effectively closed many doors that were opened before it was installed". (idem p.38). It should therefore not surprise when the same author finds that the computer has begun to be an instrument for the destruction of history: "For when society legitimates only those 'data' that are 'in one standard format' and that 'can easily be told to the machine', then history, memory itself is annihilated". (idem. p.238).

Thus, from various points of view, the growing reliance on computer systems as a basis for analyses and decisions has serious implications. Decisions are made with the aid of computers whose programs are no longer explicitly understood or known; hence, the criteria or the rules on which such decisions are based escape verification. The systems of rules and criteria that are embodied in such computer systems become immune to change since any substantial modification is likely to render the whole system inoperative. Therefore, such systems can only grow, by accretion as it were. Their growth and the increasing reliance placed on them is in turn accompanied by an increasingly exclusive legitimation of their 'knowledge base': only data and information included in computerized data bases is given legitimacy and, worse, credibility. It would in fact seem that we are only slowly and reluctantly prepared even to consider this new insidious vicious circle, much less to do anything about it.

The final remarks concerns the human being in this new environment labeled as the information society. Here we meet another set of vulnerabilities arising from what might be seen as the mismatch between our new communication systems and the information processing capacity of human beings.

Our headless rush into the development and deployment of new information systems seems to have been based on what some economists have chosen to call the pig principle: if something is good, more is better. But this simply does not correspond to the manner in which human beings function.

Considerations of the human implications of the challenges posed by the 'information society' need to include consideration of the human being's capacity to deal with information, thus to basic biological and psycho-physiological features of the human being as a receiver and transformer of information. However, this crucially important aspect of communication is almost always neglected both in theory and in the practical development of information systems. Recently, though, more attention has been paid to those

biological features in such areas as neuro-physiology and brain research, experimental psychology and psycho-physiological stress research and in such related fields as research into information overload or saturation phenomena.

In this perspective the point is made that the human nervous system with the brain as master organ provides man with a wide repertoire of reactions among which he can make deliberate choices. Through technology man has drastically transformed his social environment and continues to do so at an accelerating rate. However, in striking contrast, the structure and the size of the human brain have remained essentially the same for at least over the last fifty thousand years. Thus, we are faced with two seemingly incompatible phenomena: the standstill of genetic evolution and the accelerating pace of social evolution. This raises the question of man's adaptability. "How adaptable is man, what are the limits of our tolerances, how far can they be stretched, what happens if they are exceeded? Can adaptability be measured, the limits predicted and hence the harmful effects prevented?" (Frankenhäuser, 1974:14).

It is against this background that the concepts of under-stimulation and over-stimulation have been introduced. They refor to the inability of the regulatory mechanisms of the brain to maintain an optimal level of functioning at too low and too high levels of stimulus input. When the input to the brain is either very low or very high, the homeostatic control mechanisms break down. At low levels, we tend to be inattentive, easily distracted and bored. Conditions of extreme under-stimulation result in a state of general mental impoverishment with attendant loss of initiative, confusion and apathy. As the opposite end of the stimulus continuum, the central nervous system is over-aroused. Feelings of tension and excitement develop, followed by a gradual fragmentation of thought processes, a loss of ability to integrate messages into a meaningful whole, impaired judgement and decision-making, a loss of initiative and, finally, a breakdown of organized behaviour.

These researches have led to conclusions that are crucial for an analysis of the effects of modern communication systems and of the emerging 'information society'.

Thus, it has been found that, at any given time, only about 50% of a given population function at an optimal neuro-physiological level of information handling. However, all our communication systems are constructed

on the assumption that 100% of the population functions at an optimal level. Thus, they do present serious problems for the groups of people who permanently cannot function at an optimum (the handicapped, the very young, the old) and also for those who temporarily do not function optimally (due to illness, stress, intoxication, etc.).

In another crucial aspect, it is pointed out that communication strategies are designed so as to provide an increased output and a greater variety of choice. The neuro-psychological demands inherent in such choices require initiative and active efforts by the individual. The question has then been put: how can these demands be met when the human nervous system responds to an excessive input by loss of initiative and loss of involvement? The conflict induced by an overload of attractive stimuli which is a typical feature of life in technologically advanced societies has led to a theory of 'surfeit stress'. It has, in fact, been suggested that the problem of information saturation and decision-stress is a major contributing factor to the manifestations of discontent, apathy, flight from reality and violence in affluent societies.

Analyses concerning the limits to the individual's information processing capacity naturally also point to the social impact of the new information environment. In addition to such effects as those mentioned above, questions have been raised concerning the impact on social cohesion. Here again, we face contradictory trends. In many socio-cultural settings an erosion of family ties is discernible while at the same time other primary group ties along tribal or religious ties seem strengthened; both trends would seem to weaken traditional social cohesiveness as exemplified by the often increasing weakness of political structures (e.g. political parties). Also, the mass media as well as inadequately conceived data bases give rise to greater opportunities for the spread of misunderstanding, erroneous information or false, new stereotypes in a situation where we need, more than ever, to consider the contextual aspects of information.

If a general conclusion is to be drawn it seems to be the following: the information society, whatever meaning we assign to this concept, will not be a utopia. The current trends subsumed under this expression pose old problems in new guises and raise new problems for which we are ill-prepared or unprepared. The almost mindless rush into this new brave world has made us forget what it means to be a human being in biological terms and

has distracted us from a cool, clear look at what it is we are doing, to ourselves, to our ways of perceiving and knowing and to our societies. The new opportunities for community that are offered by new technologies and services can only be realized if we also address the problems raised by the emerging 'information society' through incisive analysis and deliberate policies. It would be a sign of immaturity or worse to forget that for any change, however beneficial it might seem, there is a price to be paid.

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