FROM THE TECHNOLOGICAL MIRAGE TO THE SOCIAL BREAKTHROUGH

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PREFACE

Former economic research at IIASA focused on comparative studies of structural changes in developed countries. The intensity of these changes has serious, and sometimes severe social implications. One area of current concern throughout the world is the diffusion of new technologies with a high potential in substituting labor in manufacturing and services, as well as drastically changing the existing patterns of international trade.

In the process of formulating an agenda for the research within the Technology-Economy-Society (TES) Program, IIASA organized an expert meeting on "Socio-Economic Impacts of New Technologies", which was held in Warsaw, Poland, from 18 to 20 November 1985. Twenty-six participants from eleven countries and four international organizations discussed possible IIASA research in this field and came to an understanding that IIASA can and must contribute to the development of a conceptual framework for analyzing and forecasting the impact of high technology (e.g. robotics).

M. Godet, an outstanding scholar contributing greatly to this issue and having been successful in the FAST program, helped us structure the discussions during the meeting, in particular as the Chairman of the session on "Impacts of High Technology on the National Economy".

This paper summarizes, in a sense, M. Godet's vision of the problem. We hope that it will stimulate IIASA staff and other scholars in their thoughts about the very complex problem of socio-economic impacts of high technology.

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M. Godet*

Contribution to the IIASA Task Force Meeting on
"Socio-Economic Impacts of New Technologies"
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The art of asking the right questions

Light - given obstacles - always creates shadows, and, if we observe that the search-lights of the media are focussed on certain problems, it's perhaps to better mask other problems that we intentionally wish to ignore. In order to gain a better insight, and to be in a position to ask the right questions, we must not hesitate to run counter to traditional thinking, even if, so doing, we disturb and displease.

Forward prospective analysis is a standpoint from which one can conveniently raise several questions and advance several hypotheses about an ongoing technological change that is so popular that it proves suspicious.

To what particular needs does the development of information technologies correspond ? Are they indeed really necessary ? Can one not identify other more important needs, which consequently merit a higher degree of priority ?

Who benefits from the fashionable attractiveness of information technologies : is it the citizen consumer, or is it companies badly in need of modernization (or supposedly so), or is it certain sectors striving for development (electronics, telephony) ? Should technological options not be submitted to a closer level of social control, to wide-ranging debate where the experts involved would demonstrably be independent of the technocratic or industrial lobbies ? Will telematic options be taken with as little heed to democratic process as was the case with the electro-nuclear programmes, whereas social risks inherent in the choices are far more fundamental ?

Is the telematic gamble any more credible than the nuclear one ? Has the energy mirage been swept aside to herald the technological mirage ?

The very fact that we are raising such questions, to some extent, is a way to pointing to an answer. It is our clear personal belief -based on long experience in forward analysis aimed at business entities and administrations - that the collective agitation in respect, and in the name, of new technologies (keep it moving ! keep it going !), together with the blind credo in new investments (to regain a degree of competitivity, to recover growth trends) is a pure delusion, the principal drawback being the drawing off of those forces that remain, towards a decoy - whereas these selfsame forces should by all rights be entirely devoted to pursuing thinking, debate and the search for solutions to the real problems of adaptation of structures and behaviours, in a fast changing world. These problems are totally ignored by the strategies of the actors involved, since their solutions very often call for a reappraisal of factors of social and organizational inertia, and it can be noted that these actors themselves profit largely from the aforementioned inertiarelated situation.

It is high time we dropped the masks and recognized that, in the main, the crises reflect this inertia, and that we will not emerge from the crisis through some third industrial revolution, but rather through a radical social transformation. From our point of view, if there are long cycles, they are not technological in nature, but are social and organizational, and this is the first idea we intend to develop hereinafter.

When applied to the entrepreunerial world, this relatively simple idea induces us to placing technological, economic and financial solutions in perspective, as far as development strategies are concerned. Faced with major environmental changes, business policy makers too often seek material solutions to problems which are in essence immaterial, to the extent that they are the resultant of structural patterns, and behavioural modes, and that, first and foremost, they are in fact human relationship problems and should be dealt with as such.

This is the second idea we will develop hopefully demonstrating, by way of an example, how and why the rate of diffusion of new technologies is dictated by social and organizational change.

I - TECHNOLOGICAL CHANGE IS NOT A SPRINGBOARD OUT OF THE CRISIS

There is no more fashionable topic, none more tainted with diagnostic and forecasting error than that of crises. Let us recall. In 1974, the major explanation for the crises was energy-related ! In order to recover a strong growth-rate, we had to overcome the constraint of energy sources ; from this concept, for example, stemmed the French electro-nuclear programme.

A decade later, we note that energy dependency was not the universal explanation. With hindsight, moreover, we can observe that both in the North and in the South, those countries that proved economically to be the most dynamic were also very dependent for their energy sources (Japan, West Germany, South Korea) whereas those countries with excellent petroleum prospects (OPEP countries and the United Kingdom) have stagnated in terms of industrial development : there is not a single OPEP country among the list of newly industrialized countries.

Today, we hear a novel, and popular, recipe : the transition crisis between two technological waves ; whereas the technologies and concomitant production of the growth figures of the 50's and 60's are now on the wane, we must await the maturity of newer technologies and products which will indubitably take us out of the crisis.

We are only fractionally short of thinking that the myth of'long technological cycles' is no better justified than the energy-related explanation of the crisis, as of 1974 - we really should beware of fashionable ideas.

It is of interest to note that during the period 1974-1977, the technological theme was absent, to all intents and purposes, from the debate raging as to how we could get ourselves out of the crisis ; we may be fully justified in asking if we have not invented the technological mirage only to replace the energy mirage[o]; while the real prolems are no doubt to be found else where, in our structures and organizations and in our behavioural trends : we always seem able to find a tree to voluntarily mask from sight the view of the forest of problems we candidly choose to simply ignore.

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[o] Cf. author's article "the technological mirage" FUTURES.

Is it not paradoxical that the drop in production plant investment, and the fall in productivity, should occur exactly at a time when the microprocessor heralds a news era of growing efficiency rates in both industrial production and associate service sectors ? This paradox serves as a proof of social obstacles (centralization, gigantism, complex large scale systems)standing in the way of better technological related efficiencies.

As we see it, the crisis is above all a reflection of accumulated inertial factors, over time, in a fast changing world. In other words, the crisis results from the opposition between the transitional driving forces (geopolitical, technological, economic and social) and the inertial forces (political, legal, organizational, social and mental structures, individual and collective behavioural modes, etc...) that we witness today in political, economic and social systems.

In particular, given that the ongoing technico-economic changes are taking place more swiftly than concomitant social changes, there is a growing imbalance and mismatching of social structures and behaviours to the new realities. The crisis is merely the image of this inadaptation of our structures and the technological changes only serve to aggravate the contradictions between inertia and change.

If we admit that the actors and the structures are undergoing a crisis because the systems are undergoing change, then, likewise, we must admit that in order to control these changes,and indeed benefit from them, we must be prepared to invest a great deal in social innovation and change. In a changing world, the rules of the game and behavioural modes must also change, to the extent that there cannot be creation without some degree of destruction. In order to get out of the crises, we must adapt our strategies and introduce new international, national and regional rules to the game, in order to really control the changes, and not only undergo them. But, the question then arises as to how we can go about inducing the necessary changes in behavioural modes and socio-organizational structures ?

Technical change is a potential lever. Unfortunately, it transpires that the social changes necessary to get out of the crisis are hardly stimulated by technological change, as René EKSL and Gérard METAYER pointed out [o] as regards the case of information technologies, "the conclusions one may draw about current experiments in France are bewildering : there are no cases anywhere providing evidence of the slightest social or cultural change. The new techniques are moulded onto present structures and relationships, and in so doing one totally ignores questions of redistribution of power, new points of balance among economic and social groups. "Technological innovation solves nothing per se, and even if, from time to time, it usefully throws light on certain contradictions within our social structures, it also raises new problems of lifestyle, labour organization and social relationships.

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[o] In a paper entitled "Technical modernism and social conservatism" FUTURIBLES N° 65-1983.

CRISES ARE OPPORTUNITIES°

Under these conditions, we may wonder what we can do to tackle the forms of rigidity that have accumulated over thirty years (which, when we think about it, were maybe not so glorious as we thought) ? The political willpower to introduce change is not enough and one also needs a consensus, dictated by necessity. It is because certain crises can generate such states of necessity that they can be viewed as opportunities for social change. Thus, the crises are both the reflection of the inertial forces, and, at the same time, the main lever with wich one can overcome the same forces.

If we eliminate the possibility of a new deal by decree, then we must, perforce, expect that there will be still more crises before we begin to see the necessary transformations and adaptations taking place. It is our belief that the crises are only just beginning (in the Chinese language, the word "crisis" is composed of two ideograms, one of which means "danger" and the other "opportunity"). Certain crises are threats, but at the same time can be viewed as opportunities we must seize, and it is for this reason that while we appear pessimistic in the short run, we remain optimistic in the long run.

II - THE PRIMORDIAL CHANGES IN STRUCTURES AND BEHAVIOURS

It is not our purpose to deny the scope and scale of ongoing technological change, but we wish, nevertheless, to raise a few questions as to the conditions surrounding their development and as to the rate of introduction of these technologies.

We formulate a hypothesis that globally the introduction and propagation of new technologies (robotization, office automation) are, and will remain, much slower than forecast, because of the inertial forces inherent in production and associate social systems. We can witness, in this light, numerous forms of resistance to effective implementation of the new techniques, whether it be in the industrial, service or administration sectors.

Process control innovation (automation, robotization) will undoubtedly undergo rapid development throughout the industrial world, because of the contraints of competitivity in international markets. Inevitable : this trend requires us all the more to raise questions, in all branches of enterprise, as to the conditions of efficiency of investment outlays. In the automobile industry, for example, the discrepancy in productivity between European an Japanese manufacturers, and which remains substantial (a factor somewhere between 1 and 2) can essentially be explained by inefficiency of behavioural modes and organizational structures.

Flexibility apparently lies with technology and inflexibility with behaviours and structures. Numerous examples show that the investment in technology does not always bear fruit when it is not preceeded (or accompanied) by a far-reaching change in organization -- a necessary, yet, in many cases, inadequate, condition, in terms of improved competitivity, and independent of any further human investment undertaken. The obvious conclusion is that human investment must be viewed with a higher degree of priority than plant investment policies,

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° Cf. "Demain les crises : de la résignation à l'antifatalité" HACHETTE 1980 and "Crises are opportunities". GAMMA Press,1985.

insofar as it is the former that makes all the difference. To be honest with ourselves, the noteworthy performance figures issued by Japanese companies cannot be explained away by some privileged access to technologies, which, when considered in a world context are now commonplace (it's just a question of the price to be paid), but by working condition and behavioural characteristics that are directly related to the prevailing socio-cultural model. Not that we should aspire to imitating the model cited, but rather we should be seeking a lesson from the example : the keystone to adaptation and sucess lies in an intelligent utilization of our own socio-culture. Indeed, it is this socio-cultural dimension that other developed countries must now rehabilitate, in their quest for a new balance of power between work and culture.

The forms of resistance will no doubt be stronger in the tertiary sector, to the extent that, provisionally, the latter is not subject to the 'stings and arrow's of international competition. As the 70's drew to a close, it was purported that office automation would sweep through all service branches (bank's, insurance companies and government departments...). We must admit today that the all-out invasion did not take place. Many factors jointly explain the slowness of penetration. Firstly, there is a question of how time freed by the advent of new technologies (in production lines or in organization) will be used : what is the point of investing - with a view to obtaining productivity gains - if the outlay cannot be converted into expanded levels of production (saturated or low-growth markets) or by laying off of personnel ? Existing staff must be occupied and the working week can only be decreased gradually (in order to maintain equitable distribution among sectors).

Secondly, the general introduction of office automation tends to generate relative transparency in the working world, and this runs counter to established hierarchic prerogatives. Information technology is not neutral with respect to power structures. It is, therefore, not a surprise that certain actors within companies (often it's the executive levels) feel they are threatened, and offer resistance to innovative processes. Another example is forthcoming in administration, specifically in the educational system (schools, universities) where the same sort of phenomena occur as were noted in the production sector : the same degree of resistance to change, the same erroneous remedies. Far too often, the persons responsible seek material solutions (claims for more floor space, more posts, more computers...) to problems which are not at all of that nature.

The adaptation of the educational system to match ongoing changes will assuredly not take place by decree, and/or by installing millions of computers in the classroom (generally keeping up with the Jones, or better, overtaking them !). In essence, this is a typically political area of predilection, but there is a high risk that it will not produce any tangible results.

In order to adapt, we must make provision so that the structures and behaviours evolve, and the full intelligence of the persons involved at all levels of the educational system should be brought to bear, starting with the teachers and instructors.

It is widely recognized that technologocal change is going to require tremendous efforts devoted to training and professional continuing education ; however, one seldom hears anyone profer the opinion that these efforts may not pay off, and thus prove inefficient, if they are not preceded by a complete reappraisal of the educational system at large : teachers need training, and, in certain cases, retraining.

Naturally, such an evolutionary trend is all the less plausible in France, where the educational system is choked by hundreds of thousands of life-tenured staff, who are protected against change (and any obligation to change) by a cast-iorn status. The odds are that the crisis of educational systems, akin to that in production systems, will be proportionate to the scale of the rigidities to be overcome.

It is only because product innovations or service sector innovations very rarely correspond to real needs, or problems, that they never get beyond the sage of experimentation and field trials to develop into marketable entities. If some leading executives are tempted to suggest "that we create the need, farm out the product, and people will end up using it, and maybe even buy it," they should bear in mind that supply-side policies only last for a given duration, and that sooner or later are caught up by market forces, with a results that all that remains of the innovations in question is proof of financial squandering.

All that is technologically possible is not necessarily desirable, from a social point of view, nor necessarily viable economically. Let us exercise extreme caution, and not launch new telematic Concordes in the lean years (e.g., wired cities, videotex and other networks).

What is the point, for instance, of having technical support systems, such a videotex, if the appropriate contents are not forthcoming, or worse, devoid of value. Another indicator : the debate about remote work or home-based work. It is highly improbable that home work will develop to the point that office work, as such, will disappear. Several factors tend to reject this maximalizing hypothesis : one one hand, there is the present usually cramped, uncomfortable and in mediocre surroundings ; this in itself would make it very unlikely that such premises would remain occupied for days on end. On the other hand, it must be recognized that work has a socializing rôle, and corresponds to a communication need, which moreover, is being satisfied less and less outside work.

A single lesson may be draw from what precedes : we must stop veiling our faces with delusions, whether they be technological or not. The essential problems to be solved, including those raised by the development of information technologies are elsewhere : they lie in structural and behavioural inflexibility. If we do not set about tackling these problems, we run the risk of wasting our technological effort (inefficient investment) or of directing them in a direction which does not correspond to social aspirations, or to real economic constraints.

Yesterday we raised the gauntlet on nuclear power, today we are face with a telematic challenger. As far as the nuclear was concerned, all the plans were overblown, in every respect ; growth rates did not recover, energy consumption figures dropped (°) while petroleum products remained abundantly available. Can the semifailure of the nuclear challenge serve as a lesson for tomorrow's telematic challenge, and, who knows, other beyond ?

Will we finally decide to eradicate irreversibility and voluntarism, which prove as irresponsible as they are blind ? It is a prime necessity, because the uncertainty levels with respect to the future would rather dictate technological and social pluralism (one cannot put all one's eggs in the same basket), with flexible options : this is the very condition that underscores adaptability.

° The best experts expected a degree of elasticity in energy consumptic during the growth period, from 0.6 to 0.8 Between 1979 and 1982, it was minus 0.15 for EEC countriues, and minus 0.6 for France.