The Director of Central Intelligence
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National Intelligence Council

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MEMORANDUM FOR: Director of Central Intelligence
Deputy Director of Central Intelligence

FROM: David Y. McManis
National Intelligence Officer for Warning

SUBJECT: The Soviet Information Technology Dilemma

VC/NIC and I have discussed on numerous occasions the impact of the computer revolution on the Soviet Union, particularly the impact of the personal computer. The attached analysis from Computerworld is an excellent treatise and I commend it to your attention. In sum, it notes that the Soviet Union and indeed the Bloc, need computer technology to remain economically competitive, but at the same time full adoption of an information society is counter to Soviet-style Marxist-Leninism.

David Y. McManis

Attachment:
a/s

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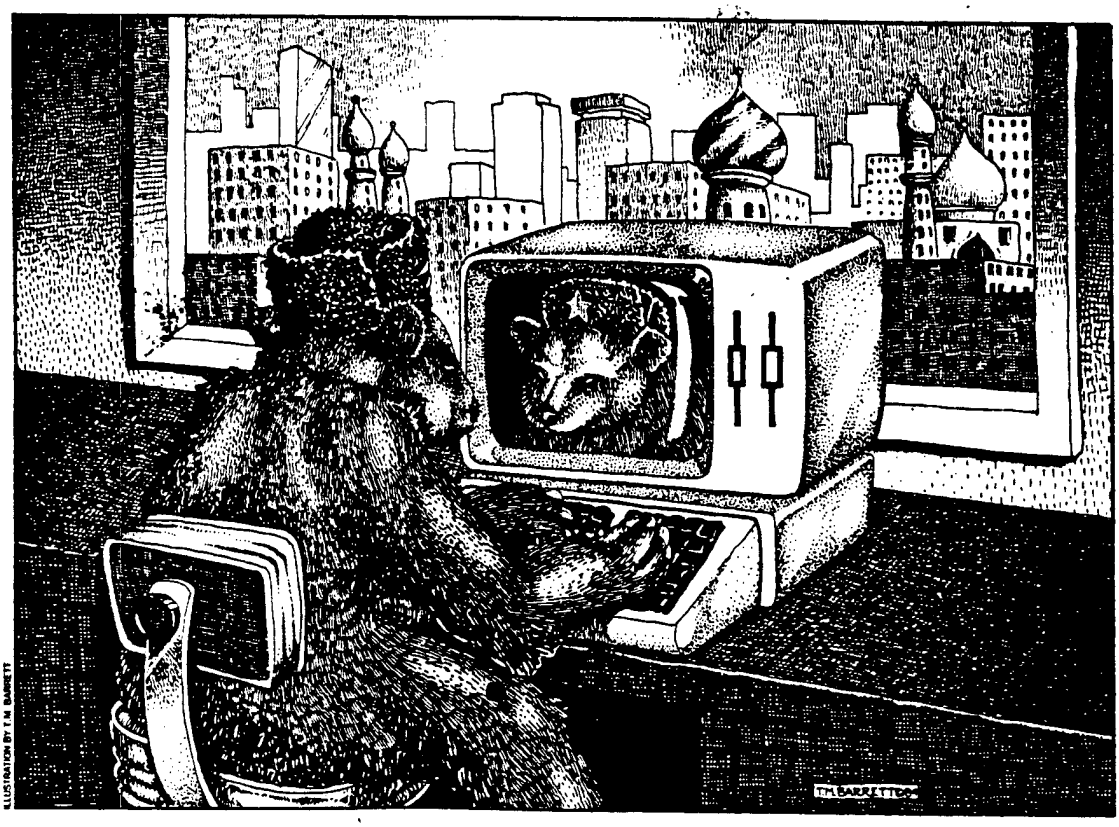

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# Communism vs. the computer

## *Can the USSR survive the information age?*

***The hardware and software gap between East and West is about 10 to 12 years — somewhat less in robotics, considerably more in office automation. The Soviet bloc follows, it does not lead; the reasons are ideological and structural.***

**By Rex Malik**

The arrival of inexpensive digital information technology poses a fundamental challenge to the survival of the Soviet system. The USSR and its associated countries cannot survive the large-scale introduction of information technology in any meaningful way and be recognizably the same system that has evolved, in the case of the USSR, over 70 years.

The main reason is this: The infrastructure necessary for the USSR to reap the benefits is absent and cannot be created without a massive administrative restructuring, which would be ideologically and politically more than difficult.

In a recent broadcast from Moscow, the Soviet commentator Boris Belitsky said that the "fifth-generation" computers the Soviet Union is setting out to create "embody the most valuable expertise built up by the computer industries of many countries, which *was carefully and critically reviewed by the computer designers of the socialist countries* [italics mine]." Once more, the Soviet Union is setting out to copy, to follow in a track set by others.

On March 29, the Soviets announced that a

*(This article was adapted from an essay in the May issue of* Intermedia, *the journal of London's International Institute of Communications.)*

"centralized system of automated access to foreign computer networks and data banks has gone into service in Moscow." Note the use of the word "centralized."

On Soviet television a week later, the chairman of the Siberian Department of the USSR Academy of Sciences criticized the incompatibility of two systems in different parts of the Soviet Union, both built at about the same time to do similar tasks. One would expect centralized planning to eliminate incompatibility.

Within the last year, senior party members and academicians have made unusual public statements reflecting their recognition that computing brings change:

- Electronics are changing the nature of labor.
- It is an urgent socioeconomic and important political task to introduce electronic equipment and microprocessors into the national economy.
- The use of computer technology could eventually release 50% of the productive work force and increase production by 2½ times.
- Most of the USSR's population should acquire skills in handling computer technology.

What is not at issue here is the eventual capability of the Soviet bloc to produce — if it so chooses — the right and appropriate technology, although its hardware and software are likely to remain at least a decade behind that offered by the West. The gap between East and West is about 10 to 12 years — somewhat less in robotics, considerably more in office automation.

The Soviet bloc follows, it does not lead, and the reasons for its lags are ideological and structural.

Why should the challenge take different forms in the Soviet bloc than elsewhere? What is inherent in the technology that poses a threat to the continuance of the Marxist ideological state system set up by Lenin and his inheritors?

Western European ascendancy was the product of two sets of forces, one of which gave rise to the other. The first was an attitude of mind, a product of the evolution of religion, philosophy, climate and language, which created a framework in which change became possible. The second was its product, the industrial revolution.

We are now witnessing the passing of that order in its second sense. It is the first set of qualities, however, that is likely to ensure that if anyone can pass through in relatively good order, it is the nations of Western Europe and their descendants and inheritors. For the cast of mind that Europe's long evolutionary chain produced is essentially adaptive. Even so, these are challenging times.

The Soviet bloc, as presently constituted, cannot manage this transition — at least, not peacefully. And if not peacefully? A repeat of the social convulsions of 1848 is still possible, but whereas Western Europe could survive that, the Soviet bloc probably could not. The challenge that faces the Soviet bloc is quite fundamental, and that challenge is caused by information technology, its requirements, its applications and what it sets in train. The growth of information technology is inimical to the continuation of the industrial society. That is the problem. And the Soviet system has the industrial society at its heart.

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We are talking here of Soviet-style communism. We are not referring to the USSR alone, but to the European bloc of the USSR, Bulgaria, Czechoslovakia, Hungary, Poland, Romania and East Germany. In many matters, these countries are best understood as one bloc; and that is especially true with the development of information technology. The linking structure is the Council for Mutual Economic Assistance, known as Comecon. Strict Soviet-style communism, as described here, centers on the USSR (notably Russia) and the satellite countries in Eastern Europe.

To say that the bloc must be looked at as a whole is not to imply that it is a monolith. To a degree, the different countries evince different attitudes and behavior to the West and to information technology. In relative terms, the USSR is taking a stricter, more orthodox line, whereas some of the satellites are being more adventurous and innovative. This is not happening with the encouragement of Moscow, only with its grudging acquiescence.

In Bulgaria and Hungary, especially, a new generation of management is taking risks with a series of economic reforms. In Hungary, planning is indicative, not prescriptive. Managers are increasingly accepting the opportunities for decentralization. Whereas in Hungary the managers tend to act independently, albeit with the tacit support of the party, in East Germany the management and party apparatchiks tend to favor collaboration. The result is progress, if somewhat slow. In contrast, the USSR moves hardly at all.

Before we go any further, let me make my obeisance to the year of George Orwell, 1984. It is appropriate that one does, for computerized information technology is seen by many in the West as an Orwellian technology. They stress the power that it can give its operators should they choose to apply it to the

purposes of social control — and the ability it can give the rulers to maintain surveillance of the ruled at a more detailed level than previously possible — and end by substituting "will" for "can."

It does not follow that repression and social control cannot work in mass societies without computer power. The USSR, among others, managed quite effectively in that department long before the first computer was brought into action. True, it was not always thorough and effective, but capriciousness can be just as effective an instrument of terror and work just as successfully if not as finely. And sometimes it can be cheaper. Computers have played little part in getting the reputed three million people into Soviet labor camps.

A scenario is possible in which computing in the Soviet bloc is used primarily as an instrument of control, in the sense of police control. But if this is all that it does, the system has essentially conceded the economic race. And this it cannot do. The bloc is a political entity whose ideological justification is economic, and competitively so. To give up the race would be unthinkable.

It is important to understand that the challenge now facing the Soviet bloc is not an immediately dramatic one; forget Hollywood and *High Noon*. The decline instead will be gradual; the processes by which it occurs are akin to erosion. And this in turn could lead to political steps that could have unfortunate consequences for the Soviet bloc and for ourselves. Given that we seem to be able to steer through the escalation of nuclear weapons and still remain at peace, one can see a situation arising in which the Soviet system is relegated to the second division of economic power, a supplier of raw materials and not much else. Whatever one may believe about the USSR, that is not a postulate that any of its people (let alone their leaders) would be willing to accept.

*We are on track for a highly dangerous situation. The way we have chosen to go presents the Soviet leviathan with some very stark choices which, however it wriggles, it will eventually have to make.*

Yet it remains clear that information technology will bite deepest and have its most profound effects in "free" societies, which have a tradition of a relatively unfettered freedom of inquiry, a freedom from direction as to where intellectual curiosity may take you and the individual freedom to acquire the skills that individuals themselves consider important. It will flourish best in societies in which, as John Milton put it more than three centuries ago, there is "an open market of ideas."

### Broad range

Information technology? That should be read as covering digital electronics and ranges from computing in all forms and applications to cable and satellite technology; from advances in I/O devices and procedures, which will make even cheaper electronics possible, to developments in high-speed, very large-scale integration. Also included: advances in software, development of abstract theories of mathematics to give ourselves a better grip on reality and research in practical applications of cognitive psychology and systems development. This last gives us the likelihood of a technology with a "human face," one that can be seriously applied to the care of the sick, the disturbed and the elderly, as well as giving powerful data tool combinations to expand the performance of the rest of us.

There may be, even in the Organisation for Economic Cooperation and Development (OECD), a mix of attitudes to the application of the technology. But we have enough experience (and evidence) of behavior, even in its sometimes still surprising primitive state, to have some indications of the main thrusts. They can be briefly summarized. Those people who have or can obtain access to the technology want it to do the hard, the dull, the boring, the routine work, while extending their own control and providing greater personal interest. Properly applied and used, it is an immense amplifier of human capability. The people — at whatever level — want this without any loss of status, income or career prospects.

The way information technology is now developing is inimical to the continuation of the structure of the Soviet bloc (and there is little possibility of turning back) because the technology is not neutral. The consequences may seem surprising. We are on track for a highly dangerous situation. The way we have chosen to go presents the Soviet leviathan with some very stark choices which, however it wriggles, it will eventually have to make.

In a market-based environment, where investment and other business decisions are made from the bottom up (in its broadest sense) and the "people" may not initiate but still have the power of rejection, one can say that, however imperfect the system, it has enough plasticity to reshape itself as change occurs. A key factor here is the extent to which the society generates new wealth and provides mechanisms to distribute it.

No such adaptation is possible in a top-down economy without the consent of those at the top. Now there are good reasons why this support will be difficult to obtain, why it would not be forthcoming, unless the Soviet bloc were to face the sort of convulsion experienced by China after the cultural revolution, the death of Mao Tse-tung and the rise of Deng Xiaoping. And even there, it should

be observed, change is slow and patchy.

**The choice is fundamental: Reject or adapt and cease to be Marxist-Leninist, Soviet-style. If the choice is the former, face the possible erosion of Comecon's economic position; though its resources will still continue to grow, they will not grow at a rate commensurate to that of the politically competitive industrialized societies. The effect of that, in turn, may well be to tip irrevocably the balance abroad against communism, Soviet-style, as a model for others to follow. It will be increasingly seen as an interesting experiment, if a costly one, but one that has failed: in the long scheme of things a very expensive and irrelevant sidetrack.**

The core notion at the heart of communism is that it will in the end provide a better life than that ultimately offered by other systems. This notion can still be held to, though the system has to find more excuses why it has not happened yet. But, increasingly, this tenet will be seen to be a delusion. And the Soviet people might well find out, which they have not as yet been officially and willingly allowed to, that their advances, where comparable to those made by others, have been bought at a much higher price than those others have had to pay. The best that will be able to be said for communism, Soviet-style, will be that it is of no more validity and importance than the idea that the application of almost any skill to the solution of a problem is better than no skill at all.

Ironically, the Soviet system's large-scale dependence upon technological advances in Europe, the U.S. and Japan means that there is a growing constituency that somehow or other has access to foreign material. Electronics engineers, software specialists, telecommunications professionals, process control engineers, chemists of almost all kinds — all must have access to this literature if they are to keep up (even if it has first to be translated, usually by official, centralized agencies).

Yet internal network and data base technology is still in its infancy. The routine inquiries made by academics and scientists in Europe and North America using packet-switched communications networks are not routine in the Soviet Union. Some networks do exist. The State Committee for Science and Technology operates Viniti for general technical data and Patent for patents. These systems seem to work moderately well, if in a passive mode, and with understandably strict conditions of access (easy to arrange if you restrict the number of terminals). Another network, called Academnet, is scheduled to become operational within the next year or so. But experience teaches us that the process of interconnecting research institutions and penetrating the research community is surprisingly difficult and has a long learning curve.

Within information technology, the digital computer lies at the core of the challenge. To consider what one can perhaps call, in a shorthand phrase, the case of "communism vs. the computer," we must briefly consider some crucial aspects of the societies being developed in the OECD countries in which computing is endemic and intrinsic, for they could no longer run without it.

There is no agreement in any detail about the changes that information technology is likely to bring about or make possible in society. For there are a number of schools of thought, and much of the writing is overlaid with special pleading not just about what might be or could be, but about what ought to be. Politics, philosophy and national viewpoints intrude (why should one expect anything different?). All that there is general agreement on is that information and its electronic handling are central to the structures and processes of the evolving societies in the West. And only those societies are in a position to pose the question: How do we get out of here?

The key words are information and electronic handling, and we need to disentangle them as much as possible. Let us now take our first push at considering information. I am not putting forward the proposition that information displaces the uses of energy and other machines, rather that it takes its place within the basic equation about what is required to make a modern society run. This can mean a major readjustment about the way one thinks about the economy at its most basic structural level.

It means not simply a major readjustment in the way we think, but also in the way we act. The evolution of work in the 20th century has been toward less and less human muscle power and more and more knowledge. That knowledge is based on transmittable information which, in turn, is based on data (which will have the same meaning and value to a task, irrespective of who is doing it, which is another principle of great power).

**Where does the Soviet bloc stand on these trends? It is not surprising — it is part of my thesis — that no meaningful figures are accessible. However, we can make intelligent guesses, especially about the USSR. At the start of the 1980s, the USSR had a population about 20% larger than that of the U.S. and a gross national product less than half the size. Yet:**

- **The USSR employs roughly twice as many people as the U.S. in the manufacturing industry.**
- **In industrial manufacturing, more than half its employed labor force is engaged in unskilled or semi-skilled physical labor, as opposed to 10% to 20% (a figure that is steadily falling) in OECD countries.**
- **There were probably 15 times as many information workers providing financial, insurance and**

business services in the U.S. as in the Soviet Union.

■ When we look at the numbers of computers installed, the ratio of mainframe installations is probably on the order of between 15 and 20 to one in favor of the U.S. But this figure does not tell the whole story. The U.S. systems (and the same applies to other OECD countries), in terms of hardware power, are much, much larger and are usually applied differently. And, of course, because of developments in software and telecommunications, they are now different in kind.

■ When you come to minicomputers, the differences between OECD countries and the Soviet Union widen. They widen even more when you come to terminals; they are immense in word processors; and with microcomputers the differences are astronomic. We are looking currently at an installed base of 15 million to 20 million in OECD countries (and an annual growth rate of 30% a year) and not even 150,000 to 200,000 in the Soviet Union.

As a generality, we are looking at an operational technology difference between East and West of probably one order of magnitude.

If one accepts that there is a correlation between meaningful information meaningfully applied and the rate of growth and the rate of change (which, put this way, is a statement of the obvious), one can think of this as the critical indicator of the process that turns a society from an industrial society into an information society.

The problem that faces the Soviet bloc in trying to make this transition from an industrial society to an information society is that it faces an evolving structure of economic society essentially foreign to it. Central to the differences is the issue of information. Its existence, its validity, its objective measurement, who has access to it and how it is used all have a critical role to play in the development and transition process.

There is in the West an open marketplace of ideas, an ever-growing accretion of information, which ensures that each year there is substantially more data to be handled, more complexity to be unraveled and ever-increasing information entropy. Change, progress, whatever you care to call it, requires that this entropy be reduced. And digital information technology is our basic means of doing so, if not our only means. The computer relates to data as effective government relates to the reduction of social entropy. It is this that the people of the OECD countries have sensed lies within information technology, which does not, of course, mean that they always like the results.

Fortunately, there is seldom widespread objection to the manipulation of data and the creation of information and knowledge. This work is helped by the fact that almost all real data arises at the individual and enterprise level independently of government. As a result, the measurement of real performance is a routine activity conducted at many levels across society. This is not routine in the Soviet bloc.

One can construct a scale with two components. One would be the penetration of computing into administrative processes, both government and industry; the other would be the degree to which data and information are shared across society. Nowhere, of course, is it enough. However, the scale would demonstrate that the more the penetration of computing and the more the information is shared across society, the greater the level of growth and prosperity; the less, the worse.

*The Japanese consensus system, which keeps everyone who needs to know informed and seeks what one could call a democratic agreement about how to proceed, can put a high initial cost on the "information overhead." But it pays off.*

It is no accident that were one to plot these two factors against stages of industrial development and the growth rate of competitive industries, the more the correlation would be shown to exist. The USSR (where computer penetration at the level of operational enterprises is probably at its lowest of all major industrialized countries and information sharing is minimal) lies at one end of the scale. Japan, where the situation is the reverse, lies at the other.

The case of Japan is particularly interesting. It illustrates the additional power conferred by open access to information and appropriate social habit. The Japanese consensus system, which keeps everyone who needs to know informed and seeks what one could call a democratic agreement about how to proceed, can put a high initial cost on the "information overhead." But it pays off.

It is worth reminding ourselves of the key differences between the two approaches. The Soviet bloc is founded on a fallacy. That fallacy is not necessarily the one that people in the West normally think it is: that the Soviet bloc tries to control the economy and that an economy cannot be controlled to the level that the Soviet bloc requires if it is also to grow and develop. Though no one has so far demonstrated a successful and rapidly growing controlled economy, one cannot rule it out. It may well be that in the long term, the digital principle makes it possible, though I suspect it does so only if economic affairs have

been radically reduced in importance in the lives of the people.

No, the fallacy is not a matter of more planning. It is much deeper. It is the fact that planning is tied to a specific ideology. And more. Everything is linked to ideology, and the ideology is hostile to change. It proclaims the ultimate revolution while debarring and preventing the next day's evolution. It embraces grand gestures and is impatient with the small steps, the fuzzy groupings, that surround innovation.

The fallacy is this: The state is ideology written administratively, and one cannot officially change the administration without changing the ideology. The result is statism, ossification and an inability to respond at the pace that change would otherwise make necessary.

Three major strands in the Soviet system conspire to make the transition to an information-based society a problem of horrendous complexity and magnitude:

1. The links between ideology and the administrative machinery. This strand is the most obvious of the three.

2. The links between ideology and people. Soviet careers depend largely on membership in the party and achievement within it, rather than on functional abilities (there are similarities with the conflict between "reds" and "experts" in China).

3. The linkage between ideology and data. The availability of information and communication flows are not sufficient to enable a 20th century industrial economy to be run effectively if the judgment of effectiveness is to be comparative performance with the rest of the industrialized world. Each step the Soviet bloc takes is seemingly bought at a higher price than that paid by its competitors. The right information is seldom easily available. Yet effective and rapidly increasing information flows are a precondition for a transition to an information economy.

It is these three conditions which have made it more than difficult for the Soviet bloc to create an electronics industry that could compete effectively with those of the OECD countries; yet the creation of such an industry is a necessity if any transition is to be made.

The notion that a new, innovative company could appear almost out of nowhere and grow rapidly is not one found within the Soviet system. It is opposed not only by the administrative machinery, but also by the ideology that sustains it.

Consider the case of the kind of small entrepreneurial company that has been so crucial to the development of microelectronics. Sinclair Research Ltd. is a good example. It could not have been predicted, let alone planned, that as a result of changes in technology, marketing, the public response to product and its own initiative, Sinclair would make four major model changes within four years and end up producing a system at four times the price, but with a 32-fold increase in raw power. That system also came with throw-in software which could not have been run on the first system; even if it could, it would have cost somewhere between 10 and 20 times the price of the initial raw system. We are talking of a price/performance improvement of something well above 1,000%. This dynamic expansion is totally outside the Soviet planners' experience and intellectual framework.

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In the real world of changing technology and changing product, the Soviet bloc's structural arrangements are such that they could be guaranteed to cause the maximum amount of delay, both bureaucratic and administrative. One of the Soviet bloc's most severe practical problems is how to subsume newish or evolving technologies within particular and specific structures of ministerial responsibility. The technology not only adds to power, it can also redistribute it; and thus, for some, diminish it. And the further up the ladder, the more difficult the technology becomes to introduce.

The problem with the Soviet bloc's information flows is quite simple. The system uses for its version of reality only those flows it claims exist, and these are built into the structure. Broadly speaking, what passes for information resources is the data that enterprises create as a result of their activities. This data may or may not be real in that it represents what the system wants and needs to know rather than representing behavior. It is then filtered and massaged by the party, mostly centrally, which puts its own glosses on the result and then makes it public — or not.

Much of the information the Soviet bloc creates is not public or widely accessible. In terms of a higher end, information is only publicized if it will help to shape society or mold it. A common pool accessible to all does not exist in any serious form except where it is operationally unimportant. The independent collection and analysis of data do occur, but in a restricted form with more often than not an even more restricted

circulation. An information marketplace, a routine widespread exchange, whatever you may care to call it, does not officially exist in the sense that ideas and data are allowed to find their own level. They are not. There is prior censorship of almost everything generated through official channels.

The subordination of the people to the collective will, whether expressed on their behalf by one person or by many, has a long Soviet existence and an even longer Russian one. As a result, the people of the Soviet Union or most of the bloc have not been allowed individual access to information or the tools with which to handle it outside collective or monitored circumstances. The list of what the Soviet Union does not have or does not allow is long and extensive.

Street maps and other maps of meaningful scale covering the country, except for a few carefully chosen sites, are not available. Telephone directories are not routinely available, except in areas not accessible to foreigners. It was announced in 1983 that the city of Tbilisi has a computerized telephone directory with data on more than 140,000 subscribers and on more than 90,000 telephones in apartments. This system is an interesting route to follow, for it makes it easier to make a subscriber a nonsubscriber.

Telephones are not routinely available. The party has more than 18 million members, and at the end of 1982 there were little more than 26 million telephones. During that year, 1,250,000 had been added. We are talking of one telephone for every 10 or so people, which is a low penetration rate in comparison with the OECD countries, where penetration rates ranged from 60% to more than 90%.

The difference is critical. It is a common observation among commentators on telecommunications that there is a critical mass in telephone installations, thought to be around one phone to every three people. It is hard to be precise because it has much to do with the urban and agricultural mix both of people and phone installations. Once that critical mass has been passed, the government has immense difficulty in imposing its will, should enough of the population decide otherwise.

That will can be imposed by closing down interurban telecommunications while the system tries to restore what it considers to be order. But even then, unless it can seriously interrupt automatic dialing across the totality of the telecommunications system (as the Soviet Union was forced to do in 1983 with direct international dialing), its control is seriously impeded. It should be remembered that the interruption of internal automatic dialing has already happened in one country, by intent, not accident, during a time of crisis. The country was Poland, which has not yet gotten enough phones installed to have reached a critical mass. Viewed in this sense, the telephone is an instrument of democratic freedom.

### More problems ahead

The Soviet people could hardly imagine a situation in which almost all books would be available for purchase or loan, as well as most records and films. This pluralism, of course, breeds knowledge and skills, which in turn breed change, and that would never do. The notion that a society could have more than 100 competing computer publications available to all, most of which are independently produced, would terrify Soviet planners, yet that many publications are available in the UK market.

The Soviet Union is now faced with the personal computer and will have even more problems. The current five-year plan talks of a computer in every school by 1990. By contrast, the UK, for practical purposes, already had at least one computer in every secondary school by the end of 1983 and should have one in every school by the end of this year.

The system cries out for information technology; indeed, it could almost be said to be tailor-made for the benefits of information technology — given, of course, that the models can be created and the algorithms written, that the necessary information flows take place and that the processing power is installed and running and deals with reality.

These assumptions might be upheld in OECD countries and, one might think, would be equally realistic in the Soviet bloc. There is, after all, a long tradition of control theory and mathematical model-building in the USSR. Russia, particularly, has a solid core of theoretical mathematicians of great skill and competence. If anyone should be able to arrive at answers, the Russians should.

Wrong. The Soviet skills, which are undeniable, may be more of a problem than a solution. Ideology permeates data, too.

To sort out what to do, one has to have agreements about the approaches to be followed — and agreement right across the system. And then one has to have a period of stability in which to build whatever it may be and get it operational and embedded across the system. The Soviet bloc has not had that stability since computing began. It has been bedeviled for a quarter of a century by argument, much of it theoretical and covering almost the entire field, from almost pure mathematical theory to arguments about organizations of systems and hardware.

I am not arguing that information does not flow — far from it. Data does flow, lots of it. It is data aimed at the production of statistics. If statistics move you, then the Soviet bloc is a delight. But it is also a graveyard of data, a nightmare in which tables constantly pass before you, yet little data is available on what went

wrong in a time scale for you to be able to affect it. Most of the time the data does not tell you what you actually wish to know and eschews comparisons across the board in any sort of time frame that would allow comparative progress to be measured. But the major characteristic of the data is that it is long dead. It is usually a record of the past, for the public, so carefully selected as to exclude what is not favorable.

### Mixed blessing

Over the years, the Soviets' talent in control theory has had impact both there and elsewhere, particularly on approaches to solutions in associated fields. One thinks of Ivan Pavlov and his work on the conditioned reflex and Wassily Leontief's work on input-output tables (which came to fruition in the U.S.).

This emphasis on mathematics is a mixed blessing. It is undeniably strong. The Russian word for software is "mathematical means." The Soviets want mathematical algorithms, rather than the efficient handling of data. Incentives (salaries, promotion, power) are not geared to practical results, like higher sales or more productivity, but to the design of more and better models and theorems. Software — mathematical means — is often not a means to an end, but an end in itself. It echoes the Soviet problem that, for instance, there is often a shortage of spare parts because the factories are geared to total output, not customer satisfaction.

The Communists understood quite early that the system they were creating after 1917 demanded that statistics be collected on a national basis and that this required machine power. They were among the first large-scale users of that predecessor of the commercial computer, the tabulator. By 1929, the USSR was reported to be the third largest user of IBM machines after the U.S. and West Germany.

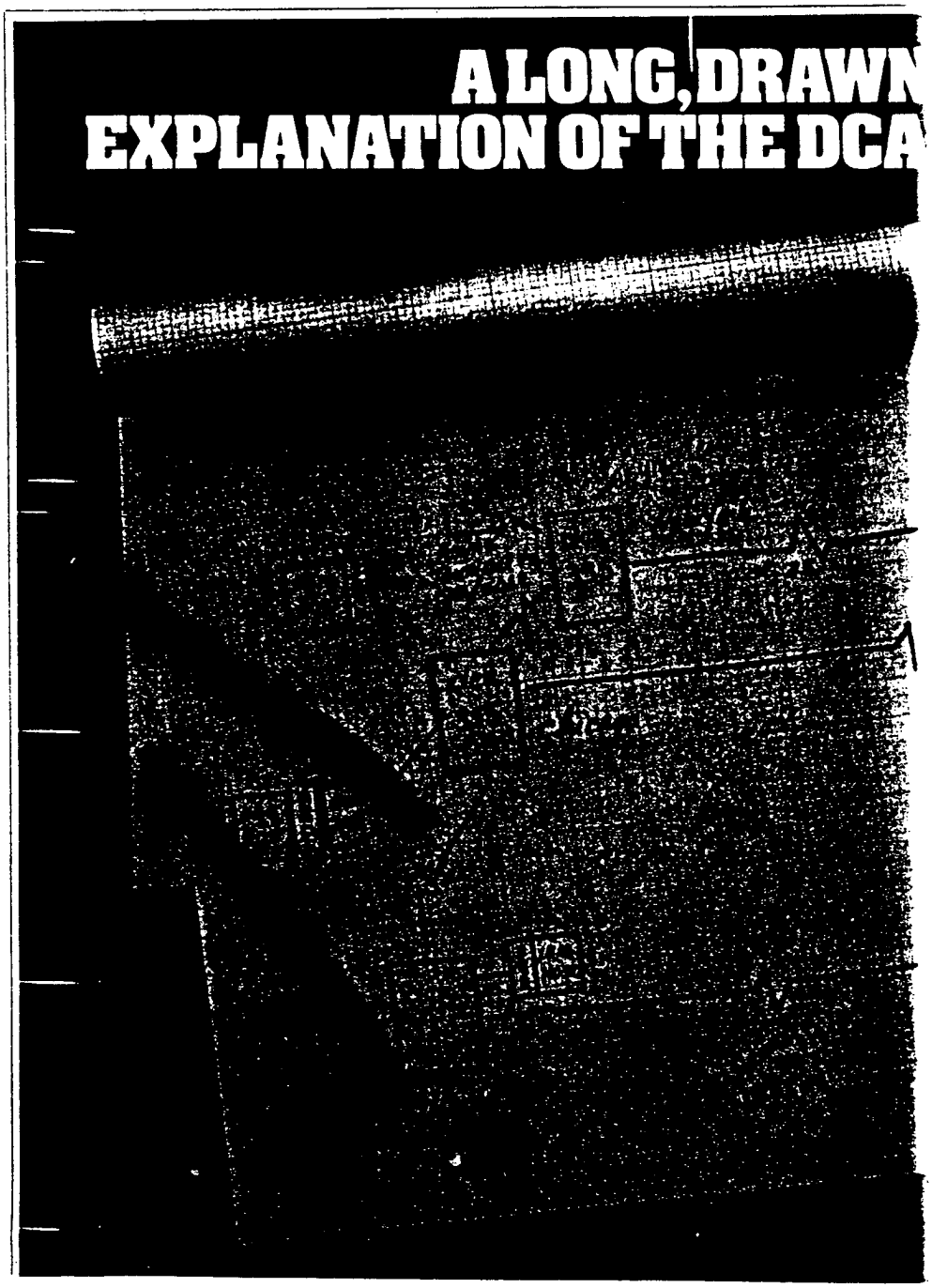
Now if you are to apply control sciences in the modern sense, then you must have the tools to do so, which means computers. The Soviet bloc had begun acquiring computing skills some time before; however, by the mid-1950s it was woefully behind. The performance differences between Soviet and Western systems were on the order of one to 100 or more.

The Soviets attempted to do something about this gap. They copied. The first real product of this policy appeared in the late 1960s. It was the Minsk series, a set of general-purpose computers for civil use which was copied from the NCR Corp. Elliot 803 which had been initially designed by Iann Barron, now strategy director of Inmos, the British semiconductor manufacturer.

Today, 20 years later, the Soviet bloc is still largely dependent on foreign technology, the USSR especially so; most Comecon hardware is built in East Germany and Hungary. The most common mainframe series throughout the bloc is the Ryad, which is largely built in East Germany (the Germans understand quality control). Its design — if one can call it that — began in the late 1960s, and it is an attempt to build look-alikes based on the IBM 360 series software architecture and instruction set, aiming for compatibility. It is copying without benefit of license payment or royalties. In the 1970s, the series was quietly upgraded to an IBM 370 look-alike, and no doubt copies of the 30 series and 4300 series will follow.

The system is still probably eight to 10 years behind IBM. And IBM is not usually the world's leader of computing technology in practice. In the past and, I believe, still today, IBM has taken the view that it pays to be second — that a reliable, known and maintainable technology is preferable to a very advanced one. It is an acceptable view of the marketplace; after all, IBM has had well over 50% of the Western world's commercial mainframe market for a quarter of a century or more. IBM technology often arrives on the marketplace three to five years behind its advanced competitors.

The agreement of any observers one talks to is that we are looking at systems, software, peripherals and applications which, even where comparable, are probably still 10 years behind the general level in the West. Much of the applications loads are still in the batch area (after-the-event administration). Communications-



oriented systems are still a rarity.

There is another peril implicit in this approach. Planning processes of the kind practiced, and the dependence on comparable architectures and hence comparable technology to make those architectures work, means that the system is locked into a track that stays behind.

Computing breeds local autonomy in operational matters; such is the history of its application in the West. The Soviet bloc's reluctance to grant such autonomy at local and regional enterprise levels has meant that the technology cannot be as meaningfully used.

The Soviet manager's problem is his inability to respond outside the confines of the planning mechanisms. He cannot react to technology change in any broad dimension. He must wait for approval, and that approval will come within the plan's normal time frames. Yet although the managerial scope to create lateral links and respond to events is limited in theory, those links do exist in practice (how else would the system work?). All this breeds serious and practical problems for the political system.

### Dilemma for Soviet elite

The Academy of Sciences of the USSR recently established a Department of Information Science, Computer Technology and Automation. A vice-president of that academy, Academician Velikhov, could be heard on Moscow Radio in the summer of 1983 discussing the growth of the computing side of information technology and public access. What he had to say shows very clearly the dilemma that faces the Soviet elite. The excerpts that follow are taken from a transcription and translation made for the British Broadcasting Corp. World Reporter Service. The interpolations in brackets are mine.

"Today," said Velikhov, "there are practically no reasons why every inhabitant of the Soviet Union should not have his own computer, one with a good memory and on which one can plan and calculate." [There is no mention of word processing, naturally, which would, I suspect, be covered by the same controls as exist with typewriters.]

*Computing breeds local autonomy in operational matters; such is the history of its application in the West. The Soviets' reluctance to grant such autonomy at local and regional enterprise levels has meant that the technology can't be used as meaningfully.*

"I do not think that today it is a matter of being able to go into a shop and buy one — it would be a bit expensive, after all." [During last year's price discounting, which is still not over, the cheapest and smallest of the Sinclair machines was selling in the U.S. for less than £25.]

"Forecasts indicate that by the 1990s, computers will be just as common as a television or a car." [Which are not common at all. The Soviet Union has one television set to every three people and claims to have one car (private) to every 27 people. By comparison, both the UK and the U.S. have one TV set to every two people and considerably higher car ratios.]

"It is another question whether they will be in personal use, for on the whole, different countries go different ways. France, for instance, is basically taking the path of public use." [This claim is not just disingenuous, but carries misrepresentation to extreme limits. What the French are doing is making public data bases (notably the telephone directory) accessible over videotex systems. They are also consciously, clearly and actively encouraging the development of home computers for private use.]

"I think that we are to a considerable degree taking the path of the public use of these computers. They will, however, be at the disposal of all. . . . There will be computers in shops, collective farms, factories, in the transport system and at the disposal of economists." [Privacy is not encouraged.]

"As to going into every flat, this must be given some thought. After all, it is very important that there should be a need for one in every

flat." [Nowhere in the broadcast is the top-down nature of the social system better caught.]

"In a flat, I think it should be something on the lines of a telephone, and it basically should be a system through which one can get information, information you need like booking tickets, weather forecasts, inquiries and so forth." [The questioner may not have realized it, but Velikhov has changed the nature of his response; he has caught up with videotex as it was first envisaged in the late 1960s, a system in which what already existed on paper was merely transferred to electronics.]

"Data from libraries and inquiry centers is a very important aspect. Such a system should be set up. [As to whether] it will be needed in every home, well, it must be understood that not many people work at home, but of course such a system will be needed for those who do work at home. . . . One could say also that the situation in our country with regard to information is by no means as good as it might seem." [He is right. He could be referring to the control of access to information, where it can be an offense to access and take away information in some libraries, though the information itself is based on translations of works publicly available in the West.]

"And now a revolution, the transition to mass service, is taking place in it, to mass introduction. Technology makes it possible to do it. We have on the one hand to prepare society, to understand its needs and to forecast them somehow, and on the other hand, we have a different situation. It is not the market that is in control; we have planned control."

*A society that copies cannot have control. The main Soviet microprocessor chips are based on the standard Intel and Motorola designs. The pace of technological change is not under Soviet control, even though the pace of its introduction may temporarily be.*

[Velikhov either deludes himself or is trying to delude his listeners. The Soviet Union does not have control. A society that copies cannot have control. The main Soviet microprocessor chips are based on the standard Intel and Motorola designs, and they are what will fuel any revolution that might occur in the Soviet Union. So even at this level, the pace of technological change is not under Soviet control even though, of course, the pace of its introduction may temporarily be.]

It is obvious that people cannot run an information-based economy unless they live in an information-rich environment in which the data that exists and the information into which it is turned can be objectively tested against reality. There has to be systemwide interaction. Currently, that interaction takes place only between managers up and down the line and the plan and planners, with management under pressure to reach output goals. If getting big and becoming bigger is the test by which performance is centrally measured (and, as a generality, this is the norm), then that is how managements will behave irrespective of the costs involved.

The consequences over time are dire in an economy with substantial shortages and deficiencies arising from flawed structures. The unofficial networks cannot make up this lost ground. Many in the West bemoan a tendency (most noticeable in corporate America) to be guided by the quarterly bottom line, and accusations are often bandied about that much U.S. management is selling short the national future. But the U.S. problems in this area are minimal in comparison with the ones in the Soviet bloc. There, the same tendencies are complemented by another: that of Soviet managers and administrators to hoard whatever is available and to cut back on forward investment to meet current output targets. All these inflexibilities mean that though the productivity of the Soviet bloc improves, it does so very slowly. A high price is being paid.

The problem can be put this way. Not all Soviet information is equal, capable of being tested by some sort of objective and neutral standard. This principle goes much further than the tendency of governments to hide what information they can, or at least try to, when they consider it embarrassing or sensitive.

The Soviet problem is a different one. It is that, to paraphrase George Orwell in *Animal Farm*, all data is equal, but some pieces of data are more equal than others. There are two primary causes.

Much economic data is highly suspect. It is based on reports by those down the chain to those higher up that they have accomplished their tasks; and whether they have or not cannot be routinely, objectively tested. The system is not set up to make that possible. A fact is not necessarily a fact in the Soviet bloc. Its truth is dependent upon who issues it and for what purpose.

But this is not the only problem. As Milovan Djilas observed years ago, the Soviet Union and the other Comecon countries are run by a ruling class. It is a large group, which perpetuates itself, although Soviet orthodoxy would deny its existence, and as the system is not flexible enough to have a plurality of routes to the top (ideology alone would in any case deny the possibility), then

reality intervenes.

The reality of life in the Soviet bloc is that access to the goods in short supply depends not on something that can be objectively measured, but on privilege. Now privilege is a slippery quantity, with data which varies unpredictably in value over time. And as privilege cannot be openly acknowledged, the Soviet Union is faced with an information structure more than difficult for computer systems to handle. There is little doubt that such systems could be set up, but the political costs would be too high.

Computerized reservation and sales systems, for example, are part of the infrastructure of the information society we have been evolving for more than a quarter of a century, and without them some service industries could not run. They hardly exist within the Soviet bloc.

Reservation systems also give an indication of market demand. The Soviet leaders know quite well that the demand would be there for almost anything. They have no wish to be reminded of the system's shortcomings. And, in any case, if such systems were set up giving access to all, other privileges would have to be found to keep the currently privileged in line. The Soviet bloc, it can be said, makes creative use of shortages (as do all systems where they can); it has just taken the principle further than most.

But what of the future, the next generation? The outlook for the Soviet bloc is bleak indeed. The evidence in the West shows that the impact of information technology upon a country's elites is both centripetal and centrifugal. Initially, it strengthens the grip of the specialists over their specialty. It makes for greater mastery among those so inclined, and the knowledgeable can become even more so. The technology resources give them an enhanced ability to defend their interests across society and to seek to influence it by stressing the importance of whatever it is that they do to the total outcome of society.

Later, however, it is hard to lock these resources up and keep them the preserve of the professional elites. To computerize data means to order it and to strip it of ambiguity or to make the ambiguity explicit; so access can become widespread and undermine the power of the traditional special interest groups. The resolution of the conflicts in interest is not easy, which means that it can begin to take up more and more of the time and energy of the political elite.

For a society to evolve in the direction of becoming an information society, it is necessary that both tendencies be present. Indeed, the second cannot be undergone unless the first has or is being gone through. So, if it is to compete seriously, the Soviet bloc has to find mechanisms to obtain the appropriate technology, either by its own endeavors or based on others', and then let that technology permeate its society.

And this is where even more problems lie. Cheap electronics (and the appropriate social structure) breed

organized data and software to make use of that electronics. Were the Soviet bloc to acquire the first, it must allow for the development of the second and third. But the software and data that can be centrally planned, originated, approved and organized are a very small part of the amount required and are mainly concerned with basic and routine processes. The truth is that the nearer one gets to operations, the closer the requirement for user involvement becomes — and not just in use, but in creation. And that, as experience shows, breeds independence.

Another problem that faces the Soviet bloc is the direction in which the broad technology of computing and information technology is evolving. Let us be pessimistic and say that the fifth-generation computer to which Japan is committed (and, therefore, for competitive reasons, all OECD countries) is 15 years in the future. The fifth generation is in part a generation of "intelligent" machines, information-handling engines, based on general principles. Analogously, the engines can be driven through information as one can drive a car across a physical landscape

The fifth generation is an information-handling tool of a power at least two or three orders of magnitude greater than anything available today. Such power obviously extends the range of our information-handling activities. But the fifth generation will not be a sudden jump. It is a general target that will be approached in steps, and we can expect that each step, having an advantage over

the then current equipment, will be marketed and used.

By the time the fifth generation arrives, we can expect that many Western societies will have had serious exposure to advanced information technology. Both elites and workers will be linked to information resources, for subjecting those resources to analysis and judgment and for communications among themselves.

The quality of ease of use will have been transformed, as will the images that can be created and handled, whether arising from graphics or from text.

These societies will not only be prepared to use information technology but encouraged to do so. Economics makes that necessary, for the heavy costs are up front in the design, creation and manufacture of the systems, whatever they may be. The costs of production for market after the initial semiconductor-based devices have been made and tested are relatively trivial.

Also coming up are more conventional computer systems of very great power indeed, two to three orders of magnitude over the most powerful systems in use today. We are within reach of systems that might enable the Soviet bloc to do effective central planning — planning, after all, can be by consent — if it had the necessary information-handling habits.

In OECD countries, where these are the norm, we are going to find ourselves with tools to test hypotheses and plans at quite low levels of organization. There will be little fear at the top of the use to which those resources might be put.

At mundane levels, they will enable us to do serious and detailed analysis and forecasting over longer time scales, to test the stress and strain of complex mechanical assemblies, to design even more complex electronics and to discover, analyze and test new biological and chemical-based substances and products. These are all obvious uses.

We are also creating a wide variety of telecommunications facilities that are now rapidly cross-connecting the industrialized part of the globe. From these interconnections the Soviet bloc is, for real day-to-day operations, almost totally absent. It is absent by choice. Its direct telecommunications links to other countries are few.

Strangely, the bloc's telecommunications connections between its allies do not seem to be very great. There is much talk of plans, both internally and externally, but surprisingly little movement. Since the mid-1970s, the International Institute for Applied Systems Analysis (IIASA) near Vienna has been creating a packet-switched network to allow interworking among its geographically contiguous neighbors and access to data bases held remotely. The network includes Austria, Czechoslovakia, Hungary and the Soviet Union. Traffic between the first three is heavy, but with the last is said to be minimal. What traffic there is originates in the Soviet Union and seeks data held elsewhere; reputedly, the imbalance is substantial.

The Soviet Union is quite happy to look out. It does not, it seems, like others peering in.

The West is rapidly putting up data bases containing much of the world's professional data, as well as bibliographic data, and developing the tools with which to search it interactively and in new ways. From this research, the Soviet bloc is noticeably absent. Specialists say that the papers in the field that originate in the Soviet bloc indicate the Soviets are relying largely on languages and approaches similar to those we pursued 10 to 15 years ago. We have rejected these languages because they are unsatisfactory.

There is a Soviet user community, but much of the time it works on foreign equipment and searches data bases resident abroad. As a generality, however, neither the foreign equipment nor the access to those foreign data bases is available to the bulk of the community that might wish to access it.

In the West, the ongoing transformation of industries is likely to speed up, and the capabilities of existing industries heavily dependent on the use of information will be much magnified. This development will continue to extend the role, scope and dependency of the economy on data, information and knowledge handled via electronics.

### Break with past, present

The problem that faces the Soviet bloc is that to breed a competitive society, for the triumph of communism to happen, it must breed not just an educated society; it must breed an informed society. Concentration on ideology, as in the Andropov-inspired directives, may be necessary if the faith is to survive, but that is not enough. Indeed, it could be argued that this is the wrong way to look. To compete requires the development and rapid expansion of electronics industries. To move in these directions, the bloc must break not only with the past but with the present.

Far from the Soviet bloc catching up, the consensus seems to be that it is falling even further behind. The snag with a philosophy of copying our successes is that by the time they have been copied, we have already moved on. Installation volumes in the West are now sufficiently large for synergistic effects to be felt; in other words, changes may accelerate.

The Soviet bloc is caught in a trap. And it is a trap of its own making, not ours — at least not by design.

### About the author

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