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East Europe Report

SCIENTIFIC AFFAIRS

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BRIEFS

FERTILITY STIMULATORS--The stimulating effect of gibberellin on the growth of plants is well-known. Plants treated with gibberellin preparations accelerate their development and produce larger size fruit. The gibberellic acid, which has been imported into Bulgaria up to now, has been successfully used only on some fruit trees. The high price in convertible currency is a serious obstacle to the large-scale use of this kind of stimulators. That is why for several years now the microbial preparation works in the Peshtera has been developing a technology for their production and specialists in the METODI POPOV Plant Physiology Institute have been carrying out practical tests. A gibberellin preparation has now been created. The works in Peshtera can fulfil all the orders they receive for it. The first results of the tests are already available. The vineyards of BOLGAR table grapes, when treated with it, increased their yields on an average by 13 percent and sugar content of the grapes was by 1.2 times higher. The yields of hot house tomatoes rose by 21 percent, while the yields of rare ripe tomatoes (which are sold at higher prices) amounted to 42 percent of the increase. The average increase in yields obtained from field tomatoes was 26 percent. Specialists have estimated that when properly used, the preparation will bring an extra profit of 20 000 leva per hectare in the cultivation of tomatoes. (BTA) [Text] [Sofia SOFIA NEWS in English 21 Dec 83 p 4]

PROGRAMA-700--The programmable microprocessing Programa-700 device is just as it is in industry. It has been designed at the Sofia Institute of Instrument-making. No special training is necessary to operate Programa-700. It is used to control discreet processes. Regardless of the fact that it has been designed on the basis of a computer, the control device requires no special knowledge of computing equipment, neither does it require any special "language" for programming. The microprocessor system is made up of several modules. Thanks to its well-developed editing functions, the module-programmer makes the rapid feeding, checking and adjusting of the customer's programme possible. Programa-700 controls conveyor lines for the cutting of timber for the furniture industry and runs the transport operations in the manufacture of automobile tyres. It is used also for laying on galvanic coatings, for greenhouse cultivation of vegetables and for baking and stacking bricks. The machine has been prepared for introduction into chemistry, mechanical engineering, metallurgy, power generation and for use, with the precision typical of it, in the control of purification stations attached to thermo-electric plants. (BTA) [Text] [Sofia SOFIA NEWS in English 21 Dec 83 p 4]

SUPER-SENSOR OF MAGNETISM--A new silicon magnet transistor has been designed at the Solid-state Physics Institute with the Bulgarian Academy of Sciences. It incorporates two basic requirements for these elements--high sensitivity, more than a hundred times greater than standard, and high technology. The patenting of this new magnet sensitive transistor removed an essential obstruction to its wide application in the control systems. The magnet-sensitive transistors are an essential component of the input and output devices or the so-called primary transformers and performer peripheral devices (actuators). The design and construction of these devices posed quite a problem after the new generation of computers was developed. Their development on a world scale was rather slow. This led to restricting the production of sufficiently cheap and reliable ones. The new magnet-sensitive guage has been well received both at home and abroad. At the recent First National Congress of Bulgarian Physicists it was highly evaluated by outstanding researchers from 17 countries. The zero series produced at the Solid-State Physics Institute attested the guage's rich functional features as a magnet guage and sensor. Its principal purpose, that of being an important element in the control systems, determines the preconditions for its fast introduction. Models have already been made of devices for contactless ignition of internal combustion engines, as well as devices for contactless determination of A.C. current. (BTA) [Text] [Sofia SOFIA NEWS in English 14 Dec 83 p 4]

CSO: 2020/61

ROBOTICS EXPECTED TO HELP REVIVE MACHINE TOOL INDUSTRY

Budapest FIGYELO in Hungarian 10 Nov 83 p 6

[Article by Katalin Bossanyi]

[Excerpt] A step was taken at the beginning of this year which could contribute greatly to improving the ability of the machine tool industry, and of domestic industry as a whole, to accomodate to the world market. The Ministry of Industry--together with the OMFB [National Technical Development Committee]--reviewed experiences with robotization and domestic robot developments. They established that thus far significant sums have been spent, with very low effectiveness. For this reason the Machine Tool Industry Society, more precisely the developmental institute of the SZIM [Machine Tool Industry Works], was entrusted with future coordination of robot developments. A group was formed here which, in the future, will coordinate domestic developments, discover the needs and install and service imports in the form of an undertaking. At the same time a competition was announced for industrial robots and manipulators which can be obtained from socialist import; equipment which can be purchased from central technical development funds and enterprise resources will be put to work continuously up to 1985 at various machine industry enterprises.

In the course of reformulating the robot conception it was discovered that quite a number of domestic enterprises--actually in isolation from one another--have effectively adapted foreign experiences already. For example, the Bakony Works and the Agricultural Machine Enterprise in Gyor have developments which could be used elsewhere in regard to the development of assembly techniques--affecting primarily manipulators and conveyor equipment. The former Gyongyos factory of United Incandescent and the SZTAKI [Computer Technology and Automation Research Institute] are working on adapting form recognition, assembly robots; Videoton, also jointly with the SZTAKI, is working on a similar development; while the Csepel Special Machine Factory purchased a Japanese license for the manufacture of a hot plant, heavy load robot family. These are useful initiatives in themselves, but the greatest improvement in efficiency might be if the NC and CNC machine tools were supplemented by various robots--by virtue of the technological conditions given. There is a possibility for socialist import also. They are now working on researching this; the first successful exhibit has taken place already, at the Csepel Machine Tool Factory--featuring a Fanuk robot of Bulgarian manufacture. Of course, a good number of the products for robots which can be made on the manufacturing-development base of the machine tool industry--primarily background industry products--are still missing here at home. It is foreseen that the members of the Machine Tool Industry Society will establish a joint manufacturing enterprise abroad to supply them. In addition, this year already, a so-called manufacturing cell (this is a "marriage" of a machine tool and a robot) has been developed at the SZIM and the Csepel Machine Tool Factory which carries out various functions. One of them has been put to work already, not at home but in the FRG. Linking machine tools and the somewhat late domestic robot developments is a significant decision from the viewpoint of industrial policy also. It provides a new opportunity that the recession barometer in this branch of industry, with many-branching effects, should not sink further.

8984
CSO: 2502/11

FUTURE OF MICROELECTRONICS INDUSTRY SEEN DIM

Budapest OTLET in Hungarian 24 Nov 83 pp 20-21

[Article by Csaba Vertes: "Chip, Chip, Hurray!"]

[Excerpt] In December 1981 the Council of Ministers adopted a central development program for electronic parts and subassemblies. According to this the electronics industry must provide the device background, together with services, needed for the electronization of the economy, which can be done only if some of the needs are satisfied with domestic manufacture while others are satisfied from the international market. And this means that the domestic electronics industry should export more and more products of better and better quality. The question is whether it will be capable of this, for the world market conditions are most merciless. He who, as a seller, cannot get his technical culture recognized can obtain, as a buyer, only lower level products. In any case, the domestic experts are confident. They feel that the production of the Hungarian electronics industry will increase by 8-9 percent per year, over a 10-year period, and that microelectronics manufacture will aid this to a significant degree. But how?

Catalog circuits (standard, cheap, integrated circuits manufactured in large series) can be obtained in the world market virtually for pennies. So it is not worth it to compete in this. But it would be worth it to design and manufacture equipment-oriented circuits (ad hoc or small series circuits made for a special task or device), circuits which might also conform precisely to the needs of domestic equipment manufacturers. In this way even the marketing prospects appear relatively reassuring--in an indirect way. The other two points stressed by the microelectronics program are the processing of silicon wafers and assembly, encapsulation and testing. According to the plans, the marketing and a supply of tools and experts meeting the technological requirements will be available by 1985, a product spectrum which is competitive even internationally will be born. In addition, the technical and technological conditions for a program counting on the processing of 120,000 silicon wafers per year will be created by purchasing Soviet know-how and, to a large extent, by purchasing Soviet machines. The assembly, encapsulation and testing capacity will be made to conform to this, paying attention to the most important task, that there must be an ability to put out a very large number of types.

More than a year and a half have passed since this government resolution, and as Zoltan Koteles, deputy minister of industry, recently said at a meeting of the academy, progress has been made thus far in accordance with the program. Indeed, they have gone even farther than planned in design and mask manufacture.

The deputy minister emphasized that overcoming the previous backwardness has begun with the realization of the program, but the big question is how the industry that manufactures electronic equipment will make use of the possibilities offered by the parts industry. How, and in what direction is it developing? Because it appears that the users are already incapable of making use of all the possibilities which the tools of today offer. This is why the development of applications is coming into the foreground along with--and sometimes in place of--technological development. That is, attention must be concentrated on creating a link between electronic systems and their environment.

How true this is was confirmed by Academician Tibor Vamos at a recent professional conference where he said that the key question in the development of domestic computer technology is applications techniques. Because if we want to buy new, more reliable microelectronic parts, semiconductors and subassemblies then in our applications technique offerings we must furnish competitive, so-called "hard" goods, independent of whether we are appearing on the computer technology markets of the western European countries or the socialist countries. And there are not only technical and not only material conditions for this, there are also personnel conditions. At the conference mentioned Tibor Vamos complained that Hungary is among those countries where there is not yet an independent high level computer technology educational institution, and this has serious consequences. In practice the mathematicians trained at universities must be made to master different information and orient themselves toward other life goals. This is a slow and clumsy process involving the loss of many years, and what we need are experts for whom computer technology is not only their daily bread but also their passion.

But let us add quickly, knowing the situation as it is seen by the experts, that even if the high level education of computer technology experts is solved and even if the microelectronics program is realised on schedule point by point--we still cannot expect miracles. The backwardness is so great and the conditions so modest that Hungary cannot become a microelectronics great power in the near or more distant future.

The advantage of the two great powers--Japan and the United States--cannot be overcome, and behind them everyone else can only strive to find the "tailor-made" trends of computer technology, applications possibilities fitting the given conditions. For us also only this can be the goal, but it is to be feared that we were rather late in recognizing this--and late in the measures taken in the wake of this recognition. Not in regard to the forefront, but even in regard to an honorable median average.

8984
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EXTRA WORK HOBBLES YOUNG INTELLECTUAL DEVELOPMENT

Budapest OTLET in Hungarian 24 Nov 83 p 37

[Interview with Aurel Tolcsvary, economic director of the KFKI [Central Physics Research Institute], by Anna Gyori: "Researchers in Overalls"]

[Text] At the beginning of 1982 the Central Physics Research Institute was among the first to "join." In a few weeks, 15 IGM's (institutional economic work groups) began operation. Today their number has increased to 70 and they employ 500 people, which is 20 percent of those working there.

[Question] Do they do primarily work within the institute or do outside firms employ the work groups also?

[Answer] A negligible amount of work is done on outside orders. This derives from the fact that the leaders of the institute authorize the creation of an internal work group almost exclusively if the institute has need of their work.

[Question] Of what use are the IGM's to you?

[Answer] In our institute we must deal with a good many more research and development problems than can be solved in 8 hours. This is why about one-third of the capacity of our IGM's is devoted to intellectual work--in contrast to the VGM's [enterprise economic work groups]. The remaining two-thirds are performing repair, maintenance and metal working tasks which we used to have done by cooperative or state firms. This was a good move in the material sense also. because the economic work groups work more cheaply than our earlier partners; we do not have to pay shipping costs and we can cover more services from our budgeted money. Nor is it a matter of secondary importance that they do faster, more precise work, because those doing the repairs are the ones who work on the equipment in their main work time. The savings in materials are significant also. I should mention that a healthy competitive spirit has developed also, because if the institute is not satisfied with the work of some unit it will not employ it later.

[Question] So one can say that everyone is doing well. Is there no dark side to the thing?

[Answer] In addition to the general problems--for example that there is less time for family and rest--a unique institutional problem was taken up at the most recent meeting of the leadership. What will happen with the further development of the young researchers? It is understandable that earning money, creating the material base--primarily housing--is as much a problem for them as for young people working in any other area, but here this could be to the disadvantage of their professional development in the long run. No time remains for the constant reading of the professional literature or preparing possible scientific dissertations. Two or three years might be made up, but what happens then? Naturally we cannot dictate how many years a person can work overtime and when he cannot. This is one of those unanswered questions for which unfortunately, there is as of now no simple answer which is reassuring in every respect!

8984
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A NEW SYSTEMS TECHNIQUE SOLUTION FOR A FREELY CONFIGURABLE PROCESS CONTROL MACHINE

Budapest MERES ES AUTOMATIKA in Hungarian No 9, 1983, pp 321-325 manuscript received 25 May 83

[DANYI, Dezso, chief of process control main department of the Gamma Works]

[Abstract] The Gamma Works began manufacturing its first process control machine, the C 801, in 1976. The C 810 is a further development of the first model. The C 810 digitizes the input data and executes all guidance operations by means of digital signal processing. Although the C 810 contains a microcomputer it differs from general microcomputers used for process control purposes. The latter can be freely programmed but the C 810 can be used free in configurations, deciding which channel should be input or output, whether it should transmit state or continuous signals and in what control operation the inputs and outputs should participate. This required a hierarchical organization with four levels: protection, control, data display and collection and data processing or optimization. The fourth level is realized in the program of the computer. The microcomputer can modify the basic signal of the closed control cycle (cascade control) or generate the execute signal directly. The lower levels themselves can perform the tasks most necessary for safe operation so that the system continues to function if the upper level or central power unit fail. The microcomputer uses three INTEL 8085 microprocessors, one for I/O operations and logical control, one for arithmetic operations and continuous control and one to display data. An additional processor is needed if the system has several process control machines distant from one another. A block-oriented programming language was developed to exploit the advantages of the system, the blocks of which represent the blocks used in the control system. The program can be modified from the operator's console to modify the configuration relatively quickly. Figures 5; references 6, 3 Hungarian, 2 American, 1 Japanese.

8984
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COMPUTER PRODUCTION, DEVELOPMENT, PROSPECTS DESCRIBED

Warsaw PRZEGLAD TECHNICZNY in Polish 4, 11 Sep 83

[Article by Dr. Marian Kuras, adjunct at the Information Science Institute, Academy of Economics, Krakow: "Achievements and Prospects of Information Science: What Does It Give Us?"]

[No 36, 4 Sep 83 pp 8-9, 37]

[Text] For almost three years now, information science has been known to be in trouble. In the meantime, many myths about its potentials and about its dynamic growth in "greenhouse" conditions created for this area in the 1970's have been dispelled. There are some publications,[1] however, that are now trying to settle accounts with information science for the years of "hasty growth" and make it culpable for some of the economic failures. The negative assessments of the justifications and effectiveness of previous outlays on information science are done without analysis of the conditions and causes and often reduce to quoting the astronomical figures of expenditures followed by the question, "What has it benefitted us?"

Drawing conclusions for the future from such simple deductions seems unjustified and even dangerous. It is dangerous not so much for the information sciences themselves as for our general cultural level. We should therefore think about the factors which have led us to the current situation and about the need (or imperative) and possibilities of developing applications of information science in the current economic situation.

Conditions

In the early 1970's, the need for introducing basic changes in the system of management of the national economy became obvious. The proposed structural changes were supported by various groups, including the community of information and computer scientists that had been developing since the 1960's. This community of professionals, which was taking shape at institutions of higher education and in the industrial centers (which were not numerous at that time), consisted of people who had some experience in introducing new technologies into office work and clerical activities and who realized the need for radical changes in the management sector and the possibilities offered by computerization. It should be stressed that in the period preceding the government program of the development of computerization attention was focused on the importance of developing the two aspects in unison as complementing one another.[2] Regrettably, reservations voiced by computer scientists and economists were never taken into account. It was decided, instead of conducting an economic reform, to introduce the highly efficient tool into the system which was not in fact prepared for using it. This tool was applied for the purposes of that system and to the extent to which the skills of its users permitted.

Computerization was used as a tool for increasing the centralization of management, with all the negative consequences of this approach. This was based on an idea offered by Professor O. Lange for computerization of central planning[3] (it should be said that the idea was eventually dropped by its author), which never was implemented both for methodological and technical reasons. Furthermore, the concept had never been fully elaborated, and changes of the activity programs during the course of its implementation were quite frequent. In this situation, all evaluations of the expenditures on the development of computerization in the nation that failed to consider the conditions under which it occurred, seem meaningless.

Two basic factors determined the development of information science and computerization in the 1970's:

--the system of economic management; and

--the availability of hardware and software.

The system of economic management by directives, with a high degree of centralization, did not favor introduction of information science into the services of the management process. This system of management characteristically lacks a demand for decision-making information and did not provide any incentives for the development of computer applications. On the contrary, the system involved detailed assignments for documentation and reporting processes, where applications assumed a secondary role. On the other hand, the financing of information science activities was such that it allowed huge spending for design, implentation and operation of systems without adequate effects.

One should stress here the general lack of proper training of users of information technology. The low level of computer science and information knowledge made it impossible for the managers to properly formulate the objectives and assignments for the computer scientists; the managers did not trust them, were unwilling to cooperate and quite often--seeing in computerization a threat to their positions--created obstacles to this work.

To complete the description of the conditions in which the computer technology was used in the 1970's, we can outline the situation in the area of hardware and software. Data on the amounts spent on the purchase of hardware and software are unavailable, making comparisons difficult. We, however, do know that not more than a fraction of 1 percent of gross national product was spent on information science and computerization, compared with about 1.5 percent in industrialized nations. We also know the results of this spending in the form of installed computer hardware. Despite claims that the purchases of modern equipment and softwaare were coordinated, in the late 1970's we had 2633 computers, including 857 medium- and large-sized computers (e.g., Odra-1204, -1304, -1305, -1325, Minsk 32, R10, R20, R22, ICL 2903, Konsberg SM4, IBM-370, PDP 11/34 and others), as well as 1776 minicomputers.[4] This number included several dozen different brands purchased by users depending on their needs--not always correctly understood--and financial possibilities, as well as "connections." For the most part, the equipment was installed in incomplete configurations and was never finalized. As far as domestic production is concerned, only mainframe configurations were available, while imports were cut to a minimum, assuming that these basic configurations would be built up in response to growing demand. Unfortunately, these intentions were not implemented in either case. Domestic producers brought out the amounts of hardware that hardly satisfied the needs of computer assembly (of course, in skeletal configurations), while imports in the latter half of the 1970's experienced continuing decrease, with computers being the first target of cuts. Given this situation with hardware equipment, it could not be utilized fully and effectively. To make things worse, depreciation of equipment set in from the first day of its operation. It is well known that maintaining computer technology in proper condition requires an annual depreciation of 10 to 15 percent of initial value. Yet, there was a permanent shortage of means for maintenance and repair, as well as a deficit of spare components.

Table 1. Production, Export and Import of Computers and Number of Installed Computer Systems

Items	1978	1979	1980	1981	1982
Total computer output	238	225	199	183	157
including:					
Large and medium computers	60	51	27	14	17
Minicomputers	178	174	172	169	140
Export (without minicomputers)	5	10	5	4	2
Import	27	52	44	21	19
Number of installed computers (total)	2092	2282	2633	2633	2553
including:					
Medium and large computers	756	812	857	874	829
Minicomputers	1336	1470	1776	1759	1724

Peripheral and auxiliary equipment was a special problem. Equipment for input data processing, mostly using paper carriers, falls below the current requirements and is a factor adding to enhanced labor-intensiveness in processing costs. Due to a shortage of office equipment, computers are sometimes used as document-reproduction machines. The underdevelopment of communications practically prevents building up a computer network, which eliminates the potential utilizing available software.

One should also mention the unreliability of domestic products and their exhorbitant cost. Both these facts have their causes. These include:

--underdevelopment of electronics (a review of the state of the electronics industry published in PRZEGLAD TECHNICZNY leaves no doubt as to the truth of this statement);

--variations in the production programs (we have Odra and Ryad--I doubt that there exists any other example of a firm that could afford to develop two such alternative systems with altogether different logics);

--a high accumulation in computer hardware production, which in the 1970's compares only with the liquor industry; and

--declarative approach and lack of a minimal consistency in the implementation of the successive "programs for developing computerization and information science."

This description of conditions under which computerization and information science were developing can be supplemented by certain other characteristics, which are often cited as the causes for the breakdown in the applications, while in reality they were results of the circumstances presented above. This involves the lack of software, obsolete methods and systems of computerized information, their poor efficiency, individualized development of what should have been typical solutions, etc. The connection between these failures and the causes mentioned earlier requires no further explanation.

The foregoing applies almost entirely to computer applications in services to industrial management. This is indeed the most important sphere for technical innovations which normally yields the great benefits and becomes the driving force in the development of a new technology and its subsequent penetation into other spheres. Since industrial applications in our conditions failed to yield expected benefits, one can hardly write much about the successes computerization has scored in other spheres, such as transport, communications, construction, health services, education, communal services, etc.

Having outlined the conditions in which computerization had to evolve in the 1970's, we should now proceed to evaluate the current state and expected development of the situation in the near future.

Current State and Prospects

Having recognized the centralized system of economic management as the main cause of unfulfilled expectations that were associated with information science and computers, all discussions of its future applications should start with a review of the changes in the system. Computer and information scientists have greeted the promises of the economic reform with enthusiasm, as they were aware of the causes responsible for the failed expectations. Independent decision-making in an autonomous enterprise creates a situation with demand for information. Decision-making is a function of information, and a correct decision depends on timeliness, reliability, exhaustivity and completeness of data provided. In view of the involved managerial problems faced in the present conditions, only a system based on automated processing technology would be capable of providing such information. Importantly, the scope of essential information for decision-making at an autonomous enterprise is particularly broad. One has to take into account the data relating to the market, competition, foreign trade, banks, technologies, etc. This calls for using entirely innovative methods in preparing decisions.

Enhanced demand for decision-making information has not yet come about, because we are still in the initial--or, rather, preparatory--stage of the economic reform, which involves numerous limitations to the autonomy of enterprises, and not fully defined boundaries of competence of the institutions that affect the operation of the economy, as well as a tendency for centralized management that is also developing. The habit of making decisions based on a personal assessment of the situation, not supported by an all-around analysis and for that reason rarely correct, is still quite strong. This situation should not be tolerated for a longer time if we want the market mechanisms, introduced at a high social cost, to bring any results. One can state, therefore, that the success of the economic reform depends on using the methods and means of information science and computerization in management, and that the development of this sphere will depend on the efficiency of the reformed economy.[5]

This creates conditions for a targeted application of information science and computers in management, and common interests between the reformed economy and information science. Do conditions necessary for computerization to benefit the economy and other spheres exist, where computers could be introduced into operation effectively? The available experience in this area could be used in changed management situations rather to a limited extent. Most implemented programs are documentary systems, which are known to be of low efficiency or ineffective. The utility of operational systems is being tested by life experience, and new requirements stimulate modernization and new projects to meet the altered conditions of management.

Unfortunately, implementing systems tailored to current and future needs is confronted with serious barriers, mainly in terms of hardware and software. We will try to outline the current situation and prospects with the equipment of hardware in the not-distant future. This is an important issue, because participation of information science in economic reform is unimaginable without resolving the hardware problem.

By the end of 1982, altogether 2553 computers (892 medium and large, and 1724 minicomputers) were installed. Compared to 1981, in 1980 a decrease by 80 systems (45 medium and large, and 35 minicomputers) was registered. Poland was one of the few countries in which the number of installed computer systems has declined substantially.

The drastic drop in the output of computers (see Table 1) observed since 1978 is disconcerting. A slight increase in medium and large systems that took place last year does not change the fact that the total output was just 28.33 percent of the figure for 1978, which itself was not sufficient. An analysis of the data indicates also that despite the relatively high level in the output of minicomputers, the number of minicomputers actually put into operation has declined. This suggests the maintenance of a relatively high (numerically) level of export of minicomputers. Since 1979, the figures of computer import has been declining systematically. A result of this trend is the aging of computer systems; their mean age last year was seven years, with eight years being the mean figure for large and medium computers and six years for minicomputers. This means that in 1983 we must scrap 6.26 percent of installed medium and large computers and 54.9 percent of minicomputers, assuming that the useful service life of a computer is eight years. Such is the standard time of useful operation and such is the percentage of systems that have been operative for nine and more years.

As regards the input and output equipment, in 1982 a certain improvement has been observed both in terms of the available numbers of units and their design. There has been a decrease in the number of such facilities as printers, screen monitors, accompanied by a decline of card and paper tape readers. Regrettably, the number of graphic input displays and plotters, small as it had been, has also diminished. Despite the drop in the number of computers, the capacity of installed working memory has increased (by 11.1 megabytes), which indicates an improvement in the equipment of existing installations. The number of external memory devices, such as disc and tape memories, has increased minimally. The number of remote transmission and terminal units has also increased.

These data indicate improved conditions of computer system operations. The state of remote communication facilities causes apprehension, because their insufficient development may be an obstacle to the advance of remote data processing. Despite prohibitive costs, its current growth is evidence of profitability of renting dedicated communication lines, rather than using unreliable regular telephone channels.

The survey of existing computer installations can be ended by an interesting fact concerning their territorial distribution. In seven most developed provinces, 67.5 percent of all medium and large computers and 65.4 percent of mincomputers are located. In 1983, almost one-quarter of computers operated in Warsaw Province, while in Krakow Province almost 15 percent of medium and large computers and 11.3 percent of minicomputers were in operation.

A discussion of the state of Polish information science and computerization would be incomplete without a mention of its most important asset--educated and experienced personnel. In 1982, 46,600 persons were employed at information centers around the country (in the peak year of 1980, the total was 56,400). Of these, about 41,000 are computer scientists (for 1980 the number was about 50,800). If the development of computerization is measured by the number of people employed rather than the number of operational computers, Poland would come ahead of, for instance, France, in a statistical survey. No one, however, would do that, because the employment structure in this field is far from rational. Yet, it is true that by common effort we have educated a network of professionals who are now faced with the need for changing specialty and, furthermore, relinquishing a "futuristic" career for a less attractive, at least less prestigious, one.

Since 1978, the number of newly employed staff has been declining, and since 1981 the total number of individuals leaving this professional field has been growing. The factors of this decline include the closing of centers, reduced employment at those still operational and low wages (23.6 percent below the national average in 1982). Many switched to jobs where their high qualifications are not needed. Forced into this change by material concerns, a programmer (engineer, electronics specialist) whose salary at the center could be about 8500 zlotys monthly, including a bonus, goes to work as a waiter in a restaurant, where he gets free food and about 50,000 zlotys. And what was paid for the education of such a waiter is known to MNSzWiT [Ministry of Science, Higher Education and Technology]. It is difficult to assess other losses caused by the drop-out of this programmer, and it seems that nobody is really concerned. There are many indications that the period of inefficient employment has been succeeded now by a period of its inefficient reduction. As a result of this negative selection, in a few years we will be able to observe that those computer scientists that are employed do not meet the qualification requirements--which are high in this professional field.

Certain positive aspects do exist in the current situation of information science. The first is the natural selection of solutions that were implemented in the past. The fact that systems that had produced losses were brought out of operation is a positive development, as well as modernization of other systems to adapt to current needs. Another positive phenomenon is the efforts by many centers to sell services to earn added income for their own maintenance. Data on changes in the cost structure of their operation are not available. There are grounds to believe, however, that under the existing pressures, the costs have been reduced substantially (obviously, in proportion to changes in the conditions of work). All that could have also resulted in a more efficient structure of employment, but this opportunity has not been utilized.

[No 37, 11 Sep 83 pp 16-19]

[Text] Are we capable of utilizing information science and computers? This basic question should be posed in view of the picture of disastrous state of the hardware base of computerization described in the first part of this article. Before attempting to answer it, one should realize the possibilities of a universal application of information science and computers in the existing economic conditions. At first glance, economic considerations suggest avoiding investment in a field which--as is frequently argued--brings only losses.

We will try to test the validity of this statement by answering the question, "Can we afford to do without computerization?" A review of areas in which the applications of computer technology are indispensable today will to many be a round-up of obvious things. We will try, however, to make this overview and then answer the above question.

Scientific-Technical and Patent Information

The number of publications in each field and the growing number of patents for many years have made it impossible to keep abreast of the scientific results, and the searches for patent information sometimes take months. The barrier here is human capacity and total impossibility of efficient information service based on conventional techniques. This can be illustrated by a comparison of the time taken for literary research in scientific work: a project that takes seven months in Poland can be completed in a week (at a price of under $100) when the investigator goes to the United States, where, in addition, he obtains access to data which will not become available in Poland for several months, or even years. The wasted time of the investigator, the financial expenditures, duplication of research, rediscovery of known facts and fictitious or mediocre results of scientific work and development are the prices we are paying for the lack of an efficient and effective system of scientific and technical information. This is the principal cause of our falling behind and not malice, incompetence or God knows what other faults of scientists and engineers.

Science

As long as digital technology remained a sphere of mathematicians specializing in numeric studies and physicists, one could justify the failure to understand the needs of equipping science with computer technology. Today there is no field of knowledge--including geography, history, linguistics and law--that does not use mathematical methods and computers. Technical and economic sciences need them the most, because these are areas called upon to take an active part in pulling the nation out of the crisis. These appeals will come to nothing unless science is furnished with proper tools to cope with the range of problems facing it.

Everything suggests today that many engineers will have to return to the slide rule and that economists will stage experiments on the living social organism rather than testing their concepts by simulation experiments. The capacity of Polish science is quite often measured lately by comparison with the achievements of other nations. I will try to add information to such comparisons, describing the computational facilities available to scientists in their work.

Two scientific centers in Poland now use multiple-access systems, type Cyber-72,* which were manufactured until 1975 by the CDC Company. One can easily name scores of Western universities, each of which has at least two Cyber-170 (next generation) systems, and between 10 and 20 minicomputers.

Design and Development

Polish products are not competitive. Technology is backward, and the methods of production are energy-intensive. For years, analysts have been pointing to errors committed in the early design and development stage as responsible for this state of affairs. An analysis of these errors suggests that the main cause is the incapacity of large groups of designers to accumulate, keep, retrieve and utilize huge volumes of data unless they are furnished with proper technical facilities to do so.

A large portion of a designer's energy is spent in collection and searching of data or in calculations, that is, auxiliary functions, and not enough time is left for creative work. It should not be surprising that the level of standardization of components in products in the West is higher than in Poland, although for years we have been struggling to attain a higher level of standardization and issuing edicts to this effect. In the West, they are not struggling, but create conditions of work which favor standardization.

Thanks to general application of computer technology and the fact that the workplace of a designer is equipped with modern facilities, his time and creative capacities are put to better use. Methods developed by designers are implemented in computer prodedures and used repeatedly as long as they are applicable; the computer selects from catalogues of standardized components (kept in large machine memories) all the appropriate items, according to the design assignment, which is done automatically, in a few seconds. The designer thus makes use of systems of scientific and technical information. The effects of this organization of work on quality of the designed products are obvious. Will we be able to compete with producers in world markets if we do not change the equipment available to designers in their work? This is doubtful.

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*The Cyber-72 system installed in Krakow currently has one disc memory station, because of a shortage of foreign currency for acquisition of magnetic heads. This is probably a unique instance of multiple-access computer system whose users are forced to virtually utilize only tape memory. Loss incurred because of delays in calculations for current research projects and underutilization of the computer's potential defy appraisal.

Process Control

A textbook explanation of this concept suggests large-scale production complexes, where man is replaced by a system of automatic industrial equipment linked to the computer, operating as a central traffic controller. This scale, however, has been greatly reduced today, and microprocessors are used even in cars, household appliances, etc. The effects are overwhelming. The energy-intensiveness of production is decreasing regularly, productivity is growing and environmental pollution is being drastically reduced. In Poland, the consumption of conventional fuel amounts to about 1300 kg per $1000 of gross national product, compared with some 500 kg in Japan, about 550 kg in the United States and about 600 kg in the FRG and France. In our savings plan, we have set an important target in reducing the energy-intensiveness by 1.2-1.7 kg of conventional fuel per 1000 zlotys, i.e., some 7.8-11.1 percent during three years.[6] Even if this target is met--which is uncertain given today's technology--the lag behind advanced nations will be increasing, because they expect further reduction of energy consumption by 15 to 20 percent.

Economic Management

Efficiency and effectiveness of economic organizations depend on decisions concerning their functioning. The economy's breakdown was caused by inefficient centralized management systems and inadequate systems of information supply at all levels. Decentralization of decision-making (to date, far from completion), unless it is supported by efficient information processes, may lead to another wave of "voluntarism," attempts to move towards increased centralization (already one hears of such proposals), accompanied by inefficiency of the information system, and eventually to a repetition of the same cycle.

Under another possible scenario, the autonomy of enterprises will be increased, leading to a tendency for larger employment and increased earnings of enterprise managers. This situation will call for introduction of computer technology. At that point it may be found, however, that such belated application will not allow for a fast and inexpensive introduction of computers. One should also bear in mind the economic effects of neglect in application of computers in management. The costs will be high and will affect activities in all spheres of production and defense.

Banks

The function of banks in the economy in a situation where economic management is conducted through control of economic measures and indicators has changed substantially. In the past, the bank was conceived as an institution handling only cash and accounting. This view will change drastically in the future. The function of banks in the new economic management calls for major improvements of their technical equipment. Tasks in financing and control of economic units will require compiling and fast retrieval of a huge amount of data, impossible for clerks working with paper, pen and old-fashioned calculators.

A bank equipped with proper data processing facilities can generate major savings through limiting currency circulation, promoting the cycle of capital turnover by reducing the transfer time between clients, as well as improved informational support for decisions concerning granting of credits and similar tasks. Introducing computerization techniques and facilities will also lead to a high quality of bank services.

Efficiency of Applications

We have named areas where the use of computers is indispensable if we indeed want to attain a real growth of productivity in the economy. In other spheres of life, such as transport and communications, trade, postal services, education and health care, further delays with computerization are intolerable, because otherwise we will see the deterioration of the quality of services, and all outlays will begin to bring much less than hoped-for results.

Besides, in the first three of these spheres, properly introduced computer applications will produce dramatic effects. We should also mention the need and capacity of data processing in local administration, where all kinds of documents are duplicated through different government offices and departments employing increasing numbers of people to perform routine work in an uncoordinated and inefficient way.

After this general outline correlating the needs and benefits, one could hardly name an area that could do without computers. Information efficiency is necessary for the government to be able to govern in accordance with the interests of the people, as well as to those they govern to enable them to work diligently and enjoy the fruits of their labor. They are necessary for the economy to operate efficiently, for technology to introduce productive and safe manufacturing processes to industry functioning successfully and, in other areas, for overcoming the obstacles to progress, and in still others, for satisfying the increasing demands. Adequate information support today can only be attained by using the methods and means meeting present and future requirements.

Some say--and quite frequently--that we have invested in computerization but the investment brought no return. One can agree with this, but with reservations. First of all, the spending was not accompanied by requirements for profits. Computerization was introduced into industry, which was not oriented towards profits but towards output. In that situation, computerization became an end in itself. The absence of an economic management mechanism resulted in the use of a tool--such as the computer--by a management system which did not in fact need data. Such a management system could set the objective of computerizing the inventory management (producer goods, personnel and wages, production output, etc.), and that goal was achieved. It took years before anybody came to question the purpose of computerization and first cost-effectiveness analyses were made. The resulting evaluations that used criteria established in operation of existing solutions could not be favorable for computerization. Furthermore, it was applied in most difficult areas, where it takes the longest for an effect to become tangible. On the contrary, the potential of large-scale computerization in areas where effects are much easier to achieve, can be attained faster and much more tangibly (transportation, communications, postal services, design and development, etc.), these capacities were not utilized.

The low efficiency of computer applications the overall national economy scale is a fact, but it should be stressed that even in Poland we have instances of highly effective solutions. Obviously, they occurred in situations where proper conditions for computer system development and operation were provided, especially exact statement of goals in relation to results of activity and subsequent analysis of effectiveness at all stages of system implementation and during the course of its operation. Making decisions now concerning applications of computers, if not supported by efforts to increase their scopes, would be an inexcusable error. The form of an economic management system is too difficult and too expensive an undertaking to risk failure. The importance of adequate data support for efficient management calls for investing of available means and taking all possible actions to create conditions for major growth. The needs of efficient economic management and the needs of science and technology, which have to overcome years of backwardness, leave no alternative as to methods and tools of attaining these goals.

We cannot afford to do without computerization; savings in this area may eventually cost us too much. The question asked at the beginning should be answered: we must be able to afford computerization! Renouncing its applications or even delaying their development until a better time (which basically is the same thing) will involve serious cultural regression. It may turn out that this expected better future will never come.

Search for Potentials and Conditions

Major needs of computerization on the one hand and the shortage of means for investments due to the economic breakdown on the other seem to make precarious the possibility of pulling computerization out of the crisis. At the same time, one should foresee the continuing major growth of the needs for decision-making data as the economic reform gets underway. In these conditions, giving up information science and computers may lead to inefficient management, although the entire program of economic improvement depends on its growth.

In terms of technical development and implements of labor, management has been lagging behind industrial production in our economy for many years. Should we wonder, therefore, that management is not efficient? Now when its growth is acknowledged as the objective of economic reform, the causes of inefficiency should be eliminated, which means introducing a program of computerization tailored to the needs which are now appearing, as well as the potentials which should be defined realistically and accurately. Such a program must be implemented consistently; conditions for this will be created if the reform goes into effect.

The basic problem to be solved in the near future is improved supply of computer hardware and software. This is no easy task, but will take a long time to accomplish. This makes it even more urgent to start now on aspects that would contain regression. These include the following elements creating prospects for increased output of computer hardware in the future and improved current supplies:

(1) considering the possibility of changing decisions threatening a slowdown of electronic industries. For its future and also the future of the fields depending on it, it may be crucial to change the decision to stop the investment project concerned with production of microprocessors at the Semiconductor Research and Production Center in Warsaw;[7]

(2) compiling a balance sheet of needs for computer hardware and drawing up the production export and import plans on this basis. Currently, these needs are not being met, and there is no coordination defining the plans of export and production programs to the detriment of domestic consumers;

(3) making decisions to speed up the growth of computer hardware output. Increasing the scale of production will allow utilizing the existing potential, decreasing costs and increasing exports without jeopardizing the situation in domestic computer hardware markets. In principle, the economic reform abolishes preferential treatment, but when dealing with an area which is critical for the entire future of the economy, this should be allowed. We should recall that there is a production potential and personnel and not waste them;

(4) verifying the (official!) prices of computer hardware in the country. The ratios of export prices extended to domestic consumers stimulate exports but, on the other hand, result in a situation when it does not pay for producers to sell in the domestic markets. This way we gain from sales, but incur losses that nobody seems to notice. It should also be remembered that stagnation in computer production will shortly lead to a decline of demand from foreign customers as well (this hardware will become obsolete and too expensive), as well as in the country (many of the consumers in the meantime give up the use of computers, and there will be a decline of organization efficiency and worse economic results);

(5) setting other aspects involved in the sale of computer hardware. All forms of out-of-market distribution should be abandoned. We must not admit the implementation of a policy whereby hardware is sold only to those users which utilize the available equipment to its fullest extent. This is absurd, because consumers are buying precisely the hardware they need for full utilization of available facilities;

(6) creating conditions for formation and development of software firms and institutions of independent consulting to provide services to users. Small firms creating and distributing software could fill the gap between major producers and users and frequently meet the interests of both sides. The experience of nations leading in computerization suggests that this

specialization and cooperation is profitable.

Such firms could probably resolve the problem facing all users that now have to think of replacing Odra computers of the 1300 series with the R32. The Odra-R32 modality currently developed by Elwro is still in the design stage,[8] and generally this is a stopgap and ineffective solution. Maybe some firm will undertake to develop software to generate programs in the output code of the R32 computer from input codes processed by Odra; the effects are guaranteed.

Definitely most difficult is defining the methods of realization of these challenging tasks, especially as regards financing. The development of a hardware base should be the subject of detailed studies that would consider the possibilities and limitations and evaluate the needs and capacities of the economy for meeting them. Yet there are problems that will not take laborious preparation and expenses to resolve. These include the following:

(a) accelerating the appraisals to enable developing the proper depreciation of computer hardware. Procrastination here may lead to major disruptions when the need arises for replacing worn equipment;

(b) stemming the outflow of highly skilled computer professionals into other career fields; their knowledge would be utilized even today while the crisis in computerization is continuing. It is odd that since they do not have employment within the country, no one takes steps to provide them with job opportunities under foreign contracts. Experienced programmers are still badly needed in Western nations, and the demand for them is growing fast in developing nations. Such foreign trips could also bring financial benefits, which could be used to create funds to finance the purchase of hardware and components. New experience gained by working in different conditions using modern hardware and software would be an even more important gain. These experiences could be useful in the not-distant future;

(c) increasing the activity of centers to raise the utilization rate of hardware. The demand for computer services has dropped, and yet a great number of enterprises and institutions have problems which could not be resolved by using conventional data processing. The centers should not be waiting for clients. The market of information services is unlike the market of consumer goods. It is now a buyer's market. Only few centers realize that computer services could be provided to individuals as well. At large centers, such services could be of a marginal significance, but every penny counts in the current situation. That such demand does exist is witnessed by the activity of the few cooperatives of computer services.

The look at the role of computers in managerial services and the related statement of goals in its application should be changed. The methods and means of computerization should be used as a factor in improving the management organization and not just as a counting device serving solely limited elements of the directorate. A condition for this is the "acute" principle of operation of the institution and "hard" financing system. The rules governing the operation of most institutions (the best examples being railroads and postal services) place their interests at the top, thus allowing to lower the requirements of the quality of the services in case they fail to cope with their duties. In effect, there is an absence of a factor compelling the progress in technical organization, which, because of the monopoly position of many of the institutions, leads to neglect of the interests of consumers and continuing downslide of service quality. In this situation, the goals placed before computerization should be linked to the basic activity of an enterprise, formulated in categories of profit, which is the basic condition for obtaining effects.

A current condition for improving the efficiency of computerization is a "hard" financing system, both of the organization's activity and computer service itself. Subsidizing its development is not justified, and it can be said that the cause of the previous failures of computerization was a system of financing based on subsidzing from FPTE [the Fund for Technical-Economic Progress?]. High spending should be financed on the basis of the enterprise's own funds or bank credits.

We have lost the capacity for classifying the methods of obtaining effects, discriminating between return on investment and results of organizational progress, although the latter is clearly preferable. It should be realized that organizational progress should be accompanied by a growth of technical equipment (and not only computer facilities) in management. Such investment --relatively small compared to industrial investments--is highly effective, given its proper introduction into practice.

Computerization now needs a more receptive atmosphere. The failures of the 1970's have given rise to frustration among computer scientists. It is the deeper, the less understanding of capacities and needs they find among critics. And computerization, because of its poor results, has become an easily accessible target for criticism (not always justified). Some critics even reach for ideological elements, trying to blame the failures on transplantation of patterns of computerization from Western nations.[1] Unfortunately, in many cases such patterns were not used for various reasons.

The concept of effective application of a tool (because a computer is a tool no less than a machine or automobile) is little affected by political or ideological influences. It is quite all right if it is in Western countries (although not only in them), where major progress in various areas has been attained through computerization, that we should look for models of present-day applications. Today, they have needs that require the design of computers, each of which has a computational capacity that is several hundred times greater (and in the near future it will be thousands of times greater) than the total capacity of all our systems. In the meantime, we are having problems in staffing our second shifts. We should try and learn even from the Devil how to better organize work, make it more effective and so utilize the available facilities to the greatest possible extent.

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DEVELOPMENT OF INFORMATION SCIENCE CENTERS DESCRIBED

Warsaw PRZEGLAD TECHNICZNY in Polish No 37, 25 Sep 83 p 19

[Article by Szczesna Milli: "What Next?"]

[Text] Late in June, the R&D Center of Statewide Statistical Information System [SPIS] run by the Central Statistical Office [GUS] released a detailed report on a study conducted at state- and cooperative-operated information science centers [OI] in 1982 (OI centers subordinated to the National Defense and Internal Affairs Ministries were not included).

The report says that 17 computers and 140 minicomputers were produced in Poland. Of these, two ODRA-1305 computers were sold abroad, while 19 were imported, 18 of them from socialist countries. The study comprised 1,432 OI centers, or 166 less than in 1981. This was due to the fact that many institutions cut their OI activities, sold facilities and dismissed personnel. Inefficient and worn-out facilities were given to higher schools--which meanwhile increased their number of OI centers--as well as to the Transportation Ministry.

Cuts in staffing continued. The 158 independent OI centers had 20,508 people on their payrolls, which yields an average of 138.6 persons, while the remaining nonindependent centers employed 25,471 persons, or 18.9 persons per center. Of the total number of 2,553 computers (which is 80 units less than in 1981), the four chief economic sectors held only 48.8 percent (down from 51.4 percent in 1981). This was caused by progressing obsolescence of minicomputers, the mean utility age of which is 6 years (that of big and medium-sized is 8 years).

In 1982, mean daily operation time was identical with that recorded in 1981. There has also emerged a clear tendency to enhance working time for automating professional and management operations at the expense of working time for technological process automation.

Mean wage in the OI branch was 8,995 zlotys monthly, or 42.5 percent more than in 1981. Yet this is 23.6 percent below the mean monthly wage in the economy's socialized sector, which, according to the GUS "Concise Statistical Yearbook 1983," was 11,116 zlotys in 1982. OI centers sold 8 percent more of their services outside their branch in 1982 than in 1981.

How can the condition of Poland's OI branch be improved in the next few years? In particular, how can OI services in the national economy be improved quantitatively and qualitatively, and how to gain better effects from them? One answer has been given by Dr Tomasz Pawlak, director of the OI Committee's Secretariat, who told a Polish Computer Science Society [PTI] meeting in Warsaw that "The government's austerity programs for 1983-85 will impose severe restrictions on the entire national economy. Many OI centers at enterprises will feel a financial squeeze in trying to use their mother companies' funds to buy new facilities or to extend their computer configurations, which is often a prerequisite for expanding computer services in enterprises. So, computer specialists must be granted better conditions for carrying out their tasks than so far. One way to achieve this is to embrace more centers than up to now by the reform-imposed new economic rules, which means computer centers should be extracted from their mother enterprises and made into independent OI firms.

"Self-financing necessitates great activeness on the part of OI centers. Under present conditions, if an OI center wants to survive, to cope successfully with the crisis, and, in many cases, to stand a chance for growth in the future, then it must effectively expand its market by offering new kinds of computer services to new clients. A center's offer of services must be devised so as to ensure economic benefits for clients at moderate, justified prices for services. The idea of transforming enterprise-operated OI centers into independent companies is feasible only for those who fulfill the requisite conditions for independence. Generally, these will be OI centers employing several dozen computer specialists. This might help embrace some 50 percent of all employees of Poland's OI branch by the reform, and give this branch a genuine chance for development.

"Computer services should be offered to potential users in institutions to a broader extent than so far. The strong reliance of institutions such as the National Bank of Poland and other Polish banks, the GUS or, recently, the National Insurance Company [ZUS] on computer services indicates this is the right way to go. OI service offers should therefore include primarily various systems for plan preparation, drafting and control for various sectors of the economy.

"Another important line of activities should be organizing cooperation between computer systems which are most common in Poland, namely those based in individual enterprises, and nationwide ones, among others with a view to exchanging magnetic tape recorded data. For this purpose, certain design and programming work will have to be done, to be followed by standardization and, occasionally, legislative procedures, and, eventually implementation can be started. Endeavors with a view to establishing cooperation between systems should be focused on the following spheres: finance settlements by the NBP for state-owned enterprises engaged in mass-scale commodity turnover or services; financial settlements by the Polish Savings Bank [PKO] of private savings operations; reporting by state-owned economic organizations in connection with ministry-level and GUS-operated reporting systems. Pilot study results should be taken advantage of in this.

"Replacement of oldest computers still operated at OI centers (especially second-generation ones, of which some 150 units are still in service) should ensure proper computation power and processing technologies at minimum investment costs. Possible ways to achieve this include substituting a new for an old minicomputer, say one of the SM or Mera-400 series; substituting a second-hand third-generation computer for an old second-generation one; establishing a single OI center equipped with new facilities by several institutions in one city or region; installing a terminal connected to the nearest center in order to ensure remote-control operation of users' orders. Transfer of software from previous systems to new computers should be accompanied by their functional and technological modernization.

"Despite the crisis, capital-intensive remote-control systems of services to users should be gradually extended, both as regards teleprocessing system building and the design and subsequent implementation of iterative systems adapted to such operation technologies. Because of shortage of funds, this can perhaps be done by establishing joint regional teleprocessing centers which would operate computers capable of running some 100 terminals simultaneously. Building costs per terminal would in such cases be lower than that of a medium-sized teleprocessing system.

"Such centers should be created as joint ventures by higher schools, economic and administrative agencies, as well as local OI centers. Such ventures should be based on an economic contract for a joint construction and operation of a regional teleprocessing system in keeping with joint-stock or joint-venture undertaking rules."

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