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1 August 1984

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SCIENCE & TECHNOLOGY
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ROBOTRON K 1520 MICROCOMPUTER

Budapest SZAMITASTECHNIKA in Hungarian Sep 83 p 4,5

[Text] Automation which steps up manufacturing and auxiliary processes is receiving an important role in the area of a further increase in the intensity of production processes. Of special significance here is use of modern microcomputer technology. Substantial rationalization results can be achieved in the socialist countries with use of microcomputers, and new possibilities are opening up in increasing the use properties of various products. As a result of its high performance and modular construction the K 1520 microcomputer system can be used economically and is a satisfying development in the area of microcomputer technology.

The chief advantages of its use are:

- design and functional modularity and flexibility; it can be integrated well with other products and it is easy to use;
- lower power consumption;
- high reliability;
- takes up little space.

It can be used advantageously in the following areas:

- automatic manufacture control;
- laboratory and measurement technology automation;
- control of information processing systems;
- decentralized solution of scientific-technical and economic tasks;
- medical technology;
- transportation;
- supervision and control of mechanical construction equipment.

According to their peculiarities these use areas require specially developed microcomputer systems. The modular conception of the K 1520 meets this requirement. Robotron provides the necessary hardware and software elements for OEM deals under the customary conditions. If the advantages mentioned are to be realized there must be adequate information about the significance of microcomputer technology, the possibilities for its use and the way it works.

System Development

The K 1520 is made up of a series of hardware and software modules. The hardware includes fittings and functional units which can be fitted together in terms of design and function--for example, circuit cards, connectors and cables. A system documentation series supports use of the hardware. It aids program development and testing by the user in the interest of connection to existing host computers (Robotron 4201, ESR) and devices and equipment controlled by the microcomputer. The system software consists of documentation oriented to the computer, test programs, operating systems and monitor system documentation (MOS). The functional units of the K 1520 are placed on separate cards and can be connected to the central bus at any place. Because of the advantageous form of the central arithmetic unit often one circuit card is sufficient in the event of lower performance. In this case there is no need for a collecting bus. The logical-functional units are made for constant operation in a size of 215x170 mm² and on the collecting bus side there are two lines of 58 pole direct connectors. Peripheral connection can be through a maximum of three 39 pole direct connectors through the appropriate control-connector units. The modules of the K 1520 can be assembled in holding frames as ORM assemblies. For this purpose there are two frames, 120 or 240 mm wide, with printed wiring on the back side. The microcomputer system bus can be built out to a length of 800 mm with the back side wiring. With the interposition of a collecting bus amplifier the bus can be extended to a maximum of 3 meters, from the viewpoint of load.

In principle it is possible for the user to design the circuits needed for his own application, holding to the electric, logical and design parameters, and connect them to the system bus. In a similar way one can develop software going beyond the general offering, and the users can exchange these among themselves. The power unit is modular also; it can be put together in special ways depending on the application.

Hardware

The nucleus of the K 1520 microcomputer system is the central arithmetic unit. The circuit card containing the central unit can be connected in various versions to the bus system realized, and can be exchanged with other cards. If the central unit is used alone there is no need for a collecting bus and the computer can be operated in the one card mode.

The central arithmetic unit is based on a U 880 D 8-bit microprocessor. The basic version contains the central processing unit, stores (RAM, EPROM), the

counter/timer, and parallel I/O circuits with supplementary electronics as well as quartz stabilized pace setter and reset switch. Through the parallel I/O unit one can connect together several central units or a central unit and peripherals. The interface makes possible use of the control driven (master-slave) principle, connecting together one controlling and three driven units. RAM and EPROM cards are available as data and program stores. Depending on the application the storage capacity can be expanded to 64-128 K bytes with use of fixed and write-read stores. Appropriate connections and controls take care of connecting other data processing, communication and process control peripherals. It is possible to connect keyboards based on the Hall effect, punch tape units, printers, magnetic tape units and floppy disk units. Among others V.24-CCITT and 20 mA loop interfaces are available for connection of peripherals characteristic of a user. An operator's unit for testing connected with program development and convenient for starting operation and for maintenance is provided in the form of model specific communication equipment.

Functions of the operator's unit:

- start at optional addresses;
- stop at optional times;
- stop at optional addresses (at so-called test points);
- operation of the microcomputer an ad hoc cycle;
- putting addresses, data and control signals on standby;
- direct memory access (to static and dynamic stores);
- displaying addresses, data and conditions of the central arithmetic unit.

The programming and erasing equipment in the assortment includes 1 K byte EPROMs. For data transmission over longer distances there are data transmission units with 20 mA loop and V.24 interfaces in the asynchronous, synchronous, duplex and half duplex modes, in two wire and four wire versions up to a speed of 9,600 baud.

In general in order to prepare for use of microprocessors and microcomputers one needs suitable devices to develop and test programs, record programs in fixed storage and test applications systems.

Basically two procedures have been developed to test microcomputer software:

- simulating the instruction set and architecture of the microcomputer with software development and testing host computer CROSS software; and
- software development and testing, and sometimes hardware testing, with a microcomputer development system.

The first solution is reasonable if, among other things, the corresponding microcomputer is not available; its chief disadvantage is the lack of real-time testing. The microcomputer development systems ensure convenient and cheap software testing and provide special hardware or software support to study faulty processes in the applications system. At present these microcomputer development systems are the most convenient and most effective aids for microcomputer users.

Robotron offers an A 5601 microcomputer development system for OEM applications of the K 1520 microcomputer but it is also a modern system meeting international standards for all uses of the U 880 D microprocessor serving as a base.

Software

The K 1520 system software helps the user in development and testing of S&T programs and program systems at the level of the microcomputer itself and at the level of the U 880 D microprocessor. The available software is divided for base-MOS and HOST or CROSS-MOS machines.

In the base-MOS case the microcomputer system itself constitutes the device base, this is the previously mentioned microcomputer development system. In contrast to this, when using HOST or CROSS-MOS, for which a host computer is needed, it is possible to simulate the instruction set of the microcomputer system. The base-MOS offered by Robotron consists of the following parts:

--operating systemy

MEOS 152L in various versions for the device base of the microcomputer development system, for various configurations;

An EMOS 152 operating system supporting real-time programming for the same device base.

--interpreter

Dialog-BASIC interpreter for various storage configurations;

--control program systems

An EIEX 1521 real-time control program system oriented toward internal storage for the various modules of the K 1520;

--programs independent of the operating system.

These basic modules are for fixed points, floating point and BCD operations and transformations. These modules execute basic arithmetic operations, basic mathematic functions and the necessary conversions. In addition there are hardware-connected routines for peripheral handling such as, for example, routines for punch tape units, magnetic stores, printers, EPROM programming

equipment, keyboards, monitors and V.24 interfaces. These make it possible for the user to use these peripherals without any special programming expenditure of his own. They are not bound to definite operating systems and so it is possible to have parallel operation with other programs.

Host computer system documentation is available for the following Robotron and ESR computers: Robotron 4000 process control computer; Robotron 4201 minicomputer system; and the OS/ES 4.1 MFT or MVT versions of an ESR computer.

This system documentation includes CROSS assembler, CROSS editor and a CROSS simulation and test system. All system documentation includes applications documentation consisting of applications and technical program descriptions. The applications description gives the user related information about applications areas, solution methods, limitations on use and the necessary hardware configuration as well as costs if the MOS is used for typical applications.

Although the applications description is intended for a broad reading public the technical program descriptions, such as the programmers', system programmers' and operators' handbooks, and language guides are intended to provide more detail and provide concrete and efficient applications ensuring professional use of the system documentation.

Applications

The applications possibilities for microcomputer technology are so various that it is not possible even to review the solutions already realized or under development. With this technology there are rationalization possibilities in virtually every area of industry and commerce, for ad hoc tasks but especially in automation of complex processes. In the broad area of process control the scale ranges from guiding the manufacture of simple consumer goods through control of machine tools and processing centers to chemical industry primary material manufacturing and auxiliary industries, control of power plants and the most recent generation of robots.

The Robotron enterprise can now list several thousand plants and institutions among the customers of its OEM system microcomputer technology products, primarily in the GDR but on the international market also.

Thus the economy of the GDR can show already an ample assortment of the most varied applications solutions realized with the microcomputer technology of Robotron. These include, among others, data recording and control for manufacturing processes in every branch of industry, condition checking and measurement in telecommunications, transportation, freight, the construction industry, environment protection and health affairs. Training devices in sports and not least of all the internationally recognized ski jumping measurement equipment prove the many-sided utility of the Robotron products. In what follows we will mention a few examples of applications already in use and proven.

--Energy conserving train control with a microcomputer

In the interest of reducing energy use all data pertaining to electrically driven trains and the route are fed into a microcomputer. As a result of optimization of energy use one can achieve energy savings of 15-20 percent.

--Control of traffic lights with a microcomputer depending on traffic

A flexible control technique corresponding to all traffic conditions was developed in the interest of saving fuel. The fuel saving is between 10 and 20 percent.

--IRS 600 freely programmed control for industrial robots

The IRS 600 is for control of industrial robots carrying out feeding, transporting and batching tasks. The controls are placed in a closed box and have a portable control panel in the interest of simple programming and control of the robot. With it one can program a maximum of three numerically controlled axes and with its aid one can handle several machines.

--CNC 600 and CNC 600-1 freely programmed numerical controls

These systems control cutting, drilling and lathe tools and complete processing centers and have been made expressly to control machine tools. The high reliability and high degree of integration of the microcomputer units and the great adaptability provided by the programming tools mean for the most varied tasks those advantages by virtue of which it became possible to develop complex controls.

--Wood industry

Automated billet cutting with computerized optimization for determined sizes, eliminating impermissible material faults.

--Metal, synthetics and textile industry

A radiometric measurement system for area sizes or to determine thickness of sheet materials in continuous manufacture of strip materials, automatically producing a controlled minus tolerance.

--Health affairs

Obstetric observation equipment to support the work of physicians and obstetric nurses, primarily connected to movement monitors in endangered pregnancies to prevent injury to the fetus or infant.

--Motor industry

Measurement of combustion processes to discover fuel use reserves, with direct connection of a fast transient storage and a K 1520 microcomputer.

Training

Training is divided into K 1520 hardware and K 1520 applications theme groups. In the hardware theme group one learns about the technical basic principles of the machine, structure and use of the modules of the central arithmetic unit, store and peripheral control, the test aids needed to put it into operation and the construction of a multi-processor system. The course is supplemented by exercises, debugging and writing one's own test aids. Separate courses deal with the peripherals which can be attached. In the applications theme group there is a description of what one needs to know about programming the U 808 D microprocessor, the basic instruction set for this, programming the U 85 peripheral circuits in the K 1520 assembly language and the basic modules of the operating routines. In these courses they discuss the different operating systems (real-time operating system), their structure, function, operating modes and uses. Training takes place in the training center in Berlin.

Technical customer service

The tasks of the customer service offices are:

- replacing defective assemblies;
- repairing defective assemblies in a specialized shop;
- delivering spare parts;
- on-the-spot repair of sudden failures with a short time limit.

In the case of special applications of the K 1520 microcomputer, especially in the case of OEM delivery, the prevention of failures by the customer has proven itself also.

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MICROCOMPUTERS OF SOCIALIST COUNTRIES

Budapest SZAMITASTECHNIKA in Hungarian Sep 83 p 5

[Article by Dr Peter Broczdo, main marketing department of SZAMALK [Computer Technology Applications Enterprise]: "Microcomputer Manufacture--The Micro Balance of the Manufacturers of the Socialist Countries"]

[Text] In the age of "miracle machines enclosed in glass cages" it was fairly easy to review the supply of computer technology devices. The manufacture of computers then could be the privilege of only the countries or firms with the most capital--as with ship or (with some exaggeration) airplane manufacture. They tried to manufacture the largest possible series of relatively few types.

The appearance of the microprocessors in 1972 let the genie out of the bottle. Today, the number of computer types being sold throughout the world is virtually infinite, the smaller capacity category of the computer market has become an unsurvivable jungle. Although the danger of unsurvability does not yet threaten in the socialist countries for the time being it is not at all certain that this is good for us.

Economic Guidance Effects

Due primarily to our economic guidance the various microcomputer types have not proliferated excessively in the socialist countries yet it is still possible to survey our microcomputer market. But there are considerable differences even among the economic guidance systems of the socialist countries. The offering of microcomputers well indicates in which countries planned management is tied down and where there is primarily a realization of market laws which are coupled with the high degree of enterprise independence indispensable for "survival."

Actually it looks as if the countries with fixed planned management developed one model per functional category and have begun to manufacture it. In the countries with greater enterprise independence (which means, in practice, only our homeland) virtually any institution in a related area can begin manufacture of a microcomputer for which it sees a market vacuum and thus the possibility for sales and profit. By institution we mean economic

units in the broadest sense, as practice also shows--state enterprises, industrial and agricultural cooperatives, economic work groups, social organizations, etc. This explains why the number of microcomputer types manufactured in our homeland is also as many as in the other European socialist countries combined. All this is now increasing. In Hungary, in 1982 alone, they began to manufacture 24 different microcomputer types. Microcomputer manufacture has become fashionable in our homeland.

It is a common aspect of the solutions used in the area of microelectronics that the individual countries make something which corresponds functionally to an already existing prototype. The attempt to develop something along a different path--so often tried and so often leading to failure--hardly appears here.

It has not been possible to realize that model standardization which was realized in the first common computer technology program of the socialist countries, in the Uniform Computer Technology System (ESZR). Although for the 8 bit machines the majority of the countries decided for the INTEL line--the IBM of microprocessor manufacture in regard to its traditions--the GDR manufacturers functional equivalents of the ZILOG and Bulgaria manufacturers functional equivalents of the MOTOROLA microprocessors. It must be noted, however, that the countries getting out of line are increasingly experiencing the difficulties of solitude (for example, their export is limited, their possibilities for software cooperation are limited). In Bulgaria especially there is a very sharp debate about how to proceed.

The actions of the socialist countries are much more uniform in the area of the larger capacity, 16 bit machines. Like dozens of firms in every part of the world the socialist countries too decided for the DEC line. No small role was played in strengthening uniformity by the fact that the Soviet Union began to manufacture that microprocessor relatively quickly and a version built into a one panel microcomputer was shown in our country at the Budapest International Fair last year.

Manufacture and Software Supply

It can be seen from the functional listing that every country is preparing to supply itself. Everyone is trying to manufacture virtually the entire functional scale. Instead of this a certain specialization, larger series, more concentrated applications software preparation, etc. should be obvious.

In regard to the operating systems used one can observe a slow shift toward CP/M as a "world standard."

Of the programming languages some version of the BASIC interpreter program can be run on practically every machine. There are differences in the area of the other high level languages, but one can observe that FORTRAN and COBOL are being gradually forced into the background while PASCAL comes forward.

The applications systems are the poorest. There are text processing program packages, an everyday thing in regard to its necessity, virtually only for

machines created for this purpose. . It would be better to disseminate program packages using the text editor WORDSTAR and the VISICALC which handles tables.

Microperipherals

At present the peripherals for microcomputers (including printers and floppy disk storage) represent the key to the success of the socialist micro-computer program.

Without peripherals the microcomputer is--to use a bizarre simile--only a giant without arms. Without a floppy disk storage it is not possible to store data files for any time or quickly read in larger data files. Without a printer one cannot write out in lasting form the results of the processing, the process or the source data.

Of the peripherals mentioned the floppy disk memories make the greater portion in the socialist countries, not least of all thanks to the Hungarian Optical Works. The floppy disk storages manufactured by it are much sought after on the socialist market; multiplying the quantity manufactured would easily find customers. In 1981 the Budapest Radio Technology Factory appeared at the Budapest International Fair with a microcassette storage of each high world level quality that it aroused great attention at the SICOB computer technology exhibit in Paris in 1982. In addition to our country Bulgaria, Czechoslovakia, Poland, the GDR and Romania manufacture floppy disk storages in the socialist countries.

Our backwardness in the area of printers which can be connected to micro-computers is a good bit greater. For example, even in 1982 a socialist microcomputer configuration had a printer designed for minicomputers and both in price and esthetics with some exaggeration--this looked like a flea beside an elephant.

After prolonged preparation the public could see a microprinter of socialist manufacture for the first time at this year's Leipzig fair, and several types too. The GDR showed two types of matrix printer (at 6 and 8.5 kilograms) and the Soviet Union had a thermal printer requiring special paper. The new thing here at home is that at the end of March the Computer Technology Coordination Institute prepared the null series of a microprinter called the MP 80 which will be manufactured by the Hungarian Optical Works. Poland, which has the greatest traditions in the area of manufacturing matrix printers, showed the D 100 microprinter at the Budapest International Fair this year.

Lessons

The tables show that the manufacture of microcomputers has begun in the socialist countries across a wide scale. This scale may be too wide--it would be better if we would specialize and make better use of the advantages deriving from the division of labor.

In the future we should strive for homogeneity instead of striving for peak technology.

In the area of developing applications we should turn greater attention to the basic branches (for example, education and health affairs).

Realizing all this could aid our further development on broader and more stable foundations in regard to microcomputers.

Micro and Minicomputer Types Manufactured by the Socialist Countries by Functional Group

	Bulgaria	Czecho- slovakia	Poland	Hungary	GDR	Romania	Soviet Union	Total
Universal micro- computers and intelligent terminals	3	7	4	41	10	9	4	78
Text processors	5	--	1	--	2	1	1	10
Graphic and picture processing computers	--	--	--	2	2	1	--	5
Data preparation and data collection	2	3	2	2	2	1	--	12
Development and analytical systems	5	2	--	4	2	--	1	14
Other special purpose machines	8	7	--	6	4	8	--	33
Central units which can be built in	--	3	--	--	3	--	1	7
Minicomputers	1	3	1	4	1	5	8	23
Total	24	25	8	59	26	25	15	182

Our country manufactures more universal microcomputer and intelligent terminal types (41) than the other socialist countries together (37)

Number of Micro and Minicomputer Types Manufactured by the Socialist Countries According to the Functional Equivalent of the Microprocessors Used

Microprocessor	Bulgaria	Czecho- slovakia	Poland	Hungary	GDR	Romania	Soviet Union	Total
INTEL	--	15	4	20	--	13	2	54
ZILOG	--	2	--	18	17	1	--	38
MOTOROLA	16	--	--	6	--	--	--	22
DEC	8	2	3	7	9	7	10	46
Other	--	6	1	8	--	4	3	22
Total	24	25	8	59	26	25	15	182

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COMPUTERS, MICROPROCESSORS, ECONOMY OF USSR

Budapest SZAMITASTECHNIKA in Hungarian Sep 83 p 8

[Article by Vladimir Myasnyikov, chief of the computer technology main directorate of the scientific and technical standing committee of the Council of Ministers of the Soviet Union]

[Text] In the Soviet Union in recent years more than 1,300 automated systems have been introduced to control complex technological processes. In a number of federated republics they have established the first stages of republic automated guidance systems (AIR's). There are now more than 3,000 computer centers, more than 2,500 automated enterprise and association guidance systems and 290 branch automated guidance systems in operation.

At a number of central organs work has been completed on development of the first stage of the AIR's--an automated system for plan calculations at the State Plan Committee of the Soviet Union, an automated guidance system for the Central Statistics Office of the Soviet Union and for the State Bank of the Soviet Union, a branch guidance system for state inventions and an automated data processing system for the State Price Committee.

Increasing efficiency in every link of the national economy depends primarily on the precise work of these systems because they help those responsible to foresee critical situations or disproportions and avoid them.

The automated enterprise and association guidance systems and the systems controlling technological processes are well known. These are widespread in metallurgy (more than 380 of them), in the chemical industry, in petrochemistry and petroleum processing (181), in petroleum extraction (about 80) and in energetics (more than 150).

The Economic Profit of the AIR's

The following factors determine the great economic effectiveness of the automated control systems for technological processes: a 5 percent increase in the productivity of equipment due to even operation, increasing annual production due to a more precise regulation of the production process, a reduction in consumption of primary materials, fuel and energy and in

operating personnel (manpower which becomes superfluous is used in other producing sectors); and people are freed of heavy work (in many cases of dangerous working conditions).

In the Pikalevo alumina producing association the automated guidance system for technological processes endures the waste-free processing of the nepheline ores. Optimization of the technological processes makes possible the production of 91,000 tons of cement, 6,000 tons of soda and 700 tons of potash in addition to the alumina. The productivity of work has increased substantially. In addition to producing more products the automation of technological processes has decreased use of electric power by 9.4 million kW/h, use of thermal energy by 386,000 GJ and use of fuel by 6,100 tons per year. Creating the guidance systems paid for itself in just 1.5 years. The technical solutions aimed at automated control of a waste-free technology in the processing of nepheline ores has been patented in the United States, the FRG and a number of other countries.

In the Soviet Union ever greater impetus is being given to the work aimed at creating automated systems for scientific research at scientific research and planning and designing organizations and automated design systems at enterprises of the Academy of Sciences of the Soviet Union and the scientific academies of the federated republics, industrial and construction industry ministries and chief authorities. These systems bring profit to the national economy. For example, an automated system for scientific research intended for common use accelerates 10 or even 20 times the processing of seismic and atmospheric-cosmic information and speeds up electronic experiments by 10-20 percent and experiments in the field of nuclear physics by 5-10 percent. Automated planning systems for investment projects have made it possible to save more than 3,000 tons of metal and more than 4,000 tons of concrete and accelerated planning work by 25 percent in the planning of the theater being built in Dzerzhinsk, the Zheleznovodsk sanatorium, the Barnaul theater and the Rustava House of Friendship, with foreign experts.

Development of Microprocessor Technology

In the past 10 years the efforts of the Soviet Union and other socialist countries have led to a swift development of computer technology.

In the Soviet Union special significance is attached to manufacture of microprocessors and microcomputers and their broad use in automation of machines, equipment and instruments and the creation of automated enterprises and technological systems on this basis. The appearance of the new type of supermini electronic devices--the microprocessors--at the beginning of the 1970's led to a significant reduction in the size of computer technology equipment, increasing their computational possibilities and reliability, and a significant reduction in their price and energy consumption.

The development of microprocessor technology and of control devices and computers based on them was extraordinarily swift. A new generation of microprocessors appears practically every two years, and they become obsolete in 3 or 4 years. The development of the newest electronic devices can be

attributed to the fact that to a gigantic extent this technology is being used for timely goals. According to some calculations microprocessors are being used in more than 200,000 different types of industrial and household devices and equipment, which in itself is a technical revolution.

Wide-scale use of microprocessor technology is leading to technical and social changes which change the character of education, reduce manual labor and mean that fewer people are employed in industry, commerce and administrative services. The microprocessor machines and instruments have better technical-economic indexes and fundamental new possibilities and are gradually forcing out or making noncompetitive products produced in the traditional way.

According to the estimates of experts about 250 million microprocessor systems and devices were operating in the world by the end of 1980. It can be hypothesized that by the year 2000 this number will increase to 5-10 billion, so that there will be one for every person.

Highly Integrated Circuits

Great attention is being turned in the Soviet Union to the development of the work being done in the area of microelectronics, especially in the area of developing and producing large or superlarge microprocessor integrated circuits. By the mid-1979's the first microprocessor highly integrated circuits had been produced and now they are producing about 10 different assortments of such highly integrated circuits, including integrated circuits being made for the chief applications areas. It should be emphasized that Soviet industry developed in its entirety all the technological equipment needed to manufacture highly integrated circuits. In the development and manufacture of highly integrated microprocessor circuits the technical policy employs a number of approaches which deviate from--for example--the methods of approach used in the United States. Among other things we feel that the extremely large catalog of microprocessors manufactured in the United States, which contains about 200 different sorts of highly integrated circuits, is hardly justified, since the number of basic microprocessors among them is only 50 and the rest are versions of them. In the Soviet Union they did not force a substantial growth in the types of microprocessor sets but rather they are oriented toward improving the quality of the microprocessors, standardizing them, etc.

Efficiency

Microprocessors and microcomputers have a number of new properties compared to their predecessors--the ordinary electronic computers. First among these is a substantial increase in the reliability of the work, which can be explained by the fact that the highly integrated circuits are manufactured in a sort of "monolithic" form. These do not have the less reliable soldering and contact connections. The power requirement is much smaller, amounting to only a few tens of or even a few mW per highly integrated circuit. The weight and size of the devices is also reduced substantially. Another

important factor among the advantages of microprocessors is the low price of highly integrated circuits--if they are manufactured on a mass scale.

All this has created the preconditions for wide-scale use of microprocessors and microprocessor circuits in data processing and control systems. We should mention two trends in their use. The first is the replacement of computer technology equipment by microprocessor systems and microelectronic computers in operating systems. The second is the conquest of new applications areas which were excluded from the use of computer technology devices prior to the appearance of microelectronic technology.

The use of microprocessor devices is efficient in already existing or planned automated systems serving to control technological processes. Among other things use of the SM-1800 Soviet microcomputer has increased 10 or 20 times the time of work done before stopping by the widely used SM-4 minicomputer. The costs are reduced to one seventh or one twentieth (3,000-30,000 rubles instead of 70,000-200,000 rubles), the power used is greatly reduced (200 W instead of 5-35kW) and the space needed to install a computer is reduced to a twentieth or a fiftieth part. The economic "success"--calculated per system--is 150,000-200,000 rubles.

In the new applications areas for microprocessor systems we might mention such examples as use of microprocessors in systems which ensure optimal operation of modern internal combustion auto motors and check the state of various aggregates of the autos. This makes possible a 7-13 percent reduction on specific fuel consumption, a decrease in the quantity of poisonous materials in the exhaust gases and an increase in the safety of traffic.

Great emphasis on new uses of microprocessor systems is being placed by both party and state. We might mention the resolutions of the 26th congress of the CPSU, one of which states: "...We should develop the manufacture of automatic manipulators (industrial robots), microprocessors and automatic control systems using electronic minicomputers and ensure their wide-spread use; we should establish automated shops and factories."

Standardization

Taking into consideration the large volume of work connected with microprocessor technical devices, great significance is attached in the Soviet Union to standardizing and making uniform the technical and programming tools to be used to create the systems. Thus the connection of units (remote sensing instruments, executing mechanisms, other complexes, etc.) and uniformization of technical devices is being realized on the basis of the main line module principle.

What is this principle? In the first place it presumes uniformization of the module organization of systems on the basis of a set of modules. This set includes both specialized and multifunction modules which, on the one hand, make it possible to reduce the expenditures devoted to designing systems and, on the other hand, make possible the efficiency needed for the

functioning of the systems. For example, we might mention the widely known CAMAC module system which has long been used successfully in the Soviet Union. In the second place the main line module principle presumes information exchange between functional and structural models at various levels, with the aid of main lines which unite input and output lines.

Soviet scientists are working actively in the area of selecting and standardizing system main lines. Naturally they are taking into consideration the existing international standards, plans for new standards and the proposals of international organizations.

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CONFERENCE ON ENTERPRISE, COMPETITION IN COMPUTER APPLICATIONS

Budapest SZAMITASTECHNIKA in Hungarian No 4, Apr 84 pp 1-2

[Article by Dr I. Sz.: "Enterprise and Competition in Computer Technology Application"]

[Text] The NJSZT [Janos Neumann Computer Technology Society], the Hungarian Industrial Law Protection Association, the Small Entrepreneurs Branch and Intellectual Products Marketing Branch of the Hungarian Chamber of Commerce, the Invention Club, the Creativity Work Committee and the Interdepartmental Technical Cooperation Organization of the Organizational and Leadership Sciences Society and the Innovation Circle organized a public debate under the title "Enterprise and Competition in Computer Technology" at the MTESZ [Federation of Technical and Natural Sciences Associations] headquarters.

On occasion a very spectacular competition accompanies and stimulates the development of computer technology. The development in this area is very lively for us too; indeed, competition has developed and increasingly a deliberate, and if necessary daring but not reckless, enterprise is becoming one of the tokens of success. The program gave a picture of this truly interesting theme of key importance with the aid of the invited guests.

The debate-initiating lecture was given by Dr Lajos Varga, chief of the Computer Technology Applications Main Department of the Central Statistics Office. In his lecture he dealt with supply and demand and the relationship between supply and demand. Before all else--as he analyzed it--we must examine whether there can be competition, whether the conditions necessary for competition are given, whether there is sufficient manpower, what the market balance is like and whether there is a market for computer technology products and services in Hungary today at all.

Supply

"Supply should be analyzed primarily in the mirror of competition possibilities. The value of the stock of computer technology devices in Hungary today is about 22 billion forints. The number of experts is more than 23,000 people. The annual economic performance of computer technology

applications organizations is about 6 billion forints. On the basis of all this it can be said that an economic activity of this scale does provide the possibility for the development of the basic market conditions.

"Since about 130 state owned undertakings and 560 small undertakings sell computer technology products and services in our country today it can be established that the possibilities for competition are ensured from the viewpoint of organizational preconditions as well.

"Naturally the market and the supply are not uniform. The price, quality, form of appearance, etc. of the products and services differ. For example, while there is great enterprising spirit in the area of selling machine time (see the newspaper advertisements) this cannot be said about the production of software.

"Small undertakings represent a significant supply factor in the area of computer technology. In 1982, 12 percent of all computer technology employees worked in small organizations, largely in economic work groups and enterprise economic work groups, which naturally is a significant percentage. At the same time the socialist sector, state ownership, has the determining role and ratio.

"Even if we know all this it is still worth examining why so many small undertakings have been established in the area of computer technology. The most important factors are the following: usually, there is no need for startup capital in the beginning; generally the tools can be leased later. Even internationally it is true that in the area of software, for example, large numbers of small organizations take part in this activity; the demand in connection with the software crisis is very great, creative work comes to the fore in the small undertakings, and the possibility of making money is increasing also. It is an important incentive that due to the character of computer technology applications activity the professionals are experienced in the economic and legal regulation, and there is no lack of enterprising spirit.

"Finally, it is very essential that the small undertakings that have been formed and are operating actually play a gap-filling role in undertaking smaller jobs. These factors (which can be listed for the development of the small undertakings) are special ones and on the basis of them this branch cannot be used as a generally valid example to prove the general advantages or disadvantages of small undertakings.

"The sales receipts or market shares of the small organizations was 250 million forints in 1982. This is about 6 percent of the market. In the first half of last year this share reached 10 percent and it can be expected that the data for the year will be about this also. Presuming that the market for computer technology products and services also increased by 10 percent last year--as yet we do not have final data--it can be said that the small organizations did not grow primarily at the expense of the state enterprises but rather, basically, they occupied the free areas of the

market or, to put it a little more pointedly, it might be said that they did not hold back the growth of the technology firms specializing in large computers. At the same time, there can be no doubt that even in the past year the growth in the number of small organizations was dynamic. Obviously this was possible because they satisfied a real demand.

"It is not without interest to examine what effect the small organizations might have on the development of flexible market behavior. Under flexible market conditions an increase in profit depends on fast throughput, a reduction of costs and losses, swift fulfillment of orders and economical use of resources.

"What effect do the small undertakings have on the price level? What points in the direction of a decrease in the price level? Why is it that the small organizations work more cheaply? The price-reducing effect of the small organizations could derive from the expertise of the work force, from the way work is done, from savings in infrastructural costs due to large volume and frequently superfluous overhead and from the small size of the organization. In addition these organizations are forced to reduce prices, because they will become truly competitive only if they are substantially cheaper and faster than the traditional organizations. It also points in the direction of a price reduction that the customers are weighing the prices being offered by the various organizations. It is already characteristic that customers are increasingly inclined to bargain. As a result of this the favorable bidding possibilities of the small organizations are increasingly prompting the traditional large organizations to offer more moderate bids.

"In addition to the above, naturally, it is also true that there are factors which point in the direction of an increasing price level. Two of these might be mentioned. One is that the large organizations are trying to make up for the lost sales receipts or profit. Since the figures show that their market share is decisive the danger exists that the market balance will develop with lower performance and a higher price level. The other factor is that ensuring compatibility, especially in the case of software, demands a complex, extensive and thus expensive control system, which further increases the already high costs of the enterprises, and which then must be passed on. Even with these latter two factors, which go in the direction of an increase, we feel that a decrease in the price level as a whole is probable, and the interventions and moral attitude of the state have an effect in this direction also. At the same time there can be no doubt that the actual price regulating effect of the market will not be fully and entirely realized."

Demand

"Determining demand is a much more difficult task at the national and enterprise level alike. This is especially difficult since very little data about the market are available--about its size and structure. As an approximation we might be aided by an awareness of the solvent demand appearing in the stock of orders for known product and service groups.

"In 1982 the investment in computer technology devices was 2.8 billion forints, and this grew by about 15 percent in 1983. International experience shows that an investment of one unit value in traditional computers requires the production or acquisition of 0.3 units of software; this figure is one unit or more for microcomputers. At least a quarter of this software is prepared by professional organizations, not for their own use. Since some of the software products (for which a demand is appearing already) are already prepared and available, we can say that each year a software demand of one billion forints will appear on the market. We must be aware of the software existing in the country, with an estimated market value of about 3 billion forints at this time and constantly growing, and that during a life cycle averaging 4-5 years it is customary to turn 20-60 percent of the price of the software to adaptation and modification. This also represents demand. According to our calculations it comes to about 300 million forints per year.

"There is another method too, when we try to determine the upper limit of demand. As a result of it we can say that the value of the information activities in the national economy can be estimated at 120-150 billion forints. Despite the imprecision of the method it is certainly good enough to indicate the size of the potential market, especially if we compare this value to the present production value of about 3 billion forints."

The Relationship of Supply and Demand

"First we should examine the development of prices. The price of computer technology activities in recent years, as we all know, has essentially stagnated. This means that products and services--relatively speaking--have become cheaper. But it is also true that this stagnation is not general. For example, fees for machine time have decreased, in accordance with our goals, but at the same time the price of intellectual input and software has increased to a certain extent. If we examine the use level of machine capacity we can say that machine utilization here does not reach the level that is technically possible nationwide. This suggests that the computer technology organizations are not being forced to maximum device exploitation and are not using their surplus capacity to offer product or external services. Despite the fact that international comparisons are vague and clumsy (due to the lack of real comparability of the data themselves) we can still say of machine utilization that in Hungary the average productive machine time of machines with a storage capacity greater than 64 K bytes is 2,400 hours per year. In Czechoslovakia the figure is about 2,900 and in Bulgaria about 2,700. We cannot speak of a saturation of the market. There is no oversupply. The small organizations are appearing on a mass scale; but they do not represent competition for the large organizations.

"As for the arena of competition we can say that it takes place primarily in the area of the smaller software jobs. It is also true that the traditional organizations are increasingly entering the lists for this type of work. I think that the arena of competition is further expanded by the fact that today, to an increasing extent, more balanced, decentralized

developments are taking the place of the development of the gigantic information systems we got used to in an earlier decade. I believe that the appearance of the microcomputers and the great increase in their numbers point in this direction also.

"The organization of the market is still unambiguously weak today. We cannot report many successes in the area of cooperation or the division of labor. The lack of performance constraints also strengthens this phenomenon.

"After such factors, how should we judge the development and especially the direction of competition? I feel that it will have an effect in the direction of sharpening competition that the large budgetary customers have withdrawn from or are withdrawing from the market and that their place is being taken by much smaller enterprises, cooperatives and in many cases small organization customers. Also pointing in this direction is the fact that the stock of computers has increased with the massive spread of mini and microcomputers; this also increases the copies of software products which can be sold. Obviously this will have an effect on the size of the market. At the same time it points to the direction of a decrease in competition that there is a traditionally developed division of labor among the large organizations; and we might list here the existing differences in the assets supply or device level of the small and large organizations as well. It is not independent of competition that even in the area of our profession competitive bidding has appeared, although the ratio of this is not yet significant and even if it exists the rivalry does not extend to the entire sphere of market and manufacturers. Supply has improved quantitatively and qualitatively and in variety. The market is moving in the direction of a balanced situation.

"What sorts of factors, in addition to these, influence the market? The professional, state-owned organizations have strengthened in numbers and in performance. The sale of computer technology capacity of organizations which do other sorts of work as their chief activity has increased. In the given economic situation the value of data and information and especially of end-products which can be produced by virtue of quickly accessible, well organized computer technology activity has been upgraded. One can observe a certain specialization among organizations in the area of small and large undertakings alike. The small organization wants to advance its position in the direction of small volume work; the large organization is striving for mass production, large volume, labor intensive, machine time intensive jobs.

"In conclusion I would like to say that in my judgment competition in the application of computer technology is taking its initial steps, and is most limited. Without doubt we may be witnessing a fairly large increase, but this quickening has not found the market for computer technology products and services entirely prepared; the market conditions have not developed yet. Assorted institutions and semimarket methods are having various effects. So when we study the market for computer technology products and services we must determine the common essence of contradictory trends," Dr Lajos Varga concluded his debate-initiating talk.

Opinions

Then--as invited guests--Peter Bartok (KERSZI, Technical VGM), Jozsef Kekesi (Golden Ear Mgtasz, Rackeve, Organization and Computer Technology Group), Dr Jozsef Kondricz (director general, KSH SZUV [Central Statistics Office, Computer Technology and Management Organization Enterprise], Karoly Pogany (director, Comporgan), and Isztvan Zitas (GTI [Machine Industry Technological Institute] Process Organization VGM) described the practice which had developed in their own organizations and gave their own opinions. Due to the nature of the matter the opinions and ideas differed greatly from one another, and in addition to just desires there were very many recommendations proposed which contained notes of uncertainty, doubt and immaturity. On the basis of not only what was said but also of other information it was apparent that enterprising spirit has increased primarily in the direction of carrying out tasks which pay relatively well and require less work and machine time. Not only is there stagnation in regard to solving the large computer technology tasks, but it is to be feared that with the opting out of a few key people it will be further delayed and frustrated....

Especially interesting were the proposals directed at a redefinition of otherwise recognized economic categories and at setting the regulations and game rules for competition. Listening to the ideas, practices and opinions, many of which contradicted one another, the audience justly recommended that the debate should not be closed but rather must be continued on the basis of what was said in the interest of the clear vision of all of us and of the more effective operation of the economy.

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ACHIEVEMENTS OF VIDEOTON FOREIGN TRADE ENTERPRISE

Budapest SZAMITASTECHNIKA in Hungarian No 4, Apr 84 pp 1-2

[Unsigned article: "The Videoton Industrial Foreign Trade Company is 15 Years Old"]

[Text] Fifteen years ago, in February 1969, two industrial enterprises, the Videoton Radio and Television Factory and the Budapest Radio Technology Factory, established the Videoton Industrial Foreign Trade Company, which was joined in 1973 by the Hungarian Optical Works, with its computer technology profile.

During these 15 years the trade of the enterprise has increased 1/4-fold; in the initial year, 1969, it was 488 million forints; in 1983 it reached 7 billion forints.

Computer technology export began in 1971 when they shipped five ES 1010 computers and MOM [Hungarian Optical Works] punch tape peripherals to the Soviet Union. In 1979 the Videoplex data collection systems were delivered for capitalist export and socialist export of the ES 1011 computers began at this time also. Since 1982 the MOM floppy disks have been exported to capitalist countries. Their latest export products is the SM-52, two-mode megamini computer.

The member enterprises must keep up with the leading products of the world market. The MOM is constantly increasing the storage capacity of the fixed head disks and increasing the specific capacity of the floppy disks by decreasing their size. New products of the near future will be Winchester disks.

Development of the Videoton display family--including their color and graphic displays--takes place by using the most modern technologies.

The goal is a further expansion of service and system export, for the price of these shows a constantly rising trend on the world market.

In the ESR-MSR member countries the 1100 Videoton computer system--there are 755 of them in the Soviet Union, 186 in Czechoslovakia and 132 in the GDR--are operating in such important economic branches as the petroleum and natural gas industry, rail transportation, air transportation, energetics

and geological research. In addition, they have exported several thousand peripherals--screen displays, line printers, fixed head and floppy disks.

Last year, 74 percent of the trade of the enterprise derived from ESR-MSR computer technology devices.

The Videoton Company handles nearly 90 percent of the Hungarian export obligations undertaken within the framework of the ESR-MSR program. The commodity structure of the non-ruble accounting export is characterized by an increase in the ratio of computer technology devices; in 1983 this ratio was 56 percent.

A software trading department has also been working in the Videoton Company since 1983; static program packages have been sold in Switzerland and Norway and the BORA tourism program package developed for travel offices has been sold in the FRG.

Thus far the products of the member enterprises have gone to 45 countries. In the interest of effective market and customer service work they have established commercial technology centers in Moscow, Prague, Berlin, Sofia and Warsaw and there is a Videoton Office in Helsinki and Belgrade.

On the basis of the experiences and achievements of the past 15 years it can be said that the Videoton Company has proven an efficient model for the successful realization of direct cooperation and common interest between industry and foreign trade.

The direct acquisition and feedback of market information aid the development of a common marketing strategy which takes the value judgment of the market into consideration in the course of research and development product design and price formation.

Composition of the 1983 Trade of the Videoton Industrial Foreign Trade Company (in millions of forints)

<u>Category</u>	<u>Ruble Accounting Trade</u>	<u>Non-Ruble Accounting Trade</u>
<u>Export:</u>		
Signal technology	1,274.7	478.1
Computer technology	3,834.0	575.4
Total	5,108.7	1,053.5
<u>Import:</u>		
Signal technology	7.6	30.4
Computer technology	329.1	470.7
Total	336.7	501.1
<u>Export and Import Total</u>	5,445.4	1,554.6

HUNGARIAN IC PRODUCING FACILITY OF SOVIET ORIGIN DESCRIBED

Budapest ORSZAG VILAG in Hungarian No 19, 9 May 84 pp 16-18

[Report by Peter Bencze Szabo: "No Progress Without Chips: Background Industry of Evolving Microelectronics"]

[Excerpts] The MEV [Mikroelektronikai Vallalat, Microelectronics Enterprise] was established 2 years ago through the amalgamation of the Communications Technology Research Institute [Hiradastechnikai Kutato Intezet], the main department for semiconductor development of United Incandescent [Egyesult Izzo] and the Gyongyos Semiconductor and Machine Factory of United Incandescent. According to MEV technical director, Ferenc Banyai, the government program requires MEV to implement its IC production program in two stages: First, a silicon semiconductor wafer processing plant having an annual capacity of 60,000 wafers was established; this MOS production line was put into operation in April of this year. A second, using bipolar technology and also having an annual capacity of 60,000 semiconductor wafers, must be completed in 1985.

Up to now, Hungary has been spending \$35 million and nearly 20 million rubles purchasing ICs. Since ICs--chips--are much in demand, not all required by industry were available, and some were unattainable because they were and still are embargoed. By producing chips, MEV aims to eliminate capitalist imports while parts obtained from socialist countries are to be paid for in kind: delivery of Hungarian ICs or chips rather than payment in rubles.

Implementation of the nearly 2 billion [forint?] investment for producing chips necessitated purchase of technology. Most of the basic material, silicon, came from the USSR. Hungarian engineers cooperated with the Soviet Licencinterorg, enterprises of the Ministry of Electronics and especially with the Meson factory in Kishinev through interstate agreements. While Soviet specialists installed the equipment at Ujpest, technicians from MEV were trained at Kishinev. Csaba Rozsaheyi, head of the photolithography laboratory was our guide through the MOS element production line. One must pass through a dressing room to don helmet, shoes and shoe covers, then pass through the 10,000 and 100-zone dust removing area. The figures indicate the number of dust particles permitted in a cubic foot of air. Air around the production line is continuously circulated and filtered. There are less than three dust particles per cubic foot in the 100 zone. One enters the first station of the technological process after having

been vacuum cleaned in the lock chamber. At this first station, the surface of the silicon wafer is chemically cleaned. The work is performed by females wearing white hoods. Their supervisor is chemical engineer, Mrs Gergely Toth, who was trained in all phases of the work for 3 weeks at the Meson factory in Kishinev. The Soviet teachers used a very strict batch control system which has been adopted at MEV.

Of the about 70 operations involved in chip production, heat treatment is very important. Gas atoms are burnt with exceeding accuracy into the crystal structure of the silicon wafers at a temperature of 1,300 Celsius through a microprocessor controlled process. The work is performed chiefly by engineers and physicists, but skilled workers and trainees are used also.

Special courses have been organized by the Communist Youth League of Hungary for persons interested in the manufacture of chips. The ministry granted permission for such training courses. To date, there have been 300 graduates. Before being hired, applicants are screened carefully. They must be disciplined, calm, prepared to work without unscheduled coffee or cigarette breaks. For this type of self-control, the technicians receive a 400-forint wage supplement.

A special, microprocessor-controlled device implants impurities into the silicon wafers to make the conductive. After this comes photolithography. The photolithography room is bathed in yellow light. Electromicroscopes stand on tables placed by the walls. Women photograph the circuit diagrams onto the surfaces of the wafers. The finished chips are sent to the Gyongyos plant for assembling, encasing, calibration and are put into circulation from there.

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INITIAL STEPS IN UTILIZATION OF ROBOTS

Budapest NEPSZABADSAG in Hungarian 26 May 84 p 5

[Article by Katalin Bossanyi: "Here is the Robot, But Where is the User?"]

[Text] Next year--if everything is true--a robot program initiated by the Ministry of Industry will get started in industry to accelerate domestic development, manufacture and use. What can be seen of the preparations at the Budapest International Fair?

It is the custom to say that a thing is so beautiful you expect it to speak! Well, to the surprise of the people around the stand at the fair the CNC controlled lathe of the Machine Tool Industry Works--which is served by a robot being made as a result of Japanese-Bulgarian cooperation--does speak. When I was there it was telling the expert taking care of it that one of the tools had to be replaced. Robotization fits well the developmental aspirations of the SZIM [Machine Tool Industry Works]; they want to supplement their processing centers and machine lines with smart machines which can be obtained primarily from socialist import. And although the initial experiences are reassuring--as Gabor Horacsek, commercial director, said--the machine systems developed in this way cannot at all do without a human being. Because of background industry deficiencies their operation is not entirely automatic. The SZIM would be willing to undertake to manufacture some of the supplementary equipment, but they would like to obtain the majority from various domestic partners. But the enterprising spirit is weak, although these tools--with traditional technologiess--could further, for example, supplementary automation. It also represents a problem that today a robot-machine tool combination is quite expensive. Thus, for example, Raba has declined to buy the manufacturing system developed for it so, after the fair, the SZIM will operate it, for the time being, in its own brake manufacturing plant.

The Csepel Machine Tool Factory is also displaying here its CNC lathe supplemented by a robot developed independently by the Bulgarians; a Budapest International Fair prize recognized the import savings. The robot tests of the people at Csepel reaped success first abroad--one of their manufacturing cells like this has been working for 2 years in the FRG. But last year the ice was broken here at home too, and since then the

Csepel Auto Factory has been using the outstandingly efficient equipment with satisfaction. This year the Soviet Union is buying from them six such machine tools which can be supplemented with robots, and deliveries may expand further next year.

Laszlo Szabo, director of the Csepel Individual Machine Factory, will talk today only in the future tense; manufacture of hot plant service robots will begin within a year on the basis of a license from the Japanese Daido firm. The gigantic industrial manipulators can move workpieces from 30 to 1,000 kilograms. After prolonged discussions the deal was signed recently, with very advantageous market conditions for us too. This essential, because even though the need to use robots taking the place of difficult, dangerous human work in metallurgical plants would be great here at home too, one can count on only a slow domestic spread due to more comprehensive management problems. They are now working on adaptation of the documentation, and plan to set up the first reference plant at the forging and trimming press of the Csepel Iron Works. And although the Csepel people are confident the example of the people at Mosonmagyaróvár warns them to be a little cautious; years ago Mofem bought from the Swedish ASEA firm a license for a casting machine supplemented with a manipulator. They use the practical equipment themselves, primarily, or they export it. Here at home they have not yet sold one.

At the MTA [Hungarian Academy of Sciences] pavilion there is a little screen for demonstration purposes only; on it even the uninitiated can watch parts moving on a miniature conveyor belt. They have been dealing here for a long time with the development of controls for form-recognition robots. Closely related to this--for control is the soul of the robot--are the efforts of the Microelectronics Enterprise also. It appears that the MEV [Microelectronics Enterprise] finally made a good marriage when, a year and a half ago, they joined with the former Gyongyos machine factory of United Incandescent. Even earlier they made here, for a Soviet order, manipulators to reload television picture tubes, and here also they further developed a control for manipulators serving machine presses. With the joining of microelectronics and precision engineering, making use of the expertise developed at the two enterprises, joint developments have already been born also. The microprocessor industrial control system shown at the fair indicates this as well. They continue to export manipulators. Experiments with the so-called intelligent control robots--that is, freely programmable or teachable--may accelerate. Although there is no market here at home the development and manufacture of measurement automats seems most promising since a few types of them have been assigned to Hungary within CEMA. All this will require larger series manufacture, so not long ago the MEV transferred this product to the Electronic Measuring Factory, where their manufacture can be organized more economically, together with the various controls.

The development and spread of electronics and robotization are proceeding on a single track. And if we have a chance to make up our significant phase delay, even compared to the socialist countries, the new developments of the domestic electronics and instrument industries will provide a guarantee for it. I received from Janos Gantner, technical director of the

computer technology factory of Videoton, the most obvious examples of how advantageously the two trades can supplement one another. Among the not too distant plants of the large enterprise figures the development and manufacture of small assembly robots and microcomputers suitable for control of robots. First of all they want to increase the productivity of their own factories with these, then they will offer them to other users. In any case it can be seen that the enterprises flirting with the development and manufacture of robots are in general those which can use the clever machines themselves. The same thing could be seen years ago in the case of the spread of assembly technology devices which can be called the forerunners of robotization. The Bakony Works gave elegant proof of this at the fair--they displayed here their automatic assembly line developed for the BRG [Budapest Radio Technology Factory]--but it is also shown by the reloading manipulators and universal assembly conveyor-belts of RECARD in Győr and of the Monori Agricultural Machine Factory. By and large this tendency can be experienced in the processing industry use of supplementary automation, in the additions to special purpose machines and in the broader spread of process control, measurement and control technology.

And this certainly indicates two things. For example, that the robot program for next year is in vain if the conditions of regulation do not change, if the enterprises continue to be insufficiently interested in the use of modern technology. (Simply making live work more expensive is little in itself in this regard.) But it is not only the narrow financial possibilities which explain the slow spread thus far of various tools which increase efficiency. Robots, manipulators, assembly techniques and controls can be operated economically and efficiently only where the organization of production is at a level corresponding to it, where the performance of work is disciplined and the supply of material continuous. Even today a significant proportion of our processing industry does not meet these criteria.

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ACADEMICIAN VAMOS INTERVIEWED ON AUTOMATION RELATED PROBLEMS

Budapest NEPSZABADSAG in Hungarian 30 Jun 84 p 5

[Interview with Academician Tibor Vamos by Judit Kozma; date and place not specified]

[Excerpts] [Answer] The present interest of science is concentrated chiefly on the guidance problems for large, complex systems, and their technical, economic and social questions.

These subjects will be on the agenda of the world congress of the International Automation Federation. A lecture will be delivered, for example, on the theory of large systems, biological systems, the artificial heart and the manifold social effects of automation. Among other things, we will deal with the man-machine relationship, with the problems of unemployment, and with questions regarding incentives to and regulation of economic organizations. The lectures will show a not too distant future, and for this reason, too, the congress is of great importance.

[Question] There are already factories in the world which operate with computerized planning and factory guidance, with robots guided by computers, and almost without human supervision. But in Hungary this hardly belongs to the picture of the near future, and this points to a very important gap between the most developed technology and our technological level.

[Answer] We cannot measure exactly how big this gap is, and it has greatly varying features. Such a feature, for example, is the difference between Japanese quality and the quality of products manufactured in other countries. Moreover, this gap developed in different ways in various areas. Particularly important to us from the viewpoint of the future is the study of the kind of advanced technologies which have leaped to the fore in the industrially developed countries, and those which have done so to a lesser extent. Experience shows that those areas have developed which are paired with very flexible structures and are supported by technologies requiring great precision and high quality. These are the two areas where our lag is the most characteristic. But if we recognize this and are capable of modernizing the structure and of improving essentially the work culture, we can have hope that the lag will not increase.

[Question] Many maintain that in response to the world-wide accelerated technical development we shall find ourselves facing an entirely different structure with another economic cycle, and if we do not prepare ourselves, we will fall behind. What do you think, what are our chances, and to what kind of condition is our improvement tied?

[Answer] In judging our situation there can be two bad extremes. One covers up our troubles and takes pride in the fact that in some areas we are at world level, which is not true, however, in this way. The other presents an even more dangerous way of thinking and feels that we are in a hopeless position in vanguard technical development, and as a consequence we can do no more than be the wage workers of large countries. Both extremes are very dangerous. In the coming period the small countries must also find their own possibilities for world cooperation, and it seems that with the new means for automation there will be more opportunity to do this than before.

In the recent past the large mass production technologies stood in the forefront of interest, and the basic economic concept was profitable serial magnitude. In quite a few areas this will still continue to be the case, but we must also count on important shifts. By virtue of automation, flexible manufacturing possibilities, and computerized production technologies, the possibility will exist of making individual products with mass-manufacturing technologies. The demand has greatly increased for more specific products and for greater satisfaction of particular local demands. Twenty or 30 years ago, for example, it was not as important as it is today for the women of Budapest not to see other women on the street with clothes like their own. Today this desire is almost natural. A similar change has occurred in many different kinds of products--the demand and the possibility, on the basis of present-day technologies, will continue to grow for the manufacture of specific products.

Let Us Be the Small Industrialists of International Cooperation

The question is whether we can acquire here in Hungary the developed, new technology, whether we are capable of creating this base. It is my opinion that we can within certain limits. If we look at the investment which Hungary implemented in the first half of the 1970's and up to 1978 in the period of big industrial construction, we see that a better thought-out and higher level investment of similar dimensions could have carried us farther ahead. At the same time, within this period the numerical guidance technology became quite widely extended and we were able ourselves to manufacture good numerical guidance equipment. We were also able in the technology of the electronics industry to make relatively modern products, which today, however, have become obsolete, and which we were not able to support with a developed spare parts industry. This was not primarily due to material causes but to erroneous and delayed decisions. Despite the fact that due partly to economic difficulties and partly to changes in the world situation our acquisition possibilities have deteriorated, we can still implement programs which in the coming years will provide Hungary with a better technological base.

[Question] What kinds of programs might these be?

[Answer] We cannot imitate Japan, the United States or the Soviet Union but must work out a model adapted to our own relations and possibilities. In the coming period we must by all means strengthen those technological bases which are the carriers of the new technology. For this it is indispensably necessary to have an electronics industry not in order to make our country competitive in electronic products with Japan or even Taiwan but because through this we will be able to raise the level of our own industry and help in its adjustment to environmental relations. The other area representing a high level and new technology, in which we have traditions and should without delay take steps to move ahead, is the precision machine industry. We must strengthen these sub-branches not for themselves but because they can provide drawing power and the technical base for flexible development in any direction.

This strategy can be the road to follow to make us a small industrial country in international cooperation. We must constantly break into those gaps which the manufacturers who dominate the world market leave open so that we can adapt with mobility to changes and the specialized requirements of the buyers. But our ability to meet demands which change daily or at least every few months could be the basis for these two technologies being strong in Hungary. Truly flexible organizations are able to transform themselves within several months to meet new demands. I see a very great opportunity in this for our positions on the world market and to guard the position we have occupied in international trade.

Key Question Is the Level of Industrial Leadership

To do this, it is extremely important for Hungary to have its own relatively strong products. The possibility is fading for the country to export medium quality and technical level mass products in the framework of long-term agreements without a technical development base. In fact, one of the causes for the deterioration of the base was the fact that we were able to move into the path of least resistance: we had some agreements under which we took over the entire technology, took over the product, and since labor in Hungary was relatively cheap and there was an economic upswing in the world we were able to make deliveries without limits. This is the explanation why in the 1970's and even at the beginning of this decade the Hungarian economy did not feel the need for technical development. It did not feel that the situation would change radically and that we will be able to adapt only if we can show our own strong products in cooperation, which would give us the opportunity to acquire by way of exchange all that in Hungary, a small country, is lacking for a research-development and production base.

[Question] To what extent have we recognized the change, the need for faster technical development?

[Answer] It would be hard to say who has recognized the need for renovation and to what extent. It is certain, however, that the judgment of technical development has changed in the most recent years. The question today is what are our possibilities for speeding up technical development in the present tight situation.

[Question] But our possibilities are apparently limited by the fact that the enterprises find it hard to welcome the new, the inclination toward innovation is weak as well as the adaptability of the economy. What is the explanation of this and how can we create more favorable conditions for moving ahead?

[Answer] There are three important factors behind the weakness of the readiness for innovation. One, which I have already mentioned, is that the importance of technical development has been devalued in recent decades because the economy was not adequately sensitive to the necessity for it. A role was also played in this by the quality of leadership, for it is not a matter of indifference whom we entrust technical development to. One of the key questions of the future is whether we can strengthen to a very great extent the circle of talented, ambitious and well-trained industrial leaders. I know quite a few enterprise managers who can work well only over the short run according to balances of the moment. Frequently the standard is not even actual achievement but a question of how the manager handles himself at conferences and what kind of relations he has with higher authorities. A strong increase in the level of industrial leadership is therefore a vital question. The third factor, which explains the slow development but does not excuse it and must be changed, is that incentive has shifted vigorously toward short-term goals. When they analyzed, for example, in the United States what the reasons were for its lag as compared to Japan they found the explanation in the fact that motivation in America is short term and in Japan long term. In Hungary, too, we must strengthen strategic thinking.

This must also include respect for the technical intelligentsia. It is an impossible situation, for example, if the young technical experts, in order to assure their conditions of existence, must give up their technical development ambitions, and perform some other kind of engineering work, even if it is of lesser importance. Therefore as in society as a whole, we must by all means secure for the technical intelligentsia respect for the main occupation.

The Engineer Establishes a New World

The engineer, the cultivator of technical science, precisely because his activity is vital for the future, is not a simple artisan but the maker of a new world. Therefore, the social situation of the engineers and their sense of responsibility must also be raised to this level. For this reason it is necessary that society should respect the engineers according to their role. From another aspect, however, we need engineers who are able to think not only in narrow technical reality but also in systems, and in the technical, economic and social interconnections of their task. Unfortunately we barely have such a generation of engineers. The conservative way of thinking which has been realized for a long time in the judgment of technical work has pushed the tensions and value systems of Hungarian technical society into a mistaken direction, and this will have a retrogressive effect also over the long run.

[Question] Is education capable of producing such engineers?

[Answer] Great efforts are being made to make education suitable. The new resolution regarding higher education also strives for this. Like elsewhere, it is true here, too, that we must improve the quality of a whole generation of teachers and create a tremendous amount of means. There are many objective obstacles to realizing these good intentions, and as long as the objective conditions are not brought together, we will not be able to do anything. The task is urgent--and meanwhile we shall be creating conditions as well.

[Question] All that we have discussed thus far about the technical development goals, necessarily touch at many points on the strategy of industrial development. The question inevitably arises: what role can a central technical development policy have, and what can we leave to the compulsory strength of the market and competition?

[Answer] For this we cannot set up a general rule. For the improvement of our technical progress and our international competitiveness we must develop those sub-branches which have drawing power and carry technologies critical to the future. Among other things, this is how the new material and energy saving solutions can be developed as well as the new or essentially improved basic materials, the fine chemical procedures which are important for chemical technologies, and so forth. These areas represent important changes not only in characteristic economic results but also in their environment-forming effect, for they draw in their wake many other areas of development. It is not by accident that the desirable industrial development directions are linked together as well as the infrastructural developments that increase the countries' technical culture.

No precise formula can be given for how all this can be achieved. From time to time we meet people who take the position that technical development is an enterprise category. This is not true of a single country today. On the other hand, the opposite extreme is also untrue, namely, that technical development is exclusively a state task. There are strategic goals and shorter term choices from among which it is possible to choose. But there are important differences also among the individual sub-branches and the enterprises. For example, the multinational IBM employs 400,000 persons. Within an enterprise of this size it is certainly possible to solve many more problems than, for example, in the Communications Technology Federation. Babolna can achieve with its own means something other than in a medium-size producer cooperative. Among large and small enterprises each has its own role, and it would be a very great mistake if we put a uniform on all our problems.

Conditions Should Influence Technical Development

This much is certain: for the acceleration of technical development we have a great need--as the lack of it led to the devaluation of technical development--for the economy to feel thoroughly its necessity; the economic conditions should influence technical development.

The influence should be multi-directional. This refers to the enterprises, the population's demands--for the possibility of the growth of work culture depends on this--and those democratic forums where the population's demands

must be conceived. All this also refers to the highest authorities, for much also depends on the direction in which they lead the value system with which they judge the enterprises. The speeding up of technical development is a problem for all of society, and basic enterprise, economic guidance and social tasks are linked to its solution, and these cannot be considered separately. From our experiences about the operation of large systems we must learn that the matters are terribly complicated and must be handled in a manifold way.

Let us wind our way back to automation. It is frequently asked what will be the task of people if we automate everything. The task of people will be to find the best solution for complicated tasks, the most efficient means of solution. Technical development incredibly increases the role of human knowledge, its importance, and at the same time it brings qualitatively different tasks. This is all the more important because in our present period our situation is determined primarily by the human factor. This is where there is the most to do, it is by virtue of this that we can give a positive answer to the challenges of change going on in the world.

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VAMOS SAYS IFAC TIES UNBROKEN BY POLITICS

Budapest FIGYELO in Hungarian 21 Jun 84 p 7

[Interview with Tibor Vamos, academician, by Judit Bertalanfy, reporter: "The Bridge Is the Important Thing..."]

[Text] The Ninth World Congress of the International Automation Association (IFAC) is being held between 2-6 July in Budapest. Tibor Vamos, academician, the current president of IFAC, was questioned by Judit Bertalanfy, reporter, about the significance of the congress and of automation.

[Question] Please, describe the association and its function.

[Answer] The technical and scientific organizations or academies of 41 nations are members of IFAC. Every important industrial country--without discrimination--is participating in its work. It deals with the more restricted areas of automation in general, with the guidance problems of technical, biological, economic and social systems. In these seemingly different thematic areas, there is extraordinarily much that is identical, for instance, the guidance theories, modelling and structural problems or methods of organization. The spectrum is very broad, ranging from the guidance of power plants and energy systems, governing of tool-machines and robot technology, chemical, cement or food-industry plants, paper industry, guidance technology in space flights, and infrastructure systems from irrigation networks to environmental protection.

The association holds its congress every 3 years and 20-30 symposia are held worldwide during the in-between period. It is a significant honor that, after Moscow, Basel, London, Warsaw, Paris, Boston, Helsinki and Kyoto, nearly 1,000 scientists will convene in Budapest. The next congress will be held in Munich because my successor in the presidential chair will be from the FRG.

[Question] The motto of the congress is: "Bridge between scientific guidance and technology." It is as if this wish would also have some political coloration.

[Answer] Yes, the bridge is the important thing here, in every respect. It is our conviction that, with the help of the tools of the systems theory, international stability can also be improved. The general scientific opinion of

the association has not been influenced by the freeze felt in the international political arena. The topics of the plenary lectures and the list of names of the lecturers indicate that our scientific cooperation remains intact. On the theoretical problems of guidance systems we shall listen to two lectures: one by a Hungarian and an American, one by a Yugoslav and an American; on the guidance problems of industrial processes to a scientist from the FRG; on the problems of machine industry automation and robotization a scientist from Japan will speak. And we are looking forward to a U.S. lecture on the timeliness of economic and organizational guidance and to a Soviet lecture on the guidance of biological processes.

[Question] How do we stand with automation here at home?

[Answer] Mixed, both with respect to the conditions and benefits. The names of Hungarian scientists do not sound bad in the field of automation. Many internationally quoted experts are being called on today to give lectures in various countries. And, with respect to our home grounds, we don't have much choice although there are some who still think otherwise and believe that the country can decline to set as its goal the application of the most advanced technology. That is why articles against research or glorifying the self-taught inventors appear in some newspapers.

History has proven with a list of examples that societies which had locked themselves in and had become isolated met with a disastrous end.

Hungary cannot choose anything but a very broadly applied automation. It is generally known that we no longer are pressed merely by the developed industrial countries but also by quite a few developing national economies. This is a pressure which one cannot flee from by retreating but only by going forward. For instance, it cannot be our goal to compete with countries which still have a lower wage level than ours.

The productivity of the Hungarian electronics industry is 10-20-fold behind the productivity of the developed countries. In our country, a value of about half a billion dollars is produced annually by about 100,000 employees in this industrial branch. IBM has 400,000 employees and they produce a value of 30 billion dollars, and other electronics companies have comparable production rates. If we fail to make progress in this area, then we will not be merely left behind but we will be squeezed to the periphery.... Therefore, the question is not how many children the Hungarian mothers will have but whether we can make progress on a revolutionary scale in productivity, most of all by applying the tools of automation.

The recently released computers of IBM and Apple--which know as much as the small or rather the medium-sized ESZR machines--are put together by robots. With respect to the numbers produced, U.S. computer production is starting to approach passenger car production levels. This induces such enormous progress in every type of work that we have to respond to it. This congress offers a suitable possibility for looking outward and this is its precise significance for us.

The events occurring in our economy since 1968 have much to do with the scientific theories on large systems guidance. The designers of the new economic system had received the scientific results first or second hand, for instance, about the impossibilities of centralized guidance in the case of extremely large systems.

[Question] Do you see any possibility for catching up or rather, in your opinion, are the conditions given for keeping the scissors from opening wider?

[Answer] One cannot offer a certain statement in this case. On the one hand, we have to hope for a rapid change from extensive development to the road of intensive development in the socialist countries, together with the various accompanying structural changes. On the other hand, we have to hope that the cultural traditions and science, providing a natural relationship in the world--and primarily between the Eastern and Western part of Europe--will be stronger than the artificially exacerbated problems, and there will be open cooperation which, in our opinion, will be more fruitful than animosity for everyone. A small country can work only within an international cooperation, and it is in our interest to maintain it in both directions.

But the most important thing is to follow the truth of the proverb beginning with: "help yourself..." The resources must be increasingly concentrated on technical development, a movement must be started for quality work and greater incentives must be offered to the intellectual stratum which is an important vehicle of the advancement.

The fact that we were provided with the possibility of organizing such a congress--not because of its foreign tourist significance but from the standpoint of the Hungarian experts--is simultaneously suggesting the possibility of catching up. There is confidence toward us and our experiments are also promising.

Small nations do not always have to be followers. We have as example Austria, Switzerland, the Netherlands, Sweden or Finland in front of us. They are small and yet they are trailblazers in certain respects, in certain special fields. We must also search for the specialities where, considering our resources of strength and the conditions, we can establish a school of thought.

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