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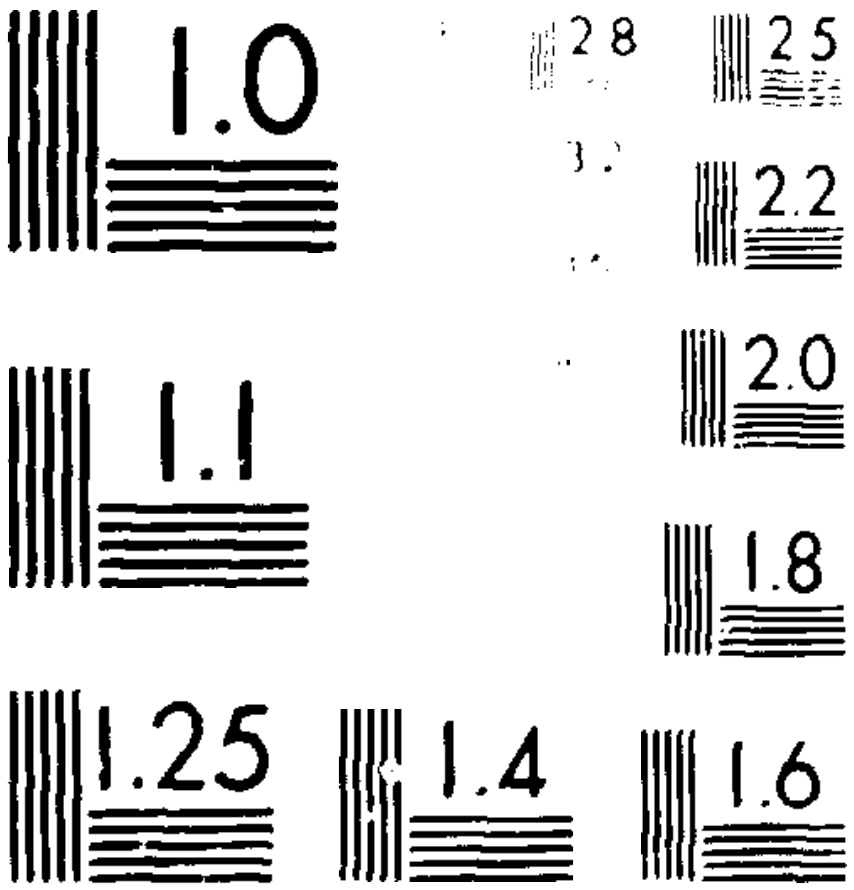
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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

MICROELECTRONICS MONITOR

12019

Issue Number 3 July 1982

Dear Reader,

It is time for yet another issue of our newsletter on microelectronics and although normally the onset of the summer period (at least in this part of the world) introduces a lull as far as news are concerned, this is certainly not true for microelectronics: things are happening at an ever increasing rate.

Staff of the Technology Progamme have just returned from a very interesting meeting organized jointly with ECLA on the implications of microelectronics for countries in the ECLA region. You will find a detailed summary of the recommendations of the meeting in "News and Events" in this issue as well as a review of the state-of-the-art in the microelectronics industry and research undertaken in the countries represented at the meeting in "Country Reports". Another project successfully implemented was a UNIDO sponsored mission to Egypt, India, Thailand and Mexico on selective microelectronics applications. More on this mission is also contained in "News and Events".

Government leaders aware of the inevitable consequences of the microelectronics revolution for their countries call for national plans and policies. At the recent Western Economic Summit held at Versailles, France, President Mitterand tabled data processing as one of the advanced technologies immediately affecting the economies of both developed and developing countries.

UNIDO is planning an International Forum on Technological Advances to be held in Tbilisi, USSR, from 10 to 14 April 1983. A Preparatory Expert Group Meeting will be held in Moscow from 29 November to 3 December 1982. Microelectronics as well as genetic engineering and biotechnology will figure as subject areas in these meetings. More about them in the future issues of the Monitor.

Response to our first two issues of the Microelectronics Monitor continues to be gratifying. Request for inclusion in our mailing list are recorded by computer; please therefore fill in the form on the last page of this issue only if you have not done so before. Also, I would like to reiterate my earlier request to you for contributions, especially from developing countries, on enterprises being set up; examples of industrial applications; government policies adopted etc., to make news coverage truly worldwide.

G.S. Gouri
Director
Division for Industrial Studies

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NEWS AND EVENTS

UNIDO/ECLA meeting calls for a Latin America Cooperative Programme on Microelectronics

As already announced in the April issue, an expert group meeting was organized by UNIDO, jointly with ECLA on the implications of microelectronics for countries in the ECLA region, held in Mexico City from 7 to 11 June 1982. Country representatives from Argentina, Brazil, Cuba, Guyana, Mexico, Peru as well as the Centralamerican Research Institutes for Industry (ICAITI) and the Board of Cartagena Agreement (JUNAC) attended the meeting which was hosted by the Secretaría de Programación y Presupuesto (SPP) of the Mexican Government. UNIDO had invited to the meeting international experts who had also prepared subject papers as a basis for discussion. For a detailed list of papers prepared for the meeting see the section "Recent Publications" later in these pages. The report of the meeting will be published by UNIDO shortly.

The meeting reviewed broadly the experience of the countries of the ECLA region. The historical development and present state-of-the-art in the countries represented at the meeting is reproduced in the section "Country Reports." The meeting recommended that countries of the region should formulate and implement integrated strategies in the field of electronics in general and microelectronics in particular, aiming at technological self-determination. The national governments were urged to develop policies geared to the development of a national electronic and microelectronic industry; the basic elements of such policy being: integrated planning promoting the interaction of all the elements forming the electronic complex such as components and their raw materials, equipment and its utilization, including software and telecommunications; the creation of a coordinating element in the government with the necessary authority and technical ability able to develop effectively and consistently an organized policy; a clear understanding that the process of maturing in this type of efforts and industry is a long process that demands continuity; and the use of the purchasing power of the government as an important tool for the development of national industries and technological capabilities. UNIDO was requested to continue monitoring technological advances in this field and disseminate the information to the developing countries. UNIDO and ECLA were requested to promote a programme of research and studies in the countries of the region and a programme of workshops in connection with already existing regional centres. UNIDO was requested to provide technical assistance and advisory services for the establishment of microelectronics assembly/manufacture including the conduct of feasibility studies and the development of human and institutional capabilities, in particular software and basic design and manufacture of components; UNIDO should establish mechanisms for exchange of information with regard to purchasing of equipment and components and acquisition of technology and provide advisory services; UNIDO should carry out studies of actual experience and a compilation of inventories as well as promote setting up and extension of design centres and pilot projects in developing countries. UNIDO should also promote cooperation among developing countries in applied research and development on hardware and software.

The meeting resolved that a Latin American Programme of Cooperation in Microelectronics should be initiated, with regard to cooperation in areas such as early identification and assessment of technological advances in microelectronics; exchange of information and co-operation regarding public purchases; the setting up and extension of plants for design and production of semiconductors and specifically integrated circuits; identification of application possibilities in critical and priority sectors relating to domestic and external markets; specialized centres of excellence for research and development and applications and networking of such centres; conduct of feasibility studies; training of manpower and reversal of brain drain; socio-economic assessment of the impact of the technology, etc. It was suggested that concrete proposals for this Programme should be submitted to an intergovernmental meeting of interested countries in 1983.

MEXICO brings together scientific and industrial sectors in the field of microelectronics

As part of the project for establishing a National System of Technology Perspectives, in Mexico executed by UNIDO, a first meeting on the linkages between scientific and industrial sectors in microelectronics was held in Mexico City on 14 and 15 June 1982, jointly organized by Secretaría de Patrimonio y Fomento Industrial (SEPAFIN) and SPP in cooperation with UNIDO. The meeting was opened with a presentation by UNIDO on the concept of a National System of Technology Perspectives; Mexican government officials made presentation covering the importance of computer electronics; the industrial policy thereon; policies relating to foreign investment and transfer of technology; the government's informatics policy; its approach to telecommunications; and its commercial policies in regard to computer electronics.

A lively and open discussion followed between government officials, representatives of the local electronics and research institutes. As a result of a provision that 5 percent of the value of production of each enterprise in the computer business should be allocated to R+D, some $500 million were expected to be available each year for R+D. A decree also provides tax incentives to promote research, development and commercialization of national technology. Several suggestions were made to constitute an inter-disciplinary group under the National System of Technology Perspectives, which could take up from time to time problem-oriented issues for action and also review the technology trends in this sector. The group should consist of representatives of small, medium and large enterprises; R+D centres; government departments concerned and major users. Long term measures would include preparation of a perspective plan for microelectronics, the setting up of inter-disciplinary centres utilizing existing institutions; the development of trained manpower and special incentives for development of software. The linking up of Mexican activities with the proposed Latin American Programme of Cooperation (see preceding item on the UNIDO/ECLA meeting) in the field of microelectronics was also considered. Questionnaires circulated during the meeting will form the basis for an inventory of available facilities of R+D institutions in this field. The Mexican Government is expected to review the various suggestions made with a view to initiating further measures.

UNIDO mission on selective microelectronics applications in developing countries

A UNIDO mission consisting of one staff member and two consultants visited Egypt, India, Thailand and Mexico during May/June 1982. A further report on the missions findings will appear in a later issue.

(a) Egypt
The following institutions and organizations were visited:

National Research Centre
Cairo University
Computation and Statistics Laboratory
Board of Health
Electronic Industries Research and Development Centre

The mission members also participated in the Seminar of Electronic Engineers.

(b) India

The following institutions and organizations were visited and the problems discussed with their representatives:

Department of Electronics, Government of India
Semiconductor Complex Ltd., New Delhi
National Council of Educational Research and Training, New Delhi
National Informatics Centre, New Delhi
Central Electrical Authority, New Delhi
Indian Agricultural Statistics Research Institute, New Delhi
Indian Telephone Industry, Ltd., Bangalore
Indian Institute of Science, Bangalore
Kirloskar Electric Co. Ltd., Bangalore
Tata Institute, Bombay
Computer Maintenance Corporation Ltd., Bombay
Tata Consultancy Services, Bombay
Tata Burroughs Ltd., Bombay
Applied Electronics Ltd.

Apart from the above companies visited, the members of the UNIDO mission took part in the Small Industry Association Seminar held in Bangalore.

(c) Thailand

The following institutions were visited:

Thaitronic Corporation
The Association of Thai Industries
King Monghut's Institute of Technology

The participants of the mission took part in the Seminar on Selective Microelectronics Applications organized by the Association of Thai Industries.

(d) Mexico

The members of the mission took part in the UNIDO/ECLA expert group meeting on the implications of microelectronics for the region, and in the Mexican seminar on microelectronics. Besides, the following institutions were visited:

Teleindustries Ericson S.A., Mexico City
Instituto de Investigaciones Electricas, Cuernavaca
Kun Grupo - Electronic Factory, Mexico City
Redcom - software house, Mexico City

A meeting was also held with the Executive Secretary of GEPLACEA - sugar exports group of Latinamerican countries.

Western Economic Summit calls for united action on technology

France's President Francois Mitterand, host at the seven-nation western economic summit meeting held at Versailles, France in June, urged the government leaders to set global goals for expenditure on research and named artificial intelligence, telecommunications and robots as priorities for heavy investment. He also called for greater emphasis on training and co-operative programmes to introduce computers in schools. Participants at the summit agreed on the need for international action to exploit data processing and other advanced technologies for their own benefit and that of the Third World. They also agreed to set up a working committee with specific proposals for the next economic summit to be held in the United States in 1983.

Microelectronics applications for developing countries and implications for VITA *

A panel meeting was held to inform VITA members on the "Information Revolution" and its impact on developing nations as well as to discuss possible roles for VITA requiring programmatic initiatives. VITA currently inputs data into a Technology for Development Data Base operated by Control Data Corporation. More generally, VITA has embarked on an effort to ensure that many new technologies are analyzed to determine their beneficial potential for developing countries. The participants of the panel meeting were professionals from the Washington D.C. area who have strong interest and experience in the applications of microelectronics to developing countries.

Summary of discussions and recommendations for action by VITA

1) Set standards for hardware and software for specific applications in developing countries (VITA Volunteers could test and debug programs written by contracted programmers or new VITA staff).

2) Add microcomputer skills to existing documentation center training program.

3) Provide technical assistance to help Third World nationals design and build data banks.

4) Develop and market software packages designed by VITA staff/Volunteers, especially "dedicated" software.

5) Provide programming training, instead of VITA itself developing software.

6) Publish a "Village Technology Handbook" - type book for generating ideas on applications and recommending existing software/hardware packages.

7) Apply technical expertise to the solution of "dirty power" and maintenance, making problematic reliable use of microelectronic systems in developing countries.

8) Write computer-assisted instructional curricula to be used at the village level.

9) Attempt a pilot computer conferencing project, possibly linking US-based VITA Volunteers initially.

10) Acquire hardware/software donations for some initial in-house experimentation.

11) Provide technical assistance to countries wishing to set up their own conferencing networks.

12) Adapt selected existing programs to major non-English languages.

Conclusion

Opinion was overwhelmingly positive that VITA should investigate further a number of possible roles in microelectronics applications. Henry Norman, Executive Director, responded enthusiastically to the panel meeting with the hope that individuals present would be available in the future in an advisory capacity as VITA's role evolves. He emphasized that in addition to supplying information on technology, VITA is becoming increasingly sensitive to the need for greater sophistication in the technology of information transfer. All expressed the hope that enlightened involvement now by development organizations will lead, not to more dependence and domination, but to greater productivity and equity for developing countries in accessing world resources.

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* Volunteers in Technical Assistance, is a non-profit organization that helps people and groups working on technical problems in developing countries and includes a network of 4,000 engineers, business people, farmers and energy experts who volunteer their technical knowhow to help others. The address is 2706 Rhode Island Avenue, Mt. Rainier, Maryland 20712 USA.

Third meeting of World Computer Services Industry Congress

This biennial event ended its third meeting on 25 June in Copenhagen, Denmark. The Congress was divided into plenary keynote presentations and more informal workshop sessions, which most delegates felt were more useful than the main presentations. The Danish Minister for Labour gave a keynote statement on how the new technology will affect the industry, the main theme of the Congress being the impact of new technology on the computer services industry, both suppliers and users. One of the most contentious debates was whether the future of the industry lies in custom software or packages. One opinion given was that the future direction of the industry lay in custom projects and individual developments and that package suppliers would be absorbed by the particular market which they supplied and that they would not be part of the computer services industry. The opposite argument voiced was that the market was moving heavily into packages and that the days of the monolithic, complex project were over. No agreement was reached.

Another subject of discussion was software protection which, it was felt, was mainly the responsibility of the software industry itself. It was thought that the best form of legal protection was contractual licensing which could be more effective than copyright control since licensing protected the idea behind a programme, whereas copyright only protected the expression of the idea. Also, since in order to copyright an item, disclosure of the details was required, copyright could invalidate a claim that an item was a trade secret. There were three major drawbacks to licensing: first it was difficult to monitor in a mass market; secondly it had a limited effect against an organized attempt to pirate a programme; and finally licensing was useless against third parties since the agreement only covered actions by the licensee. As regards the situation in the UK, it was hoped that the Forgery and Counterfeiting Act 1981 would also apply to software although originally, it had been designed to cover books and other printed matter. The next congress will be hosted by Japan in Tokyo in 1984.

COUNTRY REPORTS

The following summarizes developments in countries of the ECLA region as reported by their representatives to the UNIDO/ECLA meeting on implications of microelecronics for the ECLA region. (See "News and Events", p.2.)

Argentina

A microelectronics group was formed in 1974 and integrated into CENICE, which was established in 1977. Pilot plant production of transistors was achieved in 1980. The Centre has production capability for hybrid thick film circuits. Projects under implementation by the Centre included computer aided design and manufacture of integrated circuits. Pilot plant production of integrated circuits with 30 active components was expected to be reached towards the end of 1982.

Argentina's approach is that design and manufacturing of microelectronics components are the key factors and without them it is just not possible to have the capacity for autonomous action in this field. One of the reasons in this regard is that more and more systems design need component design. Evidence of this is seen in the continuously increasing captive manufacturing of semiconductor devices and the growing silicon wafer fabrication services offered by the most important semiconductor houses. The approach of the government is therefore to obtain design and manufacturing technology for microcircuits related to important sectors of development like telecommunications at present and informatics in the near future, simultaneously working on the applications of microelectronics in these areas. Study of other useful applications is conditioned by the understanding that without adequate control of the components technology, the effects on the economy can not be controlled.

Brazil

Laboratory-level work in electronics was enhanced in universities in the late 60's and 70's. This effort, envisaging industrial use of this work, was funded by several agencies of the government since 1967 and, later, also by the Brazilian telecommunications holding company (TELEBRAS), contracting several programmes of development that included computer software and hardware, telecommunications equipment, optical communications, microelectronics, electronic materials and others. This led to practical results and increased the rate of formation of qualified personnel in the area. There were also actions towards the development of an industrial production, based on Brazilian companies, in the area of computer hardware and software, telecommunication equipment and others. As regards production of integrated circuits, about a dozen of transnational companies are operating of which only two are making diffusion of devices for consumer applications.

A special Secretariat of Informatics was established in 1979 with the objective of formulating a strategy for informatics development. A Presidential Decree in 1981 called for the elaboration of a plan for the development of microelectronics. As a result, plans have been developed or are under consideration in several key areas. One concerns the establishment of an R+D institution to lead technological development in this field, working closely both with industries and universities. Another proposal relates to industry, where two Brazilian companies have prepared a detailed plan of their activities in this industry. A systematic approach for the development of microelectronics technology is thus being evolved.

Cuba

Research and Development in the field of electronics and microelectronics began in the universities in 1965, with special emphasis on areas such as telecommunications, minicomputers, development in semiconductors laboratory, electronic measuring devices, medical electronics and industrial control systems for the production of sugar.

Since the decade of the 70's the production of minicomputers and calculators, high consumption electronic goods, small measuring and laboratory devices series is being undertaken. At the beginning of the decade of the 80's, a plant for the production of semiconductors and other components will be completed. In the new sugar mills industrial control systems are already being adopted.

The electronics and microelectronics development policy has been defined and fostered by the Government, implementing it through the Planning, Production and Science and Higher Education State Organizations.

Within the Economic Development Plan for the period 1981-1985, development bases for electronics and microelectronics are established.

Guyana

A programme on the application of microelectronics for the improvement of rural telecommunication systems, in particular to improve the efficiency of equipment, is under development. An overall policy in the field is yet to be formulated. Production is in the nature of assembly activities.

Mexico

R+D activities take place in several centers of research and universities; in particular, it includes projects in the Institute for Electronics and Electrical Research. In addition, a new Development Centre has been established for the public sector telephone company (Teléfonos de México).

Production activities include the fields of consumer electronics telecommunications and industrial control.

The national industrial development plan includes development of the microelectronics industry, it emphasizes self-determination in this field and pays special attention to professional microelectronics. The policy aims at striking a balance obtaining cheap and quality products and components from abroad and developing a national technological base and industry, and increasing exports. The law of foreign investment and transfer of technology and the programs concerning industrial encouragement and development are also relevant for the development of the industry. Purchases of computers are regulated as a policy measure, for both public and private sectors.

Peru

R+D activities in electronics are being carried out by ITINTEC which has been established in 1974. A few projects have ben completed but the products could not be put into commercial production. A local industry of an assembly nature in consumer electronics existed but faces difficulties due to competition from foreign suppliers. There is as yet no critical mass of electronics engineers and the position is accentuated by "brain drain." However, there exists within the country a compact team of engineers and technicians capable of promoting the development of professional microelectronics, if favourable conditions were to be created by the government.

The following information has been excerpted from the sources indicated:

Canada

Canada's Labour Minister has announced the establishment of a task force on microelectronics technology. The task force will examine the status, implications and extent that microelectronics technology is used in industries under Canada Labour Code jurisdiction. The study will also assess the adequacy of the Canada Labour Code as it applies to technological change with special emphasis on its impact on women who may be more affected by the introduction of microelectronics technology.

A new $93-million, three-year program to promote the manufacture and use of electronics in Canadian industry has been announced by the Department of Industry, Trade and Commerce. The program, called support for Technology Enhanced Productivity was announced by Minister of Industry, Trade and Commerce and Regional Industrial Expansion, Herbert Gray. Highlights of the new program, that will provide special opportunities for smaller regionally-based firms, include:

- Funding for the establishment of four additional microelectronic centers so that centres are located in every province;

- Establishment of a major projects investment fund for the electronics and machinery industries; and

- A "one-stop shopping" program delivery system in the regional office of the Department of Industry, Trade and Commerce across Canada.

In addition, the new program will provide extra funds to existing programs which will benefit firms making electronic goods. The government will provide another $48 million for major projects that will support world competitive research and development and capital investment manufacturing and software projects which would not otherwise take place in Canada. The funds now will also cover research and manufacturing of equipment such as robots and computer assisted manufacturing equipment. For companies in all sectors which use these products and technologies, the program will provide for:

- An enhanced industrial education program to alert business to the potential of electronics for their industry;

- An expanded country-wide network of ten microelectronics centres so that there will be a federally supported source of sophisticated technological advice and assistance in every province, particularly for small- and medium-sized firms;

- Additional funds for incentive programs to share the costs of feasibility studies and of implementating the investment plans;

- A requirement that labour participate in the planning and implementation of the projects; and

- Additional funding to support the costs of designing custom "chips" - specialized integrated circuits which can provide greater efficiency in a product. (Canada Weekly, 14 April 1982.)

EEC

The EEC has brought together Europe's major electronic companies to consider a £750 million proposal for pan-European co-operation on electronics research and development. The funding to be made over the next 10 years, is one of the main proposals to come out of a massive two and a half years study, whose brief was to come up with a plan for a viable European electronics industry by the 1990s. The EEC hopes that by more effectively co-ordinating the European effort a more efficient use of financial resources as well as the better exploitation of existing technologies and future developments will be achieved. Two of the options proposed by the initial study were the setting up of European centres of excellence and joint development projects.

Having almost completed its consultation with industry, the EEC is almost ready to put firm proposals before the European Commission and involving the member states of the Community. There is already a timetable which involves the first phase of the project being launched in January next year, with full implementation in 1984. (Computing, 29 April 1982.)

A computer database which can be accessed by all Common Market traders is being planned by the European Commission. It would cover EEC regulations, laws and court judgments. A call for tenders for a study on the feasibility of the project has been issued by the Commission. Proposals from software houses, management consultancies or information providers with specialized legal and trading expertise are asked to arrive by mid-September. Up to £140,000 is budgeted, with the work to be completed by April 1984. (Computer Weekly, 20 May 1982.)

The Scottish information technology industry this year had a £1 million boost from the European Community.

EEC grants announced last week included cash for "Silicon Glen" in the form of money for the chip factory of US-owned General Instruments, for Rodim of Kirkcaldy, the computer peripheral maker, and for Fortronic's Dunfermline plant, which makes electronic banking equipment. (Computer Weekly, 1 July 1982.)

France

The French government has pushed ahead with the formation of a super-Ministry for Industry and Research to emphasize the key role that it is giving to the computer industry and its innovative activities.

Jean-Pierre Chevènement, 40, who has headed the Scientific Research Ministry for the past year, has taken over the Ministry of Industry. Chevènement, who is highly regarded by French businessmen, wants his new ministry to be organized on the lines of Japan's Ministry of International Trade and Industry, in which industry, research organizations and government work closely together. His first task will be to organize a programme of massive investment in computer and electronics research which he says must be raised from its 1980 level of FFr12 billion (£1.6 billion) in 1986. The Minister will give special priority to technological co-operation with other European countries. (Computer Weekly, 8 July 1982.)

By the summer, the world's largest concentration of personal computing power will be set up in Paris, if all goes to plan. This mighty microcosm will be the first major achievement of the new French research laboratory, the World Centre for the Development of Human Resources. The centre will be open 24 hours a day and will offer fellowships, especially in social sciences and psychology, possibly to people without academic qualifications. The World Centre, legally set up in January, has not yet held its first board meeting, and still has no premises. The venture is the brainchild of Jean-Jacques Servan-Schreiber. (See also "Microelectronics Monitor" No.2.)

Two top-level American computer experts will be working almost full-time on the project. These are Seymour Papert, founder of the Massachusetts Institute of Technology's artificial intelligence unit and Nicholas Negroponte, professor of computer graphics and head of the machine architects department at MIT. They hope they will be followed by more. At the moment, however, only four people work at the centre and this year's budget is a modest £3 million. But by the end of this year the centre hopes to have 50 people at work and a budget three times as big for 1983.

The centre's final target is to support President Mitterrand's declared commitment to the transfer of appropriate technology to the Third World. Despite the lack of accommodation, the first concrete moves of the centre are now well underway. Following contacts between the centre and a number of Middle Eastern and African countries, the Senegalese jumped at the chance of sending six researchers to New York's "school of the future" where they have been taught enough to set up a mobile centre. Next month, 24 Senegalese children will begin experiments in Senegal using Apple microcomputers.

The distinctive feature of the new experiment is not to mould children to the computer, but to give the children computer systems they can master, says Seymour Papert. "Afterwards we want to redesign the system taking their reactions into account," he says. Already planned is a Senegalese version of the LOGO educational computer language. The next step will be to develop a more appropriate system for developing countries. Micros will have to operate in an agricultural environment - which means that they must be physically rugged and culturally adaptable. The centre also plans a pilot scheme later this year, probably near Marseilles. The outcome of the two experiments is likely to be a personal computer tailored to human needs, not just a stereotyped model off the shelf. (New Scientist, 25 February 1982.)

The French microelectronics industry will have a shortage of half a million staff by 1990 if the current rate of training is not speeded up. And while the French domestic market is expected to double in size by the end of the decade, production in the electronics industry must increase two-and-a-half times if it is to be raised to an "international level". These are two of the conclusions of the report by the special Electronics Channel Commission which the government set up to obtain guidelines for its ambitious five-year microelectronics plan. Details will be announced later this summer.

The report, the first to embrace all aspects of France's electronics industry, says that the domestic market will double by the end of the decade. "To raise French electronics to an international level, production must be multiplied by two-and-a-half. The Commission stresses that all sectors of the electronics industry are interdependent and urges the government to adopt a joint strategy to co-ordinate research, and international co-operation. Training must be a top priority. France is presently producing only 7,000 computer and electronics engineers and 18,000 technicians a year. Twelve thousand, including 10,000 technicians, must be trained over the rext 30 months, the report says. The Commission urges the government to set up a Ministry for Electronics to co-ordinate all these efforts. (Computer Weekly, 20 May 1982.)

EUROTECHNIQUE, the partnership between National Semiconductor and France's recently nationalized Saint Gobain conglomerate, is claiming leadership of the French government's new five-year computer components plan whose details are to be announced in July.

The Eurotechnique chief, managing director Mr. J.L. Grand-Clement, expressed concern about the government's decision that Saint Gobain, which is the major partner in CII-Honeywell Bull as well as holding a 51% stake in Eurotechnique, must withdraw from the computer industry. Eurotechnique has prepared an ambitious development plan at the request of the government. This provides for a turnover of 1.3 billion francs (£130 million) in 1986, 55% of it from memories. Mr. Grand-Clement urged that Eurotechnique should become an industrial partner of CII-Honeywell Bull to prevent the Franco-American computer firm from developing a CMOS effort of its own. He added: "The entire commercial and technological battle today is being fought over memories. Firms which do not make memories are doomed. But those which make only memories and which are not geared to manufacture microprocessors are also bound to go to the wall." (Computer Weekly, 6 May 1982.)

Ireland

The Irish government has made a massive investment in the key resource needed to sustain a viable computer industry - educated people.

To staff more than 30,000 electronic and computer jobs the Irish Development Authority hopes to create over the next six years, the country has rapidly expanded all forms of third-level (degree and HND standard) education. Institutes of higher education have been set up in Limerick, Cork and Dublin.

The University of Cork has created a microelectronics research centre which can offer 25 to 30 postgraduate places each year in each of the key microtechnologies: gallium arsenide, CMOS, thin and thick film, and Josephson junction research. (Computer Weekly, 11 March 1982.)

Irish industry could be decimated within the next five to ten years because the vast majority of Irish firms are unaware of microelectronics or how to apply them. So declared the managing director of the Microelectronics Applications Centre in Limerick, Brendan O'Malley, speaking in Dublin. It was the latest in a series of warnings which Irish industry has received that it must get to grips with using new technology. These have become more strident as unions have appeared uncertain how to deal with developments which they fear could cause job losses, and which some unions have been using as basis for increased wages.

The Microelectronics Applications Centre was established in January, 1981, with the purpose of promoting and increasing the more effective use of microelectronics in all sectors of Irish industry. It was established as a commercial enterprise under the sponsorship of the Shannon Free Airport Development Company, the National Institute for Higher Education in Limerick, the Industrial Development Authority and the National Board for Science and Technology. Mr. O'Malley said the position was especially serious for Ireland in view of the vulnerable open economy and low rate of investment in research and development, which was under 0.5% of gross output, compared to a European average of 3.5%.

Failure to adapt and grasp the opportunities offered by microelectronics would not preserve but destroy jobs at a rate never experienced before, he warned. (Computer Weekly, 1 July 1982.)

Japan

The Japanese Industry Ministry, MITI, formally announced a national drive to produce the "fifth generation" of computers for the 1990s. Eight of Japan's big computer and electronics groups are to share in an Institute for New Generation Computer Technology, headed by Mr. Takuma Yamamoto, of Fujitsu. Government funding will be little more than £1 million in the first year. The vision of the fift generation is not just of vastly more powerful computers but of machines that will understand the conversational human voice; of computers that will work in human ways. (The Guardian, 15 April 1982.)

Investment planning and production in Japan are done on a long-term basis. And all the long-term planning hinges on the Fifth Generation project. In a report on the Japanese computer industry, Alex Stewart, a consultant with stockbrokers Henderson Crosthwaite, quotes an American company president. "The companies that do a good job and perform well are going to prosper over the long-term, not the short-term. Many companies make trade-offs in the short run versus the long run, and this is not something that comes easily, I know, but I want to encourage you to look at the long-term because that's where the real money is." The idea that short-term profit-seeking is self-defeating is hardly revolutionary, but it is vital to Stewart's context. His report is intended primarily as a guide to investors and financiers, many of whom, especially in the UK, have become mesmerized by the lightning success of American companies like Apple and Osborne.

Stewart says Japan's Fifth Generation Project is creating the commercial and technical environment in which the Japanese computer industry will work for the next five to ten years. NEC was the first to understand the importance of a stable supply of proprietary integrated circuits and the mating instinct of the digital signal. As a result it has been able to achieve leadership in both semiconductors and office automation equipment, he says. The company is by far the biggest microcomputer supplier in Japan, with some 28% of the total market for small business systems. Stewart says that NEC maintains an extremely aggressive investment programme, which pays scant attention to the return on the bottom line. (Computer Weekly, 24 June 1982.)

U.K.

The British government has asked leading electronics specialists to come up with proposals for a collaborative research programme on advanced ways of making and programming computers. The group, appointed by Kenneth Baker, the minister for information technology, should report back to the government by the summer.

Among the items it will discuss are whether Britain should mount a big government-backed project along the lines of the Japanese programme to develop "fifth-generation" computers. These machines, on which the Japanese government plans to spend at least £200 million over the next few years, will use principles of artificial intelligence to operate in a way similar to human brains. (New Scientist, 15 April 1982.)

INMOS, the British semiconductor firm which has cost the government £100 million since it was set up four years ago, last week announced the product that founder Iann Barron had set his sights on all along - a 64K dynamic random access memory chip (DRAM). The company, which has already introduced a 16K static RAM, is a latecomer to a market that is just beginning to take off. Last year just 9.2 million 64K RAMs were sold, but US electronics analyst Ben Rosen estimates that this year the number will rise to 60 million, followed by 140 million in 1983. Inmos's latest chips have plenty of redundancy built into them. Redundancy involves building extra columns and rows of memory cells into a chip so that they can be switched in if the final testing stage reveals dud memory cells. On each chip eight columns and eight rows of memory ships are spare. There are two versions of the 64K chip: one has a 100 nanosecond access time and costs £17.34 when bought in quantities of 100, the other has an access time of 120 nanoseconds and costs just £13.39. The chips are the Rolls-Royces of 64K RAM chips. With a cycle time of 160 nanoseconds, Inmos says that its fastest chip is aimed at the makers of home videos and personal computers. Inmos has been able to increase the speed of its chips by collecting information from them four bits at a time, instead of the normal one bit. The power of the chips has also been increased by a technique which does away with the need to issue so-called refresh commands. Dynamic memory chips have to be given regular shots of power to top up their capacitors. In Inmos's chips the access signals carry the instructions to do this, leaving the extra connection pin spare for other work.

Although Inmos can hope to get some advantage from the late arrival of its chips - it can avoid the mistakes others made - the company still has to persuade its potential customers that it can provide workable chips in the right quantities. Computer companies can get along with smaller memory chips, such as the 16K static RAM, simply by using four times as many of them.

In the meantime, Inmos is working on what Iann Barron calls a "transputer". This is a chip that combines both the processor and its associated memory. It should appear in 1984. (New Scientist, 8 July 1982.)

A tiny new British company is taking a short cut past current Artificial Intelligence techniques to generate programmes straight from logic. The theory could mean a breakthrough for Fifth Generation machines. Computer Research Systems, known as Cores, is using a theory based on "Natural Logic" called Multiple Objective Boolean System (Mobs). According to Cores, Mobs can communicate directly in natural human logic, without using either symbolic programming languages or the "Natural Language" techniques which have absorbed so much AI effort in the past.

The formulator of the theory is Dr. Fariedun Hilmi, who developed the Natural Logic technique during a long academic career at Cardiff and City Universities. "It's not easy to explain as really there is no comparison with anything that's already available" said Hilmi. "To all intents and purposes it's an AI processor. You can structure models without programming them, to as many different levels of relationship that are needed."

Mobs works by building a model or logical network, with relationships indicated by pointers. This network is expandable, allowing new structures to be added and "learning" about its environment as the knowledge base is increased. The structure is "filled" with the basic items of the formula or application, and the system is then generated with a single command: "Like a very, very, high level language" said Hilmi. A commercial product, called Prelude, has already been developed from Mobs, primarily for business applications. It is being sold on a bureau basis or as a complete system for software houses wishing to make use of systems generation, for £20,000. However, Hilmi sees Mobs as having further significance in the areas of Artificial Intelligence, digital and analogue system design, and robotics. He is hanging on to the results of his years of research because he feels that it will solve one of the most pressing problems of the Fifth Generation systems. "Mobs deals with fundamentals and basics of logic - it explains the function of thinking, not language. This is the key to the Fifth Generatio..." (Source: Computer Weekly, 24 June 1982.)

The London Chamber of Commerce and Industry has set up a database of export opportunities for UK companies. It includes calls for tender from the EEC, which can be worth £5 million a day and require bids within six days. The database called Europort, is available on the Odyssey private viewdata system run by NVA Consultants on an ICL ME29. It can be accessed via 24 ports on the public telephone network by the 7,000 members of the LCCI, as well as 12 other UK chambers of commerce. (Source: Computer Weekly, 20 May 1982.)

Milton Keynes, the new town of 100,000 people, aims to become a "testbed for the nation" and the "foremost city of Europe" in demonstrating the IT lifestyle. Its development corporation has begun 60 Information Technology projects. They are to include home banking and shopping and local news on viewdata TV sets; an IT demonstration home; an IT exchange as an advice centre for business; and an IT training centre for school-leavers who have missed the academic boat.

With the formation of an Information Technology policy advisory group, Milton Keynes is gearing up to become the Information Technology city of Europe. Many leading lights of the UK IT business make up the group, which is chaired by Sir Henry Chilver, vice-chancellor of Cranfield Institute of Technology and chairman of the NEDC's electronics development committee.

Milton Keynes' IT strategy is to make it the foremost city in Europe for the practical application of IT at work, in the home and in the community at large. The advisory group will review this strategy, using their own experience to identify opportunities for the city to set the pace. The main element of the project is the setting up of an Information Technology Exchange to be opened later in the year. It will act as a focal point for the business community, giving advice and information, providing training and offering services and equipment to hire or buy. Other aspects include the provision of a communications infrastructure using the existing cable network to bring TV to 20,000 households, and a trial optical fibre cable with British Telecom. (Excerpted from articles in "Guardian" and Computer Weekly, 20 May 1982.)

RECENT DEVELOPMENTS

Preparing for the Vth Generation

What exactly is a fifth-generation computer? The classification makes sense if the early, valve-based computers are considered first-generation; the next in line were those that used transistors, followed by the ones based on integrated circuits. "Fourth-generation" machines are available today: they use VLSI, or very large-scale integration, in which tens of thousands of individual circuits are on the chips inside the machines.

The Vth Generation is an attempt to create truly intelligent computers, computers which can be addressed in something like plain language and with which one can carry on some sort of intelligent discourse. They would have the advantage over us that they would use one computing system ability which taxes us, the ability to hold almost endless data, and to sort out from it almost anything and everything which bears on the problem under consideration, and put it in some sort of importance and priority order, this at normal electronic speeds. And those, the way people work, could be anything from a few to many millions of times faster than people can operate.

Among the targets for the Vth Generation, you find the following. A machine translation system which can handle multiple languages, with a vocabulary size of 100,000 words. The system is to guarantee 90 per cent accuracy, with the remaining 10 per cent to be handled by people. Total costs? To remain at 30 per cent or lower than those of human translation. That sort of system means eventually on line telephone exchanges which can handle translation as you speak. The consensus of the researchers is that it is probably 10 to 15 years away. Which means that by the end of the century one should be able to phone Japan in English, the recipient will hear what one says in Japanese, will respond in Japanese and the original caller will hear it in English. This will, in passing of course, make obsolete many of the world's international telephone exchanges.

Work towards building such systems has already begun. But first it has to be quite fundamental. The types of hardware and software we have become used to over the last 30 years are unlikely to be able to accommodate these sorts of visions. As usual, the social implication of such machines has yet to emerge into political consideration: the whole emphasis in Japan and the United States, and now Britain, is on winning the race to make it.

The fifth generation super-computer has been given the green light by the Japanese Ministry of International Trade and Industry (Miti), but funding has been cut and international co-operation is still uncertain. The finance ministry will provide a working capital of only £960,000 for initial research and development during 1982. Miti had originally asked for £1.16 million. A joint research foundation called the Institute of New Generation Computer Technology will be established from June. The Japanese participants will be six computer makers - Fujitsu, Hitachi, NEC, Mitsubishi Denki, Toshiba and Oki - and two home electrical appliance manufacturers, Matsushita Denki and Sharp. These eight companies will contribute a total of £113,000 towards initial starting costs. Foreign participation in the project, especially that of the US, is still uncertain. Miti has officially called for a multinational effort but Fujitsu's president Takuma Yamamoto, who will head the new research institute, has spoken of the 'big difficulties in management' that the involvement of foreigners will cause. The US Government has asked the Japanese to allow foreign representatives to join the project, but Miti has said that no US enterprises have so far expressed a wish to do so. These structural issues will be discussed by a group of industry representatives, the Fifth Generation Technical Development Organization. (Computing, 15 April 1982.)

The grand design for Britain to produce her own version of the fifth generation computer is virtually complete. A 12-man study group - set up to advise the Government less than three months ago - will consider final draft papers at its next meeting and the group's report should be with the industry Secretary next month. The Government set the group that tight timetable with the aim of reaching decisions by autumn and getting real work under way before year's end.

The cost of Britain going it alone in this research could be at least £250 million over the next five years. The Government is ready to provide "substantial" public funding to match industry's contribution, and the study group looks likely to recommend that state money should be directed towards nearly total funding of basic research work by both universities and firms. The group is also keen to see a small but high-powered directorate established to run the programme with much decision making delegated to it - a notion that is almost certain to bring Civil Service opposition.

Several members of the group are surprisingly optimistic about achieving genuine European co-operation at the development stage - working within the EEC framework but dodging much of the bureaucracy through firm-to-firm work. Britain's big electronics groups, like GEC and Plessey, are already talking to their continental counterparts about the fifth generation. (The Guardian, 7 July 1982.)

Advanced computer system for chip design

A 27-year-old graduate of Warwick University has led the creation of what is claimed to be the world's most advanced computer system for the design of silicon chips. It's called Fat Freddy, and its inventor is Miles Chesney, one of the 35 chip designers - 17 of them recruited straight from university - at the Bristol technology centre of the Government-owned microchip company INMOS. Strictly speaking, Fat Freddy is the name for one part of it - the layout generator. It's a fattened version of a piece of software called the Friendly Editor, but since the only other name for the totality is the INMOS Design System, Fat Freddy wins. Professor Iann Barron, who heads the European operations of Inmos, says they had to create Fat Freddy because none of the design systems on the market were adequate for their needs. Commercial systems could not handle the complexity, nor link the work of the design computers in the hierarchical fashion that INMOS required, he says. Ten man-years went into Fat Freddy, and - "regrettably" - it has attracted wide interest in the chip industry, but INMOS does not intend to market it. Barron says, because the company is not in the software-selling business.

The system immediately checks the design logic of every move the designer makes and warns him if he is wandering into error by, for instance, lacing lines too close together so that there is a danger of electrons leaking from their destined path. The system takes you down, step by step, into the maze, from the totality of the chip to a full-screen coloured portrayal of one microscopic corner, at which stage the designer is doodling with lines which in the real world are thinner than a 30th of the width of a human hair. The designers at

Bristol are building INMOS's next major product - a true computer on a chip, combining the roles of the micro-processor, which does the work, and the memory chip which holds the information. Barron calls it a transputer. He says it will be the "first universal programmable component," a role that today's micro-processors cannot fill. The first transputer, due by the start of 1984, will contain 400,000 transistors. The eventual aim is to pack in a million. That means putting the equivalent of a street map of Greater London, not one alleyway missed, on to a sliver of silicon smaller than a fingernail. It would also be a three-dimensional map, showing the sewers and the gas mains, for a microchip's structure, slim as it is, can involve a dozen layers in processing terms and four or five layers in physical reality. To design that, and then to make sure that the design will actually work, would, of course, be impossible without the aid of computers, directed in this case by Fat Freddy. (The Guardian, 22 April 1982.)

Air cooling of computers

IBM has taken a first step towards air cooling its biggest computers. The company has replaced the external water cooling on its 3087 machine with one that uses air to take away the heat. There is some debate among the makers of big computers about whether air or water is the most efficient medium for cooling. IBM, despite its move away from water on the outside of the computer still favours water for channelling heat away from the chips inside its machines. The American company's solution to the problem is to enclose groups of 118 to 133 chips, covering an area of 30 sq.cm., in small boxes, each equipped with a spring loaded piston. The pistons carry heat away from the chips to a reservoir filled with liquid helium. Water pipes acting like a car's cooling system, take heat from the reservoir. A second cooling system based on water, or air in the case of the 3087 removes heat from the water pipes. Cooling is vital in big computers. Each chip in IBM's machines generates 3 watts/sq.cm. an output greater than a domestic iron's. The cooler the chips can be kept, the closer together they can be packed, and the faster the machine will operate. IBM admits that under perfect conditions water cooling is superior to air. The company reckons that it takes 90 cu.m. of air per minute to deal with its clumps of chips. (New Scientist, 15 April 1982.)

New computer design

Computer scientists are becoming increasingly bold in trying out new ways of combining hardware and software to make a computer work. Since the 1940s, almost all commercial designs have slavishly followed principles laid down by John von Neumann, the mathematician. Now, interest is switching towards "non-von Neumann architectures". The reasons are several. In the 1940s, hardware dominated costs, so von Neumann produced a design that economized on hardware by making a lot of use of software, or programming instructions. Since then, hardware costs have fallen 20% a year, while writing programmes remains expensive. Software now accounts for about 85% of computer costs. So what sort of solutions are computer scientists thinking up for these problems with von Neumann computers? One solution to the multiplication problem is a so-called hardware multiplier. Texas Instruments has just introduced a microchip that uses this. Part of the chip is designed for making multiplication easier. Various specialized chips are now being introduced that are good at doing particular types of complex maths. Stanford University in California has just announced what it calls a geometry engine chip. This is designed for jobs like putting 3-D images on a screen. (The Economist, 8 May 1982.)

New semiconductor technologies

IBM unveiled its newest semiconductor technologies at the International Solid-State Circuits Conference (ISSCC) held in San Francisco this February. The technologies concern memories and logic elements that help to improve the processing speed and also lower the price of computers. The developments made a strong impression on the conference. The technologies unveiled at the conference involve the following three areas: (1) 2 types of extremely high-density experimental memory chips, (2) a unique high-performance experimental custom logic chip, and (3) a mathematical model and design helpful to the improvement of high-density semi-conductor parts.

In the area of experimental memory chips, IBM gave a technical presentation of a 288K RAM chip that, according to IBM, realizes the world's highest density. This memory is built on a chip of about 10mm by 6mm. The device is about twice as large as the IBM 72K chip, which is aiming at becoming the world's biggest capacity device among dynamic RAMs currently being mass produced, but it can store 4 times more data. This chip actually has 294,920 memory cells, with each cell storing 1 bit of data. Therefore, a new chip has the capacity to store 32,768 letters when a 9-bit amount is counted as 1 letter, or is capable of storing about 7,000 words, a volume equivalent to a typed document of about 25 pages.

In the new chip there are 4 independent memory arrays, and each array has 73,728 cells. IBM claims that these cells together with their support circuits occupy only an area twice as large as the total surface of a 72K chip, thus realizing an extremely high density. The smallest line-width is 2 μ. In order to boost the production yield, a technology called redundancy is employed to replace any cell found defective in the final test. The manufacturing method is almost the same as that employed for conventional memory chips. The production line also uses the same line as the 72K chip. On the other hand, the experimental 72K memory chip that is 13 times faster than the 72K chip currently mass produced by IBM realizes its high-speed performance with IBM's bipolar transistor technology. The access time to data stored in a bipolar chip is only 50 nanosec as opposed to 600 nanosec in the case of a 72K FET-based chip. The chip size is 6.13mm by 6.33mm and the capacity of the 72K is equivalent to 30 times that of the 2K bipolar chip IBM currently manufactures for computer use. IBM attributes its success in realization of an improvement in density to its new cell design and its progress in chip manufacturing technology.

IBM's new experimental custom logic chip succeeds in mounting a throughput of 4,208 logic circuits and a memory (ROM) capable of storing 13,000 bits of data on a chip the size of the fingernail of a child. In testing, the processor functions are customized so that the logic mechanism is directly structured as the layout on the actual chip, realizing the level of customization only the FET technology could achieve in the past. (Reprint from AEU, June 1982.)

Rivalry between MOS and bipolar processes

Faster, smaller, cheaper: these aims are always at the top of a semiconductor designer's list. Since the early 1960s it has been the pattern that every two years the complexity of a silicon chip doubles but the price continues to fall.

Semiconductor designers strive to pack the components on the silicon chips closer together because the electronic circuits can then operate more quickly since the electronic signals have less distance to travel. With memory circuits - used for storing information needed for computers, for example - the aim is to cram more storage space in a smaller area. At present, it is possible to store 64k bits of information on a silicon chip and most semiconductor manufacturers are now developing memories four times that size which will push the present technology to its limits. Today the tiny elements which are produced by photolithography and chemically etched can be only one micron (one millionth of a metre wide) in size. In the future the element will be even less than one micron but the industry will have to use X-rays or electron beams to draw the fine lines that define the size of the thousands of transistors on each circuit.

Technical developments in semiconductors still centre around making silicon chips operate faster and consume less power. This means that there is intense competition between the two main processes - bipolar and MOS (metal oxide semiconductor) which are used to ma' electronic circuits. Bipolar process is generally considered superior for high speed a analogue applications while the MOS technology is used for low power applications such calculators and digital watches. Over the years, however designers have been striving to improve the performance of both technologies so that the relative disadvantages of both are less apparent.

In general however, bipolar technology still remains superior for applications where digital signals have to be translated into analogue forms. This is necessary when converting from the digital world of computers to the analogue world of industrial machines which relay varying electric currents. MOS, on the other hand, has found its niche in the world of microprocessors and large-scale memories and has generally overtaken bipolar technology for many applications.

In addition to these large-memories and microprocessors circuits which can be used in the telecommunications industry are under development. The telecommunications industry is now undergoing changes from electromechanical to completely electronics techniques and this, tied to the growth in automated office systems, is demanding silicon chips which can control the operation of telephone call connections. Speech recognition and synthesis - where electronics can interpret and reproduce human speech - is an area of fascination and profit. It has been predicted that by the end of the decade more than $1bn will have been spent on circuits which can carry out these functions. For many reasons, companies need special components which require a customized circuit but do not want to pay the price of having it exclusively designed for them. This has resulted in the growing popularity of logic arrays which are half way between a standard circuit and a special design.

Coupled with strides in integrated circuit technology are important developments in connecting components to the printed circuit boards and miniaturizing the assemblies on to which the semiconductor and passive components, such as resistors and capacitors, are connected to make the complete circuit. Hybrid microelectronic circuits, in effect tiny printed circuit boards, have been making steady rather than revolutionary progress over the past few years. Hybrid circuits are made by depositing conductive, resistive and dielectric materials in film form onto glass or ceramic carrier substrates. Hybrids come in two forms: thick film, where the materials may be deposited by screen printing and subsequent firing in an oven, and, thin film, where the circuit patterns are formed by condensing vaporized materials on to the substrates. New developments in the use of lasers to trim the components in hybrid circuits to meet the design specifications and in photolithography which allows the patterns of the circuit to be drawn by laser are also extending the possibilities of hybrids. In addition to these improvements passive component manufacturers, who make the resistors, transistors and inductors which form the rest of the circuits have also made important progress in miniaturizing their components to fit hybrid circuits without loss of performance. (Financial Times Survey, 18 April 1982.)

Analog Microprocessors

Microprocessors have worked wonders for computer systems, but they have one big drawback. Microcomputers "talk" a binary language of ones and zeroes (equivalent to "power on" or "power off"), whereas the real world communicates in analog signals like sound and speech. Creating an electronic system that can work on constantly changing analog signals has, until recently, meant building up circuits from several components - as used to be the case with digital computers before the microprocessor was invented. Now, "Analog microprocessors" are beginning to emerge as a whole new range of integrated circuits designed to take in real world signals - perform computations on them - and send them on their way. These new chips will bring the economic advantages of microprocessors to a new range of applications. Like regular microprocessors the analog variety will reduce the number of chips needed to build a system, and can be fitted to particular system requirements by changes in software programs instead of completely new chip designs. For the chip makers, the new devices could represent a $100m business by 1985, growing to as much as $200m by the end of the decade, according to some estimates. (Financial Times, 1 March 1982.)

Customized chips

Mix-and-match microcomputer chips tailored to fit customers' needs for a tenth of the price of developing current custom devices is the promise held out by American Microsystems with its alterable microcomputer unit, AMU. It is based around building blocks, a sort of cell system for building up a custom microprocessor. It has a 16-bit arithmetic and logic unit with an 8-bit internal data bus in a CPU based on the design of the Texas Instruments 994. Around this core CPU, tailor-made memory and I/O channels can be bolted on to create modules of the required bit width. Users are not constrained to 8-bit or 16-bit modules. Linear functions such as analogue-to-digital and digital-to-analogue converters, filters and comparators can also be included on the chip, opening the way to applications in telecommunications, signal processing and control. Standard components from semiconductor manufacturers offer various quantities of memory and I/O functions, but still impose compromises in systems on users. First chips in the AMU family will include a prototype processor (AMU/PR), a counter-timer and a general-purpose interface chip. They will be made in CMOS and the first silicon for the AMU/PR should appear soon. (Computer Weekly, 8 April 1982.)

One-megabyte chip

In an expensive game of leapfrog, Japanese microelectronics manufacturer Toshiba has abandoned the race to produce the next generation of dynamic memory chips with 256K capacity.

Instead, the company is planning to invest 20 billion yen in a plant which is designed to deliver one-megabyte chips in volume by the end of 1984.

An experimental one-Mbyte RAM is expected to be available some time in 1983. (Computer Weekly, 11 March 1982.)

Japan's top microchip maker, Nippon Electric Company (NEC) also looks set to leapfrog the next generation of integrated circuits. The Tokyo-based manufacturer is ready to start taking orders for its new one-megabit memory device - packing 1.1m memory cells on a sliver of silicon only seven millimeters square. That is eight times more than the most powerful memory chips on the market today. Commercial production is to start in June, building up to 100,000 chips a month early next year. Another Japanese microchip firm, Oki, has also started taking orders for a one-megabit device, though it has yet to announce its production

plans. The product unveiled by NEC is not, to be sure, an all-purpose device that will replace today's "random-access memory" (RAM) chips. It is a more specialized chip called a "read-only memory" (ROM) which, like a book, has information printed indelibly into it during its fabrication. The NEC product has been designed as a dictionary, storing definitions of 4,000 kanji characters used for writing Chinese and Japanese. (The Economist, 1 May 1982.)

Bubble memories

The sick man among semiconductor technologies - the bubble - is to get a major shot in the arm through a joint effort by Intel and Motorola. As well as agreeing a standard architecture for two new M-bit devices, the companies are to work together to get out a 4M-bit bubble memory.

When National Semiconductor, Texas Instruments and Rockwell all pulled out of the business last year, it looked as if bubbles were going to follow CCD memory as a technology whose time never came. Now Motorola and Intel, the only two semiconductor majors to survive the recession without short-time working, redundancies or cutbacks in new-product budgets, have joined forces to develop two smaller versions of the Intel 7110 M-bit memories. They will be based on the architecture of the 7110 and one of them will, says Intel, provide half the 7110's access time and twice its data rate. For Motorola it is the company's second major link-up in the bubble business. Last year it tied up with Natsemi in a technology exchange deal under which it obtained details of National's 256K and M-bit bubbles as well as its LSI control chip set. Accordingly, Motorola brings to the deal a depth of knowledge extending well beyond its own development effort. (Computer Weekly, 11 March 1982.)

Dust protection

Dust particles are a big hazard in chipmaking. Typically, microchips are made from circuit patterns that are created by "printing" electronic circuit patterns on a chip. The patterns are built up step by step by shining ultraviolet light through a transparent mask of patterns on to a wafer of chips. These days, the patterns can be a mere three millionths of a metre wide or less. A large dust particle, sitting on the mask, could obliterate the exposure of part of a circuit pattern on to a chip, thus causing a defect. Too many defects and the chip will not work.

Enter pellicles. Placing a pellicle just a tiny fraction of an inch away from the mask (between the mask and the chip wafer) ensures that any dust particles fall on the pellicle, not on the mask. Also, because the particles are out of the field of focus. their presence does not get in the way of the patterned light and show up on the chip. Yields of defect-free chips go up dramatically - by as much as 50%, according to VLSI Research, a Californian market-analysis firm.

Companies that specialize in making pellicles are keen to wring still more out of them. For example, Advanced Semiconductor Products of Santa Cruz, California, says it can "tune" pellicles to a specific wavelength of ultraviolet light - such as 436 nanometers - to get a light-transmission efficiency of up to 99% in the right printers. (The Economist, 1 May 1982.)

MARKET TRENDS

US Semiconductor market to hit $20 billion level by 1986

U.S. shipments of semiconductors should top $20 billion by 1986 - more than double this year's estimated $9.8 billion total, according to PurchasingWorld magazine. Using figures supplied by Frost $ Sullivan, the publication reported that domestic industry will be able "to hold its own against not only Japanese inroads but also the Europeans, who are now receiving hundreds of millions of dollars in aid from government sources."

In just the integrated circuit sector, U.S. sales over the next five years will increase by 129% - the equivalent of about an 18% annual rate of advance. This phenomenal growth will be propelled by an increased demand for standard circuits such as microprocessors and memories into a very wide range of applications. Also, circuits which are designed for specific applications such as automotive and telecommunications will help spur integrated circuit sales.

PurchasingWorld notes that other sectors of the semiconductor market, including bipolar digital circuits, linear integrated circuits, and discrete semi-conductors will experience remarkable growth. As a result, semiconductor firms, recognizing the potential of the marketplace, will be searching for merger partners among key systems houses to take advantage of their marketing information in the telecommunications and automotive markets. Without such marketing knowledge, PurchasingWorld warns that semiconductor outfits "may not be able to take advantage of all these new opportunities." (The Southern Purchaser, May-June 1982).

Chip costs rise, lead times slow

The lifting recession and accompanying increased market activity for semiconductor components may be good news to the chip makers, but for the end user it looks likely to spell longer lead times and higher prices.

While US semiconductor manufacturers are showing relief - tempered by caution in some cases - that an upturn in sales heralds the end of a two-year low for the industry, there are warnings that it will also mark the end of price attrition.

Increasing demand, particularly for newer, more glamorous devices such as 64K dynamic RAMs, will start to push prices up and lengthen the time customers will have to wait for deliveries.

The pick-up in sales in mid-February has carried on through to April, causing leading figures in the US industry to look optimistically to the future. (Computer Weekly, 20 May 1982.)

European community at a crossroad

Europe may be at a final crossroads in its drive to forge a competitive microelectronics industry. Its producers have been struggling ever since they lost out to the Americans in the 1970s, when U.S. chip makers grabbed the lead in Europe's integrated circuit market. Now the Japanese are poised to strike. If the European producers are not able, individually or collectively, to compete on even terms, they could be blown away in the looming battle between the U.S. and Japanese semiconductor giants.

The four technologically rich members of the European Community - West Germany, Italy, France, and Britain - are doggedly pursuing different paths in nurturing domestic semiconductor companies. Germany is trying to "grow" a bigger domestic market by encouraging more use of semiconductors among small equipment companies, France is emphasizing electronics independence, Britain is funding a startup, and Italy is running a state-owned business.

Dataquest Inc., a California market research company, estimates that the dollar value of total IC sales in Europe last year dropped a sickening 26%, as European consumption slid to 18% from 23% of world demand. As a result, revenues of the top six U.S. competitors plunged almost 30% - twice as far as their European counterparts. A disastrous price war in the high-volume businesses dominated by the Americans - computer memories and microprocessors, for example - coupled with the effects of a strong dollar on profits on all imported chips sent revenues reeling and has prompted many U.S. companies to notch their belts tighter.

The Europeans hope to exploit the Americans' disillusionment and permanently win back a bigger share of their home markets, now that they believe they have caught up with U.S. and Japanese leaders in key IC technologies. If Europe's top chip makers can pull that off - and stave off the imminent onslaught by Japanese semiconductor makers, which now account for only about 6% of the local market - it will buy them enough time, the Europeans believe, to develop more export volume and implement a program dubbed ESPRIT, for European Strategic Program for Research in Information Technology.

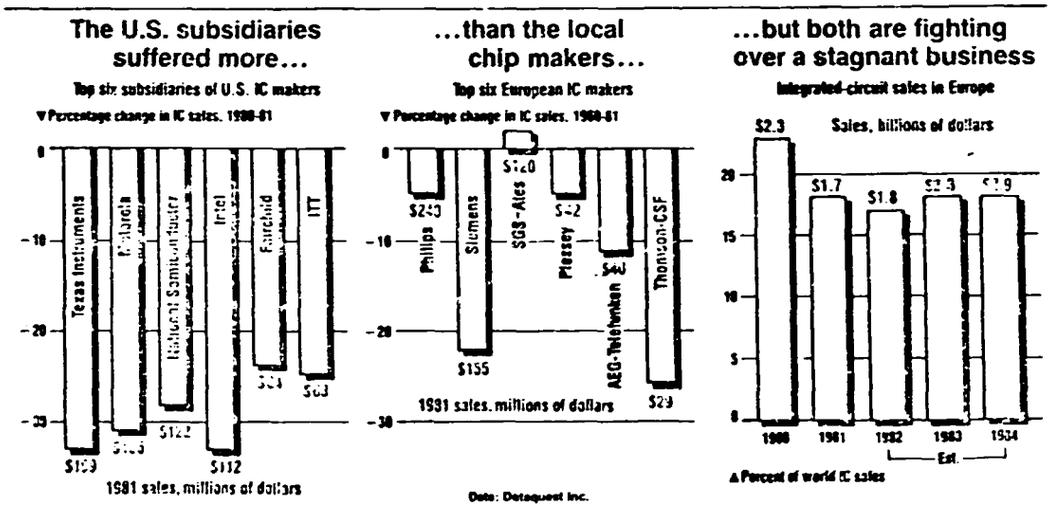
Proposed by the EC in May, ESPRIT would lay the foundation for European progress during the 1990s in microelectronics, robotics and advanced production techniques, artificial intelligence, and software engineering. European governments may further reduce massive support of semiconductor research. Germany's Ministry of Research & Technology is shifting its focus away from research. "The main emphasis of this ministry is to see what we can do in strengthening the application of microelectronics," says Uwe Thomas, director of elec-

tronics research. His ministry unveiled plans to spend $190 million over three years to do this. In Britain, observers expect the Thatcher government to be cautious about further semiconductor support until it sees some payoff from the $100 million invested in startup INMOS International PLC, which lost $26 million on sales of $4 million last year.

At the same time, many Europeans believe that too much reliance on outside technology jeopardizes Europe's economic future. Preventing foreign domination of microelectronics is one objective of ESPRIT. The program, which if approved could involve spending as much as $1.5 billion over a four-year period, with $300 million funded by the EC, was patterned after the Japanese research effort to dominate the market for the next generation of computers by developing a fifth-generation machine. "The idea," says Jan Witt, research manager at Siemens, "is to do preemptive research."

"The U.S. and Japanese giants will engage in a to-the-death price war in Europe," warns EC consultant Robert Taylor, head of European Research Associates in Brussels. "If Europe doesn't maintain competitiveness, the only alternative will be to close the market." (Business Week, 28 June 1982.) (See also graph on European i.c. market below.)

Europe's no-growth market for integrated circuits



INTEGRATED CIRCUITS			WEST EUROPEAN MARKET				IC MARKETS IN EUROPE		
	End 1981 $m			End 1981 $m				Percentage	
	1980	1986*		1981	1982	1986*	Application	1980	1985
							Military	5	6
France	254	640	Germany	675	760	1,445	White goods	4	4
Germany	713	1,445	UK	310	335	595	Consumer	24	17
Italy	179	315	France	280	325	640	EDP	23	25
Scandinavia	163	325	Italy	165	175	315	Industrial	26	23
UK	388	595	Scandinavia	160	180	325	Telecom, and communications	18	24
Rest of Europe	253	480	Rest of Europe	230	255	480	Automotive	-	1
Total	1,950	3,800	Total	1,820	2,030	3,800			
*Estimated. Mackintosh International.			*Estimated. Mackintosh International.				Mackintosh International.		

(Financial Times Survey, 5 April 1982.)

LEADING MANUFACTURERS OF SEMICONDUCTORS

(1980 shipment estimates)

West European		U.S. ($m)		Japanese	
Philips+	558	Texas Instrts.	1,580	NEC	769
Siemens+	420	Motorola	1,100	Hitachi	658
AEG-Telefn.	196	National Semi.	770	Toshiba	629
Thomson-CSF	190	Intel	575	Fujitsu	419
SGS-Ates	150	Fairchild	566	Matsushita	300
Plessey	49	Signetics	384	Mitsubishi	254
Ferranti	48	Mostek	330	Sanyo	180

+Excluding U.S. subsidiaries. Source: Datamest July 1981.

(Financial Times Survey, 5 April 1982.)

The IC processing equipment market will reach $1.92 bil+ in 1985 vs $916.6 and $779.6 mil+ in 1981. Because it increases productivity to cut costs, the assembly and packaging area of semiconductor production equipment will continue to show good growth, thus bucking the overall downward trend. Lead-bonding equipment, which will be fully automated by 1985, should show a growth rate of 21%/yr to $183 mil. The consumption of tape-automated bonding equipment is forecast to grow 50%/yr. Die-separation and die-attachment equipment will show a 20%/yr growth to reach $43 mil and $28 mil by 1985, respectively. (Electronics, 13 January 1982.)

The cost/bit of microelectronic memory will cease to decline in about 1985, according to GE Moore of Intel Corp. unles there are breakthroughs in manufacturing techniques. New methods of fabrication now under investigation could lead to a further increase in density of 3,000X. If electron-beam etching becomes economically feasible, it has the potential for scaling down the size of circuit elements several thousandfold. (Scientific American, January 1982.)

Custom "chips" sales booming

The market for standard electronic components is in a slump, but sales of "custom" chips - those that are tailor-made for a particular application - are booming. Industry estimates put the size of the custom chip market at $680m today, growing to $1.4bn by 1984. The growth in custom circuits has been brought about by several factors, some economic and other related to semi-conductor technology. Custom integrated circuits offer many advantages in terms of system performance and reliability over standard components.

- Custom circuits save money. By placing more of the functions needed for a new electronic system on a single chip, production costs can be reduced.

- Custom circuits are more reliable. Reducing components cuts down on the number of possible system failures.

- Custom circuits reduce space and power requirements. Again, fewer chips mean a smaller system.

- Custom circuits offer proprietary protection. Competitors cannot duplicate a system with off-the-shelf components.

Designing a new integrated circuit from scratch is however, a major undertaking. The development cycle typically takes about a year, and the cost is very high. Traditionally, custom circuits were only economically viable when very large quantities of the special circuit would be required, for example, in automotive and consumer applications. Alternatively, they have been used in the rare instances when standard components cannot meet the performance required for a particular application. Making considerable use of computer-

aided design systems, chipmakers can now tailor a circuit for a customer's needs from a library of predefined circuit functions. The resulting circuit may be slightly larger than one designed by hand from scratch, but the cost savings in the design process outweigh the proportionately small disadvantages of additional production costs. Development time can also be halved to about six months.

Another boost has been given to the custom chip market by the widespread acceptance of simplified design approaches pioneered in the U.S. by researchers Lynn Conway (of Xerox) and Carver Mead (of Cal Tech). The Conway/Mead chip design methodology allows an electronic systems designer to design his own chips with a minimum of training, again using computer aids, and focusing on the system performance of the chip rather than the - for him - irrelevant details of optimal chip design. More than 60 U.S. universities - and several chip manufacturers - are now offering electronics engineers courses based on the Conway/Mead method to teach the systems engineers how to design their own chips. These courses have sharply increased the number of people capable of designing an integrated circuit. Until last year, the number of chip designers in the U.S. was estimated to be only about 2,000.

A vast new market has opened up for "customer designed" chips. Industry estimates suggest that over 40 percent of custom chips will be designed by systems manufacturers by 1984. These chips are manufactured at "silicon foundries," more often than not the idle production lines of the standard chip makers. Intel, one of the latest companies to enter the silicon foundry business, estimates that the market for such services is worth $135m today, and that it will grow to $680m by 1985. For applications in which a full custom circuit cannot be justified - because of cost and volume requirements - another solution is the uncommitted logic array, or gate array. These circuits, which are often called semi-custom circuits, are a matrix of unconnected logic functions. The logic array is "customized" by adding a layer or two of interconnections that define how the circuit performs. Gate arrays offer a speedy - as short as 16 weeks - development cycle and are cheaper for lower volume requirements. There are, however, some performance trade offs as compared to fully custom devices. The logic array concept was pioneered in the UK, by Ferranti, but now most of the major chip manufacturers offer a range of logic arrays with different numbers of functions and built using different semiconductor technologies to suit various systems requirements. (Financial Times Survey, 5 April 1982.)

16 bit micro-mix

The 16-bit micro is being heralded not just as a more powerful piece of technology but as a new generation of computer which will bring sweeping changes in applications, attitudes and even such highly proclaimed concepts as local area networks. In a market area which has had its share of overnight revolutions, will the 16-bit chip rapidly overpower its 8-bit predecessor and come to rule the microcomputer roost? The answer doesn't depend purely on the increased power and byte value for money provided by a more compact chip. As with any new developments in hardware technology, its success will depend heavily on the operating system and applications software available to exploit that additional power. Although a number of suppliers on the UK market have released different versions of the 16-bit micro, a major split in their approach is in the operating system they are backing to become the 16-bit micro standard. Unix, CP/M or MP/M and MS DOS are currently the major contenders in that race. With processor capacities of 128 Kbytes or 256 Kbytes becoming almost standard with the 16-bit approach, the new micros are able to support much larger operating systems. Companies such as Keen Computers and Zilog see the 16-bit micro market split in two. They are putting all their money on Unix because they believe it is the only true multi-user operating system available at that end of the market with sophisticated facilities such as record locking.

There are two distinct forms of 16-bit computers. There are the large personal computers such as the IBM version and they tend to use slower 16-bit chips. The only difference between those systems and 8-bit technology is that they are faster. 'Then there is the advanced 16-bit technology which gives you straightforward mini-computer capabilities in the Digital Equipment (DEC) tradition.' It may be that with the development of 16-bit technology the old argument of whether you use a large central processor at the centre of a network or distribute power to end users may come back to life. Both Keen Computers and Zilog are convinced that for the first time a true multi-user system is now available on a micro. Other manufacturers and suppliers have been claiming that for years, however. (Computing, 15 April 1982.)

16 bit desktop

The advent of the 16-bit processor has brought with it a new range of problems for the poor uneducated end user of microprocessors. All he wants is a reasonably priced machine that will help him do what he wants with speed and ease. But just as he begins to get to

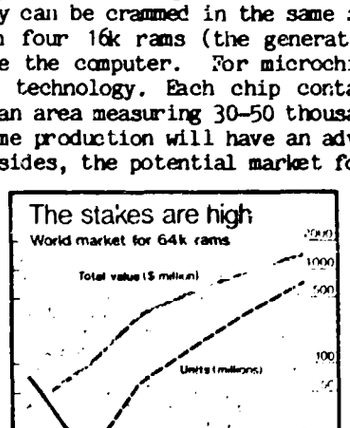
grips with the 8-bit micro, with CP/M and a range of 3,000 applications packages to choose from; just, in fact, as he begins to lose his fear of the new-fangled technology, along comes the latest breakthrough: 16 bits on a desktop micro. Three major problems face the end user of the 16-bit micro: problems that either didn't exist for him, were eventually solved for him, or he simply got used to on the 8-bit machine. These problems are an enormous increase in computing power, a lack of applications software, and an inherent incompatibility between the different chips. This last problem may not affect the end user directly, but it is a major contributing factor to the second. For the 8-bit processor, a fundamental compatibility between different processors plus the universality of Basic as a development tool made it largely irrelevant which individual processor was used.

Dr. Mike Nash, product development manager at SPL's Advanced Research Establishment, sees the current problem as twofold: while the incompatibility of the chips is one of the main reasons for the current lack of software, the sheer power of the 16 bits may well lead to its misuse of the hardware. Some single chip microprocessors offer facilities very similar to 16-bit minicomputers. However, the latest generation of 'superchips' offer much more - 32-bit integers, on-chip memory management, dedicated registers. It is not clear yet which of these extra facilities are really needed. In some cases there may be positive advantages - for example, reals are often used in RTL/2 merely to represent numbers outside the 16-bit integer range. Where 32-bit integers are available, they may often be able to replace the use of reals, with significant gains in processing speed and arithmetic accuracy. In other cases these new facilities may be a positive disadvantage - for example, many applications for micros will fit quite happily within 64 Kbytes of main memory, so that memory addressing requires only the 16-bit values available from the 16-bit registers of the standard 8-bit micro.

Nash points to the current encroachment of the newer 32-bit 'superminis', led by DEC's VAX, into the lower orders of the mainframe market as another example of the same effect. If this is correct, there is an unspoken implication that full benefit from the 16-bit micro can only be achieved with an installation that parallels today's mini site: a dp manager with a separate operator and quite distinct users. And this, of course, is exactly what most small businesses hoped the 8-bit micro would help them avoid. The danger must still remain that many 'supermicros' will be purchased for individual managers, placed on the edge of their desk, and left for them 'to get on with it'. It seems that the main problems for the new 16-bit processor is user-education and software development. The major systems designers are all concentrating on the production of machine independent development tools. When these are acceptable, the lack of applications software must diminish.

The 64K question

American microchip manufacturers are at last mounting a counter-attack against Japan in the battle for 64K rams (random-access memories with 64,000 memory locations on a single chip). There have been only two large American suppliers, Motorola and Texas Instruments. But Intel is now launching a 64K ram with several features aimed to make its device more attractice to users than the Japanese alternatives. Fairchild, Mostek and National Semiconductor are also expected to enter the fray, as is Inmos, an Anglo-American venture backed by the British taxpayer. For designers of minicomputers, word-processors and so on, the 64k ram means more memory can be crammed in the same space - and for less money. One 64k ram already costs less than four 16k rams (the generation of chips that preceded it) and occupies no more room inside the computer. For microchip manufacturers, the 64k ram means stretching their production technology. Each chip contains 64,000 transistors and 64,000 capacitors, all packed into an area measuring 30-50 thousandths of an inch square. A company that can master this in volume production will have an advantage in making other devices such as microprocessor chips. Besides, the potential market for 64k rams is huge.



The Japanese companies - Fujitsu, Hitachi, Mitsubishi, Nippon Electric and Oki - adopted a conservative approach to production. They took existing designs for 16k rams, especially Mostek's design, and quadruplicated them, making only modest advances in process technology. Most of the resulting chips are rather large but at least they work.

United States chip makers tried to push the state of the technology farther. As a result, they were slower getting off the ground. Intel put a 64k ram on the market and then had to withdraw it because of production problems. Arguably, pushing the state of the art will not give the Americans an edge even now. Japanese firms are reportedly redesigning their 64k rams to make them more sophisticated. In any event, although the 64k ram market is still in its infancy, the battle for the next generation of chips, 256k r is already about to start. Motorola and several Japanese companies have announced the entions. Texas Instruments and other American firms are drawing up designs. (nomist, 15 May, 1982.)

APPLICATIONS

Micros to beat doctors at diagnosis

The nuclear monsters in America's Polaris fleet often disappear into the ocean depths for months at a time. The submarines do not normally carry doctors, and the paramedic on board now use a unique piece of UK-written software to help diagnose the cause of stomach and chest pains among the crew. The software, two small Basic programs which will run on any CP/M-based micro, are possibly the only installed and working computer-aided diagnostic programs in the world, other than those directly associated with the team who wrote them. They were written for the US Navy by a team of four people, led by Tim de Dombal from the Leeds University Department of Clinical Medicine.

Currently, doctors in 26 countries, including two centres in China, one in Japan and others as far apart as Mexico and Pakistan, are testing de Dombal's system, and submitting results to Leeds. This has led to a vast increase in the database source rate, and a subsequent increase in the accuracy and versatility of the diagnostic system. In Mexico a group of doctors in several hospitals are making immediate and direct use of the system to assist with diagnosis in poor city and rural areas. This lead is shortly expected to be followed by the participant groups in the various countries. De Dombal says that this amounts to giving the poorest doctors, in the poorest hospitals, in the poorest parts of the world, direct access to the expertise of hundreds of their colleagues for the price of a microcomputer system. (Computer Weekly, 18 March 1982.)

Micros in geophysical surveys

Researchers at Manchester University's Geology Department regularly take their desktop microcomputer with them when making geophysical surveys. The computer is enclosed in a weatherproof case and mounted on a trolley fitted with large wheels so it can be pushed like a wheelbarrow over rough and boggy ground to wherever surveys need to be made. A battery housed inside the trolley provides the power. (The Guardian, 6 May 1982.)

Microcomputer tracks maintenance

A new computerized preventive maintenance package has been developed by Datatend (Minneapolis, Minn., USA). Called Mainta-Gard, the package employs a microcomputer with which the maintenance staff can plan and schedule maintenance, establish priorities, provide a printout describing the work to be done, and keep a running record of everything completed. In addition the system maintains machinery history, date purchased, warranty data, maintenance costs, hours of downtime and other data. (Industrial World, May 1982.)

Automation streamlines storage

An automated storage system has been installed at the British Leyland Land Rover engine plant at Solihull. Designed to assembly 2000 engines a week, new production facilities at the North Works factory have a high level of automation. Computers control the component stores, engine assembly, engine testing and management information systems to handle engine build schedules, reporting, time and attendance recording, and data network control.

These systems were designed and commissioned by another BL company - BL Systems - which says the systems are sufficiently flexible to be used by firms of any size and is now marketing them under the FAMIS (Factory Management Information Systems) name. The FAMIS suite of computerized systems includes AUTOROUTE for scheduling and sequencing, CAN-BUILD for preparing production schedules, and AUTOSTORES for automated stores. The systems can be offered as packages, but typically will be customized to suit the users' specific manufacturing operations. (Engineering Computers, May 1982.)

Bar code scanning for UK retail outlets

By the end of the decade, at least 1000 UK retail outlets will be using electronic point of sale (PoS) equipment incorporating laser scanning techniques, according to market survey company A.C. Nielsen.

There are currently only nine installations in the UK. Each of the major supermarket chains has one, with Key Markets leading the field with three. Nielsen says that if the US trend towards the new PoS technology is followed, up to 50 grocery outlets will be equipped by the end of 1983. Tesco plans to have a total of 15 stores operating PoS installations this year. Laser scanning requires all goods to be bar coded in order that the product may be identified by the hardware at the checkout. Nielsen estimates that over 70% of goods sold through supermarkets currently carry such codes, and that in many product categories over 90% of items are already suitably coded. Nielsen has been appointed by the Article Number Association as the central UK clearing house for data collected through PoS systems operated by retailers.

But a report* from the Distributive Trade Economic Development Committee (EDC) predicts that the magic 1,000 mark will be reached nearer 1985 than 1990. It says that Spar, the group of small independent supermarkets, expects at least 1,000 of its members to be using laser scanners by the end of the decade. The EDC maintains that, for the majority of UK shopkeepers, their first encounter with information technology will be with PoS equipment. Other aspects of new technology lie further in the future. Electronic funds transfer (EFT) and shopping from home via view-data are cited. The NEDO report calls on the government to give the distributive trades more help in the form of additional funds "to encourage more widespread introduction of new technology." One of the potential problems highlighted in the report is the education of the general public in order that they both understand and accept the reasons behind the disappearance of price tags on goods. In the US, where almost 5,000 supermarkets are using PoS laser, scanning, retailers are only now beginning to discontinue item pricing after five years' use of the equipment. There has been a fierce resistance from consumer groups, who insist that it is vital that shoppers can price their purchases as they go into the trolley. (Computer Weekly, 13 May 1982.)

Micro project management

Project management, an application which has for many years been the exclusive reserve of the service bureaux, is increasingly finding its way onto micros. Thorncroft Manor Services, a Leatherhead (UK)-based bureau and software house, has now launched a micro-based project management package called T-Pert to run on the CP/M operating system for micros. Micros are slow but users trade off this inconvenience against that of waiting for work to be returned from the bureau or of hooking up to a time sharing service. T-Pert allows a user to analyze and monitor up to 750 activities. It is written in Fortran and needs 64K of memory. (Computer Weekly, 11 March 1982.)

Micros create images for cockpit trainer

Microprocessors have invaded yet another traditional preserve of mainframes and minicomputers - flight simulation. Late last month, Link Flight Simulation division of Singer Co., unveiled a visual display system for a cockpit simulator that is controlled entirely by distributed 16-bit microprocessors. The Image II system, as it is called, meshes with virtually any aircraft simulator. In particular, it will work with the training simulator for the Hawk aircraft that Link announced last October, also built around 16-bit devices. (Electronics, 10 February 1982.)

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*Technology: The Issues for the Distributive Trades. NEDO Books, Millbank Tower, Millbank, London SWIP 4QX. Price £3.

Applications in developing countries

The UNIDO expert working in the Bangladesh Bureau of Statistics informs that the Bureau has got a new IBM 4341 computer with which they are trying to organize thematic cartography and set up a national data bank with geo-information systems and environmental monitoring.

An electronic voting machine based on micro-processor technology will be used in elections in Kerala State, India. The machine has been designed and produced by Bharat Electronics Ltd. and consists of two units: one control unit which stays with the polling officer and a balloting unit which is placed in the polling booth from where the voter will exercise his franchise in total secrecy. The cost of the voting machine is at present Indian Rupees 5,500, but this is likely to come down when manufactured in large numbers. The import content is less than 10 per cent consisting mainly of large scale integrated circuits, which are not manufactured in India.

A case study of computerization in small/medium scale industry:

Maini Precision Products Pvt/Ltd. of Bangalore, India are engaged in mass production of high precision engineering items. Over the years the product range has grown in the high precision ancillary area. It was observed that the growth had resulted in a certain amount of slackness in the controls leading to a drop in productivity and substantial increase in costs. Hence a programme was undertaken to establish an information and control set-up. It was decided that a totally integrated computer system would not be economically justifiable. Instead, a computer was used for handling the bulk data of the pivotal materials control system, with manual follow-up based on computer summaries in the areas of direct and indirect material consumption control, material with suppliers, work-in-process, inter-plant accounting, purchase planning etc. Further phase will cover financial accounts, production incentives with labour accounting and efficiency reports. The system is now stabilized and is working smoothly with the direct involvement of the concerned line personnel. The following quantifiable/non-quantifiable gains have accrued:

- A reliable record is available on the 3rd of every month.

- The bankers are satisfied with the stock statement being received regularly by them.

- Control is being exercised over the stock, W I P and M W S levels.

- Production hold ups, on account of stock-out of direct/indirect items, have almost been eliminated.

- The number of purchases have been reduced through better planning resulting in lower procurement costs.

- Overall tension in the organization has been reduced because of better planning. Direct material costs have been brought down through timely feedback on consumption and highlighting of unaccounted rejections between stages of production.

- Indirect material consumption and corresponding component of machine-hour rate have been brought down substantially.

- Inter-plant accounting and M W S accounting have reached desirable level of accuracy.

SOFTWARE AND TRAINING

Computer pranks worry experts

Concern is growing on both sides of the Atlantic about the ease with which so-called secure computer systems are being broken, particularly by students. The latest breach in security involves a popular operating system called Unix and a particular type of computer terminal. Operating systems like Unix control the movement of programs and data within a computer system and handle security routines. Students at the University of California, Berkeley, have come up with an untraceable way of inspecting files protected by the operating system. The authorities at the university are so worried about the technique, which they describe as simple and easy to carry out, that they have alerted manufacturers and the US government to the danger and demanded that their system is changed.

The National Computing Centre (NCC) in Britain is sufficiently concerned about the security of operating systems that it has asked the Department of Industry to pay for a one-year research programme into the problem. "There have been a number of cases where operating systems have been broken, especially in universities," said Ian Douglas, the centre's senior security consultant. "The auditing profession is very worried about this development."

Cases of computer crimes that involve a detailed knowledge of the computer system are rare. Perhaps the best documented is the case of George Rifkin, who was convicted of a $6 million fraud in 1979. Rifkin used his knowledge of security codes used on the American Fedwire banking network to make a fraudulent withdrawal. But as "real time" systems spread, more people, particularly programmers, are gaining the knowledge to break security systems. And as companies are usually reluctant to talk about cases of computer crime, fraudsters could escape detection. (New Scientist, 11 March 1982.)

How freaks play havoc with your computer

The various computer freaking techniques have gathered a bizarre collection of names. Among the most common techniques are:

Drilling. Using a home computer to call up with different passwords until one works.

Scavenging. Once into a computer, browsing around to find interesting clues, left in the memory, to passwords for restricted areas.

Trap doors. Putting into programs special undetectable routines that only become active when they gather useful data, for later collection.

Time bombs. Placing malicious instructions into an innocent program, to be activated only at a certain date or stimulus. For example, London students programmed a demonstration terminal to deliver obscenities when used by a particular visiting dignitary.

Superzap. Using the universal access program of the computer (a kind of master key) to override all normal controls and access all data files. This technique is especially dangerous because in skilled hands it leaves no trace. (International Management, July 1982.)

Cobol to be streamlined

A UK proposal to streamline Cobol, the world's most widely used computer language, has cleared the major hurdle to acceptance, after seven-year battle. Codasyl (Conference on Data Systems Languages), the US-based group which is the world's main technical arbiter on commercial computer languages, has agreed on specifications for a "Validate" verb. Designed to eliminate tedious data validation methods of current Cobol, it is already in use in UK installations such as British Gas. "Unlike some things implemented by Codasyl, Validate is a high level facility," said John Triance, former chairman of the BCS Cobol Specialist Group. "It is talking to the DP man in his own language. We like to think it's the way the language is going. "Without the BCS effort nothing would have happened. I must admit I didn't think it would make it because of the sheer size of the proposal." Cobol standards are strictly controlled, and the proposals have had to pass through as many stages as a Parliamentary Bill before final approval. Now that Codasyl has agreed on a detailed specification of the Validate verb, it is likely that the Ansi standards authority will agree to "rubber stamp" the changes. It is now up to individual manufacturers to implement the Validate verb in their Cobol compilers along the lines established by Codasyl.

The British Computer Society started the Validate ball rolling some years ago. The idea was to do away with the clumsy validation processes by putting all data specifications into the Data Division. Instead of validating each input, which can involve hundreds of lines of repetitive coding, the programme can refer to the information coded in the Data Division. One instruction in the Procedure Division, "VALIDATE", refers back to the specifications and automatically checks the validity of the item. This puts the effort of coding into the Data Division rather than the Procedure Division, a development which is not only economical, but fits in with the trend towards using Data Dictionaries. (Computer Weekly, 8 July 1982.)

Self-teach Cobol on a microcomputer

Most Cobol programmers in the industry today probably received their initial training without sight of or contact with a computer. After days of ploughing through theory and manuals, the first treasured bundle of coding sheets would have been sent off for punching, then returned having miraculously become a program.

A newly-formed software house called Microcal, based in Windsor, is aiming to change all that, and has launched an interactive CIS Cobol training package for running on a microcomputer. Jon Shearing, one half of the partnership that runs Microcal, used to be a lecturer at ICL's training centre at Beaumont. "The course is aimed at a person with computing aptitude, and takes them from the very basics, with knowledge, through the design and writing of their own system," he explained. To allow potential customers to evaluate the software before committing themselves to paying the full cost, the course has been divided into two parts. The first is called an assessment pack and costs £35. This takes the student through the rudiments of Cobol, to the production of an initial program, and includes an introduction to information processing in a business environment. The price of the completion section is a further £315. "The course is slanted towards business applications, and uses personnel and stock control systems as examples," said Shearing. (Computer Weekly, 20 May 1982.)

More on computer languages

Cobol is here to stay - until our schoolchildren grow up. That is the stark finding of survey of the consultancy and software services market in Europe conducted by CMG Computer Management Group. Packages will be the biggest growth area in the software industry, which will increasingly be relied upon by the computer manufacturers for window dresssing application programs. And there will be more collaboration between software houses with government encouragement for joint ventures, mergers and acquisitions to create large companies competitive in world markets. The survey also finds that demand for packages will outstrip that for bespoke software, even in specific industries. Here we must be clear that the line between bespoke and package is vague and blurry. Bespoke software will often include modules available as packages, and a system developed for one company on a bespoke basis might later be sold to others in a packaged form. This is the case with British Petroleum, which markets software developed internally to other oil companies through its subsidiary Scicon. There will be more of this in the future, according to the survey, with bespoke development more confined to new, unforeseen applications.

The most contentious finding of the CMG survey concerns Ada, which it believes is not likely to become commonly used in the next five years. After that new languages will be developed which will render Ada obsolete, at least among the business community, as new ideas come in from the present generation of computer-crazed schoolchildren.

This interpretation of the survey is hotly disputed by leading Ada authority John Barnes of SPL, who finds this faith in our schoolchildren extraordinary. "They are being taught in junk anyway, so they will never have any impact at all," is his initial response on hearing the assertion. "Teachers are just passing on information on Basic from manuals," he says. Barnes goes on to say that a skeletal course in Basic is fine for arts pupils in order that they may have a flavour of computing. But children going into science should be taught maths and learn nothing directly about programming at first. "Children are taught New Maths at school with set theory," he says. The set theory should be built on in computer science, using a language like Pascal. Barnes thinks that the style of Ada may not directly appeal to business users, but he sees no reason why it should not take over in process control applications and in defense. Indeed it is already doing so with CAP Reading, for example, doing research with robots controlled by programs written in Ada. (Computer Weekly, 13 May 1982.)

A form of the Basic computer language with extensions for industrial control applications has been developed jointly by Oxford University and the Warren Spring Laboratory. It is available under license from British Technology Group (formerly NRDC). Programs can be developed, tested and run on just one single board computer such as the Intel 80/20 giving a low cost development system with considerable input/output flexibility. Programs can easily be modified on a customer's site. BTG points out that versions of the software can be provided to suit anyone's single board computer with its own input/output characteristics and address spaces. The program extensions allow for direct control of peripheral devices, access to specified memory areas, logical operation and bit manipulation. Speak to Ken Cunningham at BTG on 01-730-9600. (Financial Times, 6 November 1981.)

CAD/CAM

Computer-aided design and manufacture (CAD/CAM) has become one of the fastest growth areas in the computer industry; 10 years ago CAD/CAM was little known but has recently attracted some of the world's largest companies. CAD/CAM was originally developed for the electronics industry to help design the increasingly complex microchips and printed circuit boards. Most electronics circuits are now so complex that they would be almost impossible to design without CAD/CAM. The CAD/CAM industry is dominated by American suppliers. A handful of independent companies grew rapidly in the U.S. through the 1970s, including Computervision, Applicon, Calma, and Autotrol. Computervision greatly outstripped its rivals in the second half of the decade. One of the reasons for Computervision's success was its early move into supplying CAD/CAM systems for mechanical engineering. Both the aerospace and automobile industries were quick to see the advantages of CAD/CAM. In aerospace, CAD/CAM is particularly useful in designing the highly complex surface shapes for the best aerodynamic effect while achieving the maximum strength for the minimum weight. In the automobile industry the reduced lead times in producing a new design, the ability to simulate a collision on the computer and the opportunity to avoid expensive mistakes in the building of the prototype all helped in the rapid introduction of CAD/CAM. All volume car manufacturers now use computer-aided design. BL has one of the largest CAD/CAM systems in Britain.

Most of the independent suppliers of CAD/CAM systems have been bought by large corporations in the past two years. General Electric of the U.S. bought Calma, and Schlumberger, the giant oil services group, bought Applicon, which resulted in speculation on how long Computervision would remain independent. McDonnell Douglas, one of the pioneering companies in the development of CAD/CAM for its own use in aerospace manufacture, sells its system to other companies. International Business Machines has a fairly small share of the CAD/CAM market, but it has been advancing rapidly.

In Britain there are about 60 organizations - ranging from independent companies, software houses, subsidiaries of large companies to management consultants - which offer CAD services and systems. Most are very small compared with the U.S. companies. Quest Automation, which boasts it is the largest independent European supplier of CAD/CAM systems, has recently reported a loss of £1.5m for the half year to August 1981. The main problem is its very high research and development costs combined with weak sales of its larger systems as companies defer capital investment because of high interest rates. Quest exports over half its turnover. Although it has substantial sales in the Eastern bloc it does not sell, at present, in the U.S., which accounts for 60 per cent of the world CAD/CAM market. Quest has specialized in the electronics industry but recently bought Genesys, a small CAD/CAM company specializing in construction and architecture, from the National Research and Development Corporation. Racal also has a CAD/CAM subsidiary (Redac) also specializing in supplying systems for design of electronics products which is of a similar size to Quest. Most of the suppliers of turnkey CAD/CAM systems use a minicomputer made by companies like DEC, Hewlett-Packard Data General, Prime and Perkin Elmer. The most notable exception is Computervision which has developed its own computer. Quest also developed its own minicomputer after finding delivery times from its U.S. supplier rapidly extended.

There has been considerable concern that British manufacturers are being slow to adopt CAD/CAM which may result in lower competitiveness with other countries. (Financial Times Survey, 18 January 1982.)

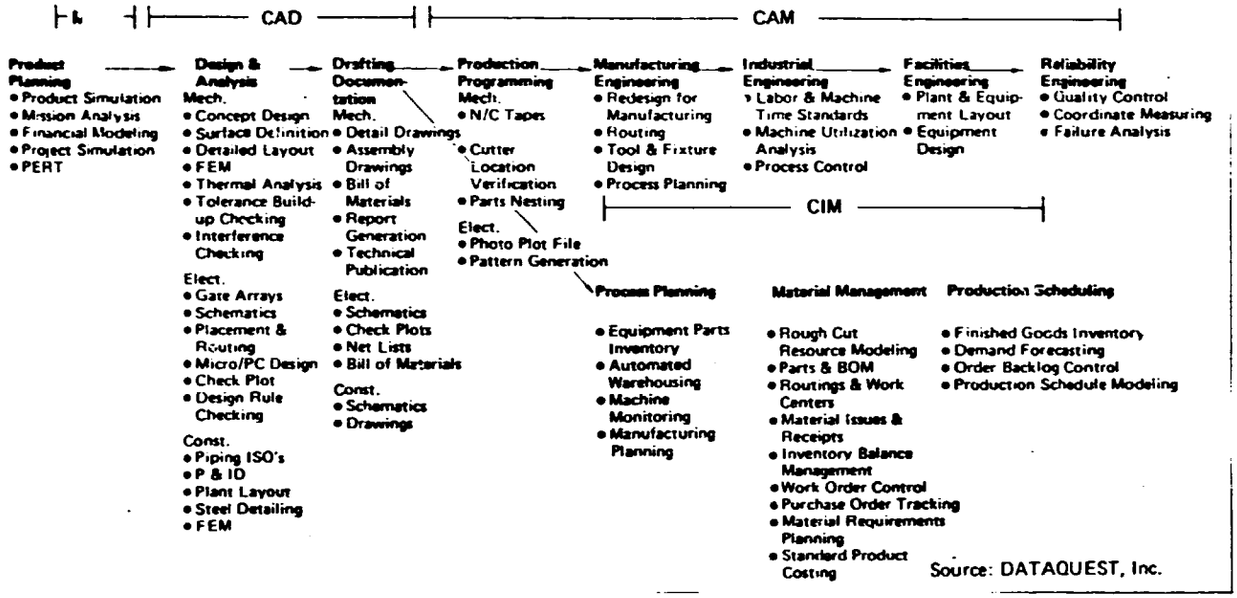
European three-day CAD seminar set for London

The first European three-day seminar dedicated to the fundamental appreciation and awareness of CAD. "CAD in the drawing office - what you must know," took place on June 29-July 1, 1982, in London, organized by Prodex Ltd. 79 High Street, Tunbridge Wells, Kent. Tel: 0892 39664. Prodex Ltd. says it has been devised and developed specifically to satisfy the needs of all in industry, commerce, and the professions, who would benefit from a sound basic understanding of the total CAD scenario. It will be of particular interest and value to anyone considering adopting some form of computer-aided design but who is unsure of the issues to be assessed, the correct ways to approach the problems of identifying their needs and matching a system to suit, or how to overcome the associated financial and social difficulties of system implementation.

Automated software development

Automated software development itself refers to the ever-increasing number of programs that solve a user's data-processing needs directly from a problem definition, entirely obviating his or her need to code it in a computer language. The problem definition is usually derived interactively, from the user's or system analyst's responses to computer

Automated design and manufacturing



Source: DATAQUEST, Inc.

Significant CAD/CAM numbers from Dataquest

	1976	1980	1986
Estimated installed turnkey systems	1,000	4,000	24,000
Estimated turnkey system revenues	$69 million	$480 million	$4 billion

- Compound annual growth rate of CAD/CAM industry (1981 – 1986) **40%**
- Compound annual growth rate of mechanical applications **45%**
- Compound annual growth rate of integrated circuit design **33%**
- Compound annual growth rate of architectural engineering construction **40%**

Source: DATAQUEST, Inc.

terminal prompts that lead him through a complete definition. Once that step is performed, the automatic software tool takes over, performing the task that is usually done by a programmer - translation of that definition into a debugged program.

The customary process of developing an application-program consists of four distinct steps: problem definition, translation into a computer language, debugging, and documentation. Generally, a system analyst sits down with the user and interrogates him as to what sort of data must be handled, how it is to be entered into the program, what sort of information must be available on line, and what sort of reports must be generated from the data base. For simple programs, users often act as their own systems analyst; but for most serious applications, a professional is required to define the problem.

An example is an inventory control system that might consist of the kinds of objects in inventory, the lengths of their names, the format of their part numbers, and their price range, as well as the means of delivery to the warehouse, types of information that must be available to terminal operators, and the sort of reports that the front office requires. It is then the system analyst's job to design the methods of entering information into the data base, processing it to produce responses to queries, and designing the necessary reports.

After these are approved by the user, it is then the programmer's job to translate that problem definition into a computer program that will implement the system analyst's design. It must then be debugged and tested extensively to guarantee not only that it does what it is supposed to, but also that it does not do anything it is not supposed to. These last steps of coding, debugging, testing, and documenting the system analyst's design are the ones that automated application software addresses.

By automating this tedious and error-prone process, a software house can increase its productivity many times. Also, programs produced in this way should be error-free, eliminating the need for debugging and testing. They are self-documenting, having built-in documentation facilities consisting of summaries of the data structures used, full-blown editing facilities for changes and often annotated source code. (Electronics, 2 June 1982.)

Computer networks

The computer user's dream of open systems connection, networks of computers made by different manufacturers, came a step closer to reality last week. Twenty computer companies headed by ICL, came out in support of local area network standards devised by the European Computer Manufacturers' Association (ECMA). The standards, which the association approved two weeks ago, cover three out of the seven layers needed for open systems connection laid down by the International Standards Organisation (ISO). The most important layer in the ECMA's standards is the transport layer. The new standard will enable data to be transferred between devices on separate networks over any type of cable. The other two layers the association has fixed cover the physical connection of devices to the cable and the transfer of data between devices on the same local area networks. The standards in these areas cover only one type of network technology - known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD). This is the technique seized on by a consortium of the American companies, Xerox, Intel and Digital Equipment, for their jointly-developed Ethernet local area network. ICL has adopted Ethernet, and plans to base two types of network operating at different speeds and over different distances on CSMA/CD. Xerox, the prime mover behind Ethernet, had hoped to have it adopted as a world standard by the Institution of Electrical and Electronic Engineers (IEEE) in America, but the IEE has decided to include other systems.

One of these is the so-called token passing network, very different from CSMA/CD. This is the technique that is used in the predominantly British ring networks. ECMA appears to have ignored the ring networks. Pat Cohen, managing director of Logica VTS, a company that sells a ring system called Polynet, said that Logica, ICL and British Telecom were keen to "progress the adoption of standards to other system areas". ECMA has also ignored what are called broadband networks - high capacity networks using cable and equipment similar to those employed in community television. In broadband networks the cable frequencies are divided up to provide hundreds of channels. To date they have been used mainly in factories and university campuses, but several manufacturers have produced systems for offices based on the technology. ICL's managing director Robb Wilmot believes that it is important to get the lower capacity networks standardized first, on the grounds that these could be incorporated into the broadband networks. (New Scientist, 1 July 1982.)

Computer graphics

Computer firms are falling themselves to get into what many foresee as the next digital bonanza: computer graphics. According to enthusiasts, these pictures-on-a-computer-screen will revolutionize everything from industrial design through corporate-management techniques to Hollywood movies.

Computer graphics have been around since the early 1960s, when researchers at Massachusetts Institute of Technology and General Motors, working independently, first demonstrated ways of turning a computer-linked cathode-ray tube into an electronic sketchpad. The commercial gold-rush started in the late 1970s, when micro-electronics brought high-quality colour graphics within the budget of the average data-processing manager.

Now interest is running at fever pitch. Leading computer-graphics firms have been gobbled up by larger companies keen to get in on the act. In the past two years, United Telecommunications bought Megatek (which supplies display screens and graphics software); Schlumberger bought Applicon (which makes computer-aided design equipment); General Electric bought Calma (another CAD firm) and Sanders, itself a computer-graphics company, swallowed up weaker sister CalComp. A dozen small new firms have started up, mostly run by engineers leaving the bigger outfits. International Data Corporation, a market-research firm in the United States, expects computer-graphics sales in America to reach $4.5 billion by 1984, up from around $1 billion in 1979. (The Economist, 17 April 1982.)

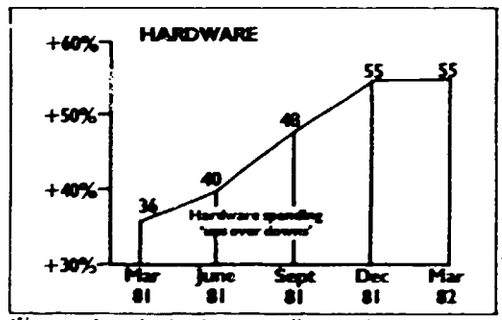
UK survey on hardware vs. software spending

Hardware spending slackens

Computer bureaux and the finance sector will be holding back on the expansion of their hardware budgets in the next 12 months, causing the overall trend of expansion to level off.

In December 1981 72% of bureaux and 62% of managers in the finance sector expected increased hardware expenditure in the next 12 months.

In the lastest survey, only 39% of bureaux and 53% of managers in finance will be expanding their hardware budget. Some of the slack will be taken up by the engineering sectors and general industry which, along with education and research, has been most restrained recently.



'Ups over downs' in hardware spending stay the same

Engineering leaps for software

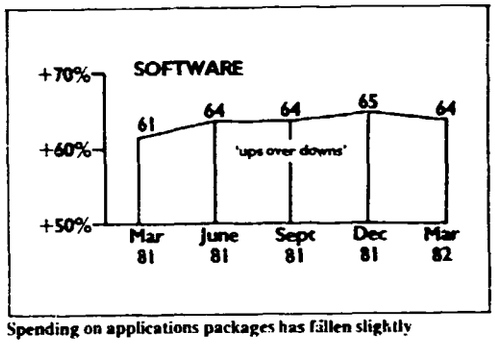
The pattern of software purchasing will change over the next 12 months in line with the changes in hardware budgets.

Bureaux, formerly the leaders of software exansion, will drop right back in their demand for software while engineering companies will put on a spurt.

Software purchasing will be led by the process industry and public administration.

General industry will slow down its increase in software purchasing compared with the past 12 months.

The overall picture is one of slightly diminished increase with concern that once managers have moved in the direction of purchasing packaged software, it is almost impossible to go back to tailoring your own system. (Computing, 15 April 1982.)



Spending on applications packages has fallen slightly

Software course

The 1982 Group Training Course in Computer Technology (Software Course) will be conducted in Tokyo from September 16 to December 16 by the Government of Japan in collaboration with the Asia Electronics Union. The course is part of Japan's technical co-operation programs for developing countries with a view toward contributing to the upgrading of their knowledge and techniques in this field, and to promoting friendly relations between those countries and Japan.

Arrangements for the course are primarily administered by the Japan International Co-operation Agency (JICA), but the Asia Electronic Union helps organize the course. The Union Secretariat will draw up the curriculum, recruit instructors and teachers, make arrangements for computer and classrooms, and prepare timetables, fields, and inspection tours.

The cost of participants' travel to and from Japan, their subsistence while in Japan, and their authorized trips in Japan will be borne by the Government of Japan. The expenses involved in organizing the course, including field inspection tours, and remuneration for the instructors and teachers will be paid by AEU. According to the contract, JICA grants AEU a subsidy to meet the expenses of running the course. UNESCO supports the program and grants a partial subsidy.

The Government of Japan has selected the following countries: Bangladesh, Burma, Indonesia, Malaysia, Nepal, Pakistan, Rep. of Korea, Singapore, Sri Lanka, Thailand, Peoples Rep. of China, Iran, Jordan, Saudi Arabia, Turkey, Bolivia, Brazil, Mexico, and Nicaragua.

Applicants must acquire the respective government's nomination, and the government must then forward the nomination from (Form A3) to the Government of Japan through the Embassy of Japan in the country not later than July 31, 1982.

Purpose

The purpose of the course is to introduce participants to advanced knowledge of computer software and techniques and practice in programming so that they may be able to lead other programmers in their own country. The course comprises advanced COBOL programming, applications, system design, and practice.

Qualifications

Applicants are to: (1) be nominated by the government of their own country in accordance with the procedures; (2) have fairly good knowledge and experience (preferably not less than three years as programmers) in COBOL and FORTRAN programming; (3) have a sufficient command of spoken and written English; (4) be preferably under thirty-five years of age; (5) be selected according to their scientific and professional carreer; and (6) be in good health, both physically and mentally, to undergo the course of training.

Tentative Program

1. Orientation: September 16-25, 1982

   (1) General Orientation,
   (2) Lectures on Japan,
   (3) Sightseeing in Tokyo.

2. Lectures and Practice: September 27-December 16, 1982

   (1) System Design: System analysis, Program planning, Data management, Personnel planning

   (2) Operating System: Introduction to the operating system; Introduction to the job control program for COBOL programming

   (3) COBOL: Introduction to COBOL syntax; Programming - File maintenance, Table search, Sort and merge; Introduction to the online COBOL program

   (4) Application: PERT/TIME, PERT/MAN - POWER; Statistics, tabulations, census, data entry system etc.; Information retrieval; Lectures on: Government computerization and computers used in banking, industries etc.; Observation visits and tours.

A group training course in advanced informatics will be held in Tokyo in January 1983. Further information on the advanced course will be made public later. (AEU, June 1982.)

Educational Software

Educational software market is to reach $8.7 billion in 1990 according to the report, Educational Software for Personal Computers, (No. 1502), the first in Strategic Inc.'s new Personal Computer Information Service. The education market is defined as including schools and colleges, industrial and business training, and individual study. As virtually every subject commonly taught is a candidate for computer assistance, course material now available on computer-controlled interactive videodisc systems includes typing courses, language training, automotive mechanics, computer programming, and even ballet, all coming about through the combination of advancing technologies, including: personal computers, software, local area networks, and videodiscs.

More than one quarter of US public schools are today using personal computers regularly in instruction. Carnegie-Mellon University has announced its plan to give every enterin freshman, no matter what his or her major, a personal computer for use in all courses. Xerox has discussed its long-range plan to create a computer - "the size of a book" - with high resolution display and more mass storage than an individual can today envision filling. "While it may require another ten years to realize the hardware goals of this project, the software is already well-developed," according to Strategic's Mr. Cherlin.

The report says that the US training market, now estimated at $6 billion a year, is showing the fastest growth in computerized instruction. The military, another large scale user of computer-aided instruction and interactive videodisc, has reported that the army is even modifying the popular arcade game "Combat Zone" to train tank gunners.

In the next five years, computer-controlled videodisc players will be sold directly to consumers as educational programs and videodiscs proliferate. More than 250,000 systems are expected to be in use by 1985. The report points out that trials of videotex services in Britain, Europe, and in the US have made clear the considerable demand for educational materials, with some 40% of videotex trial users voicing their demand. Today, 10% of the actual usage on various experimental systems already involves educational materials.

In addition to preprogrammed courses, textbooks in mathematics and engineering are being written in APL (A Programming Language), which can double as a notation for mathematics. With such texts, every statement can be entered directly on a computer and then executed.

At still another level, the LOGO language (developed at MIT) is designed to be usable by elementary school children. The premise underlying LOGO that children should learn by instructing the computer instead of having the computer teach them. Since a person's preferences and loyalties are largely determined by the first system he or she uses, the report emphasizes that it is more important than ever for all computer companies, not just those presently manufacturing personal computers, to evaluate this critical market of first-time computer users. (Information Hotline, March 1982.)

French Government orders micros for secondary schools

The French Education Ministry has placed an order for 2,200 microcomputers as the first step towards a final total of 4,400. The order marks the intention of the government to revive a school equipment programme which it suspended after taking office last summer. Education Minister Alain Savary now seems likely to carry out "Operation 10,000 Micros" launched by his predecessor, Christian Beullac, during the presidency of Valery Giscard d'Estaing. The number of schools involved is now likely to be only 100. But the level of orders from computer manufactures will reach the same level as under the last government. The objective of "Operation 10,000 Micros", which appears to have been adopted by the government, is to use computers and line printers as aids for teaching languages, history, geography and mathematics. Daniel Gras, a Ministry of Education official, announced that training centres, each equipped with a score of computers, will also be opened this year to train 200 teachers by Christmas. 6,000 microcomputers are scheduled for installation in French schools by the end of 1982. (Computer Weekly, 11 March 1982.)

'A micro in every UK school'

The responsibility for provision of school microcomputers in England, Wales and Northern Ireland lies with the Department of Industry. Every secondary school is entitled to half the cost of one of two machines, the BBC computer or the Research Machines 380Z. The DoI has a budget of £3m for this purpose. By the end of the year, it is expected that almost every school will have taken advantage of the scheme, although most schools believe that a single machine is inadequate. The intention now is to extend the scheme to primary schools but final details have not yet been worked out.

Each school applying for a DoI micro grant has to make at least two teachers available for in-service training at one of 14 regional information centres established by the Department of Education and Science. The DES is providing £3.5m a year over three to four years to help set up centres which will offer training, information and act as points of contact for school microcomputing. The cost of the centres is met partly by the local education authority and partly by the DES. The DES has the principal responsibility for the practical side of educational computing - techniques of computer-aided instruction, educational software and so on. All local school microcomputing ventures have now been subsumed by the DES Microcomputers in Education Programme. The Scottish Education Department has made broadly similar provision. (Financial Times).

500 Apples in Irish secondary schools

Over 500 Apple II computers have been installed in Irish secondary schools under the first two phases of the Department of Education's scheme for the provision of computers for post-primary education.

Apple estimates that over 25,000 pupils will participate in computer studies using this computer in 1982. Back-up from the computer company includes the provision of Level 1 service centres and training seminars for teachers.

And in Cork, Apple began production of the controversial Apple III in March. To date, over IR£13 million has been invested by Apple in the Cork operation which supplies close to one third of the entire European market for micro-computers. Exports markets include England, Germany, France, Holland, Denmark, Italy, Spain, Canada and Australia. (Technology Ireland, June 1982.)

Programming at arm's length, or how to slash people costs*

No DP manager needs reminding of the ever increasing costs of his staff. Hardware costs may be plunging but salaries, fringe benefits, national insurance, pensions and other people related costs continue to grow. Many solutions are being tried in attempts to resolve this problem. Fourth generation languages such as SQL, ADF and Focus are beginning to produce large productivity gains. Structured analysis, design and programming techniques are leading to smoother development projects and reduced systems maintenance. Data administration together with the use of a DBMS does eliminate much duplication of effort. But for all this, the application backlog remains, end users are tempted into trying to do their own thing on a mini or micro, and people costs steadily climb. Non-procedural languages and system building by end users may well be the answer in the long term. To make an immediate impact, at least on the programming backlog, there is an alternative strategy: send the work to where costs are substantially lower and quality people are available.

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*by Ian Palmer, an independent consultant and co-author of Computer Weekly's successful Data Analysis series, now available in book form.

In several Third World countries where labour costs are a quarter European rates, there is a substantial pool of under-employed university graduates. The idea is not new. Large volume data preparation jobs have been exported to such countries as Taiwan and the Philippines for many years. A good example of the arm's-length production of software has been the co-operation between Burroughs and Tata, India's largest industrial firm, which now has a substantial software subsidiary.

Not all programming projects are suited to being handled in this way. The criteria for program coding to be handled remotely must be considered:

- The system design and specifications must have been fully validated and approved by user management. Interaction should not be necessary between end user and program coder, as this is clearly not practical.

- The program structure, design and specifications must be rigorous and complete. In other words there should be no scope for imagination or initiative on the part of the program coder.

- The strategy for program and system testing must be clearly laid out, and carefully designed test data supplied.

These principles imply a clear separation of design (the architect's role) from coding (the task of the construction worker). They imply standard management approval stages and quality control. They certainly imply a clear analysis and design methodology, with good documentation standards. The objective of these criteria is to minimise communication between the design team and the construction. But even with the best methodologies and diagrammatic techniques no specification can be proved to be watertight. Project organization should allow for one of the head designers to spend some time with the coding team, ensuring that there is no mis-communication in the specification. This is best done after the coders have had a few weeks to study the specifications and to organize the sharing of the work between the members of the team. Similarly, once the system is complete and conforms to the results specified with the supplied data, the project budget should allow for at least the coding team leader to install the new system in the user environment and to be present during user acceptance testing and performance evaluation.

This inevitable overhead in terms of travel and communication costs means that there is a minimum size of project which can be handled in this way. I have found that on the basis of the costs in India detailed in Figure 1 and assuming comparable in-house costs of $130 per day, the minimum size of a project is of the order of six man-months.

The selection criteria for a remote softwear development location include:

1. The availability of programming staff. Is there a pool of experienced programmers or graduates of a high standard, as would be expected in a major commercial city with one or more leading universities or technological institutes?

2. The availability of compatible hardware. Are there computer centres or installations with time to spare, running an operational environment (such as operating system, DBMS, TP monitor) identical with that under which the new application will run?

3. Communications facilities with Europe. Are telephone, telex and telefax lines and equipment available, and if so are communications good or are there endless delays in making a connection?

4. Travel connections with Europe or America. Is there an international airport nearby with frequent, reliable direct flights to London or some other convenient centre?

5. Infrastructure and business facilities. Is the location geared to multinational companies with adequate office accommodation, banking, electricity supply, water supply, security, etc.?

6. Quality of life factors. Is the location well served for transport, personal accommodation, shopping, recreation, or will there be difficulty in attracting staff, particularly management staff, from Europe?

7. Political stability and maturity. If a long-term view is being taken, does the country have a stable government with the prosperity of the people on the increase, or is it riddled with bureaucracy, corruption and hostility?

Among the countries worth considering are India, Sri Lanka, Malaysia, Thailand, the Philippines, Taiwan and South Korea. Figure 2 provides some comparisons for four countries I have studies personally. Singapore is not included; labour costs are already too high.

The availability of experienced DP professionals is highest in India. India and Sri Lanka both produce large numbers of graduates, who do not find it easy to obtain employment matching their intellectual ability. Note that in establishing a software factory where the emphasis is to be on coding and certainly not imaginative design, it may well be best to train recent graduates around the methodology and standards to be used, rather than attempting to retrain more experienced programmers.

It was in the Philippines that I found the greatest enthusiasm for participating in foreign programming projects. For example, one of the largest software houses and computer bureaux in Manila (with some 300 staff), is keen to participate in software product development, offering to share the investment by undertaking the coding and testing at no cost in return for a royalty on eventual sales. Another is able to undertake programming projects at a fixed price, but this is based on costings of less than $70 per day.

A bonus is provided by the government incentives offered to encourage Western companies to introduce their skills and to provide employment. In Singapore incentives have gone so far as to include a 70% subsidy on fees paid for training seminars, and even a similar subsidy on consultancy projects.

Most other countries have a zero or very low corporate tax rate for the early years in the life of a foreign subsidiary. Most have a duty-free zone where industries can be established; all necessary equipment, such as computers, imported free of tax; modern accommodation and services supplied; and where, in theory at least, red tape is cut to a minimum.

The Santa Cruz Electronics Export Processing zone near Bombay is one of the longest established. (Figure 1 assumes use of SEEPZ facilities). Other zones include Bataan in the Philippines and a newer site near Colombo in Sri Lanka. (Reprint of full article by permission of Computer Weekly.)

Programming costs in India

	(Dollars per annum)
Labour Costs:	
Basic Salary	?,700
Accomm. Allowance	900
Medical	150
Vacation	230
Travel Allowance	150
Retiremt. Fund	270
Training	400
Total	4,800
Overheads (shared between 30 progammers):	
Managemt. Costs	930
Admin. Staff	620
Accommodation	700
Services	760
Supplies	330
Telecommunications	830
Total	4,070
Annual Cost per Programmer	$8,870
Daily Cost	$38.50

Figure 1.

A comparison of four low-cost countries

	INDIA	MALAYSIA	PHILIPPINES	SRI LANKA
Programmer's monthly wage	$225	$800	$450	?
Computer installations	500	272	415	32
Software houses	?	15	23	2
Computer bureaux	?	10	28	2
Availability of staff	good	competitive	limited	need training
Income tax on foreign investors	7.5% for 5 years	0% for 8 years	0% for 10 years	0% for 25 years
Major foreign influences	British & Russian	British & American	American	British

Figure 2. Factors in establishing a software factory.

LEGISLATION

Data banks: Right to privacy

Following the adoption of the European Parliament's resolution on the rights of the individual with respect to data processing, it now seems that the European Commission may well start work on drafting legislation to protect the confidentiality of information held in data banks.

Respect for the individual's privacy has become a matter for international organizations like the EEC and the Council of Europe because of the increasing amount of information which is passed across national borders for processing or storage. The fear is that countries without satisfactory legislation on the subject might become information "havens", analogous to offshore banking centres, remote from the judicial control of the country of origin. (Nature, 15 April 1982.)

UK

Conference on computer law

A two-day conference was held on 19/20 May in London to cover aspects of the law that have been affected by the proliferation of computers through government, commerce and industry. One day dealt with new or proposed legislation and the second day covered practical matters with precedents for contracts, licensing agreements and presentation of evidence. For more details please write to School of Business Administration, 5 Elwick Road, Ashford, Kent TN23 IPD.

Software piracy

"Software piracy is a multi-million dollar problem and tis getting worse. The value of illegal software copied and sold by pirates may equal the value of the legitimate software market," according to Mr. Gervaise Davis, General Counsel for Digital Research Inc., and a specialist in software copyright law. "The basic problem is that there is a conflict between high technology and property law. the legal system was just not designed to deal with property that can be recorded on a magnetic disk." Mr. Davis suggests that the same type of copyright problems will soon arise in biotechnology.

The pirates have become a major headache and expense for U.S. software houses, Digital Research, like several of the major software producers, now has a staff of legal experts to handle the task of tracking down and taking action against the illeg copiers of their products.

Micropro International, which publishes Wordstar, one of the most popular word processing systems for personal computers, offers a reward to anyone supplying information leading to the pirates. Last month their efforts paid off when what is believed to be the first court room test of the 1980 amendment to U.S. copyright law which made software subject to copyright. The Federal District Court in San Francisco granted an injunction against a company called Dataforce prohibiting it from copying microcomputer software. (Financial Times, 22 April 1982.)

INFORMATION TECHNOLOGY

Send more bits

The age of electronic mail is about to dawn in Europe, not traditionally the leader in new information and communications technologies. Before the year is out, most European telecommunications administrations are expected to introduce a new international standard that will allow word processors to communicate with each other through existing telephone and data transmission networks.

With its penchant for confusing names, the information technology community is calling the new service "teletex". It is, however, a far cry from teletext, the broadcast information service. Teletex is either a sophisticated form of telex or a standard that allows computer terminals to communicate with each other.

The teletex standard was adopted by CCITT, the international telecommunications standards agency, at the end of last year. Europe's enthusiasm for it stems from the present difficulty of linking incompatible word processors over telecommunications links. The United States, which might be expected to be the largest market, is reluctant to adopt the standard, chiefly because the already-large word processor market makes it worthwhile for manufacturers to adopt their own communications standards. Canada, however, is not showing its neighbour's reluctance. It also plans to introduce a service this year.

The service to be launched throughout Europe this year will be relatively simple, but a facsimile standard is expected later. British Telecom's service will initially be suitable only for communicating between teletex machines through either the public telephone or packet-switched data networks. However, the service is expected to expand in 1983 to allow communications from teletex to telex machines.

The Federal Republic of Germany (FRG), which introduced its own teletex standard in part compatible with the international standard, has already laur ed a service. Manufacturers that have supplied to the FRG market, however, may not be able to sell their equipment in other countries without first modifying it for other networks. (Nature, 27 May 1982.)

British Government outlines IT spending

By 1983-84 the government will be spending twice as much on information technology programmes as had been planned by the last government, Patrick Jenkin, Secretary of State for Industry, claimed in the Commons. He told MPs that the sums committed by the government were £70 million in 1980-81 and £91 million in 1981-82. This included support for microelectronics development and application projects, development of IT products and processes, and space research and development. Cash allocations for the next three years stood at £134 million for 1982-83, £165 million for 1983-84 and £168 million for 1984-85. In addition to projects already announced, the money would go on new schemes for fibre optics, computer-aided design manufacture, robotics, flexible manufacturing systems and office automation, as well as micros for general practitioners, the micros in schools scheme, IT centres and the small engineering firms investment scheme. (Computer Weekly, 24 June 1982.)

Information technology down on the farm

Britain's agriculture ministry is helping farmers get to grips with information technology in the shape of British Telecom's Prestel service. The ministry has provided about 2000 "pages" of information on Prestel's computers, and is helping in trials to make television sets adapted for Prestel available to farmers.

The Ministry of Agriculture, Fisheries and Foods (MAFF) has been in the Prestel business for some time. It took on the 2000 frames when Prestel began public service in 1978. It followed that in 1979 by running a small trial on 10 farms in Norfolk. In 1980 it started another experiment, supplying 30 farms in the Midlands with sets. There are now about 500 regular agricultural users of Prestel: 350 on farms and in associated businesses, and 150 in the food and drink trade. The ministry is trying to spread the service still wider. Certainly the scope is there - there are about 200,000 farms in Britain.

But what do farmers gain from using such an incongruous piece of technology down on the farm? To many people's surprise, the modern farmer is not the sagacious man of the earth to whom natural disasters are of no more consequence than a flat tyre. His business is now so bound up with pesticides, herbicides and other chemicals that either boost or restrict growth - not to mention the rapid changes in prices of commodities - that he needs masses of up-to-date information. (New Scientist, 3 June 1982.)

ROBOTICS

Where robots are used

The most familiar robot application is car production. The works of large manufactures have become veritable breeding grounds for sophisticated robots which track car bodies along moving conveyor lines while spot welding panels together. Multiple welds are accomplished in short cycle times and the units automatically adjust their speed of operation to account for varying line speed. Tooling, consisting of spot welding equipment, in the region of 45 kg is manipulated effortlessly inside body sections. The phrase "handbuilt by robots" is becoming synonomous with reliability and quality in the automobile trade.

Materials handling is another area where robots can be successfully employed. Loading and unloading of machine tools is a typical case. The hostile environment of a foundry where hot castings have to be handled is ideally suited to automation. Welding and paint spraying require a higher degree of sophistication of the unit but these processes are still catered for with ease.

Robots are not entirely concentrated in automobile plants. Many have found their way into small and medium sized manufacturing companies. In one case, the consistency and speed of a robot welder justified the investment; welding time was reduced by a third on most jobs and by a factor of 10 on some, while positional accuracy within 0.25 mm was possible. The production quantity in this application was 5,000 units per annum.

Planning a robot application is complex and involves many financial and technical considerations. The particular process must be examined and its suitability to automation ascertained. Different equipment caters for low accuracy curve motion (spray painting), gripping (machine loading) or high positioning accuracy (assembly). Preliminary selection of a robot may be made using the parameters already discussed. When a short list of alternatives has been identified it is quite probable that feasibility tests will be required either at the suppliers or by an independent consultancy body.

There is a growing trend to shorten the considerable and laborious process of checking equipment suitability by the use of computer-aided design. Interactive graphic simulation of the workplace is possible to allow assessment of robot capabilities and optimisation of investment.

One feature of the industrial use of automation which must not be neglected is safety. The apparently unpredictable and random motion of robots is hazardous for maintenance personnel, adjacent workers and onlookers. Suitable barriers are mandatory and where possible equipment should be immobilised before access.

Manufactures should not believe that robots are the exclusive domain of high volume producers. This concept could lead to the failure of our industry to keep abreast of modern technology and maintain competitiveness. The evidence pointing to a rapid acceleration of robotics is inescapable and it is significant that despite the recession, investment worldwide continues at a high level. The trend has been well recognised in The Federal Republic of Germany and Britain where government backed development programmes have started.

The cost of the technology both in economic and social terms, will be considerable. However, if companies do not face up to the inevitable challenge they could fail. Others, for example the Japanese who have already adapted, have a stable and low price policy and an enviable standard of living. (Technology of Ireland, June 1982.)

World: Industrial robots in place, end-1981 (units)

Japan	10,000
US	5,000
W. Germany	2,300
Sweden	1,700
UK	713
France	600
Italy	450
Other Western countries	1,500

Source: British Robot Assn.
(Technical Survey, 10 April 1982.)

World robot count growth, 1985 & 1990

	1985	1990
Japan	16,000	29,000
US	7,715	31,350
W. Germany	5,000	12,000
Switzerland	600	5,000
Sweden	2,300	5,000
Norway	1,000	2,000
UK	3,000	21,500
Poland	200	1,200-1,500
Denmark	110	250
Finland	950	3,000
Belgium	150-200	-
Yugoslavia	100-150	300

Source: Robot Inst of America
(Technology Update, 19 June 1982.)

'Million robots by 1992' in the USA

Sales of robots in the US could more than double over the next two years, and increase by a factor of 10 by 1992, according to a report by US based research agency International Research Development*. IRD predicts that robot sales in the US will be $315 million in 1982, giving an installed base of 11,300 units. By 1984, sales will reach almost $640 million. Ten years on, in 1992, IRD predicts sales over $4 billion, at constant 1982 values, with almost one million robots installed. The US manufacturing industry is taking to robots on an increasing scale, says IRD president Kenneth Bosomworth. He cites worries about international competitiveness, especially with Japan, as the major reason for this.

Robots at Ford Motor

Ford Motor plans to have 4,000 robots at work in its US plants by 1990 and has formed a center to develop uses in Dearborn, Mich. The firm has acquired a building to experiment with uses and to train employees to program, maintain and operate robots. Ford reportedly has 300-400 robots now operating, mainly welding and loading/unloading parts. (Am Mtl Mkt, 22 February 1982.)

More DoI aid for robotics companies

The British Department of Industry's support for flexible manufacturing is a logical extension of its involvement in robotics, but this time with the emphasis on firms involved in smaller production runs. Up to now automation in the factory has been centered largely upon robotics and the undeniable cost and speed advantages they can bring. However, the robot is not a generally applicable tool, since the majority of factories are not concerned with turning out hundreds of thousands of identical products. Firms making limited runs of products or making several different products at the same time need greater flexibility and if the benefits of computerised techniques are to be used they need to be applied to machine tools and batch work. A typical flexible manufacturing system (FMS) is controlled by a central on-line computer linked to work stations and machine tools and provides a process control facility.

Announcing the scheme, Minister for Information and Technology, Kenneth Baker, said that £60m had been allocated offering 50 per cent grants for consultancy studies and a third grant towards development costs. He emphasised that the scheme is selective and applicants' projects should have 'innovatory features'.

About £25m of the grant is coming from the Science and Technology Act and this will be used to assist high-risk projects. The robotics assistance scheme has been regarded with the introduction of the FMS support and robotics grants will now also be one third development costs, rather than one quarter. (Electronics Weekly, 16 June 1982.)

French robots in space

Since the exploration of space started in the 1950s, the arguments have raged over whether people or machines should do most of the work. Pierre Morel, deputy director general of the French national space agency, has no doubts over the matter. Morel's pet project is called Solaris, though he prefers to call it a "concept" because a lot of the details are still undecided. Solaris is an orbiting platform on which automated systems such as robots will work. These will dock the platform with other orbiting space hardware such as satellites, perhaps to inspect or repair them. Later on, more advanced robots could perhaps construct larger platforms, or even form the workforce in the first space factories. (New Scientist, 18 March 1982.)

Japanese robots in Lancashire (UK)

If proof is needed that Lancashire is at long last managing to shed its chimney-blackened 19th century image, it is to be found at the Central Lancashire Development Corporation's industrial site at Walton Summit on the outskirts of Bamber Bridge.

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*The Robot Explosion, IRD, 30 High Street, Norwalk, CT 06851, USA. 151 pp. (Computer Weekly, 24 June 1982.)

High technology is the keynote of the whole development operation being orchestrated by the corporation. Microelectronics, control systems, and heat and fluid forming of exotic metals - among them titanium for the defence and aircraft industries - are some of the existing examples. But the latest arrival, Dainichi Sykes Robotics, does more than simply extend the parameters of high technology in the area. It puts Lancashire in the very forefront of what will certainly be a crucial element in the revitalisation of much of British industry.

Dainichi Sykes is the outcome of a unique agreement on British/Japanese co-operation in the field of robot manufacturing. Dainichi Kiko is one of the world's leading industrial robot manufacturers. The £125 million a year turnover Sykes Group, in Britain, has major engineering and oil interests. The group's partnership in Dainichi Sykes represents an important breakthrough since it is the first time that the Japanese have been prepared to transfer robot technology to a British company. At present a range of ten different Japanese-made robots are available through the Lancashire-based operation. Assembly and ultimately manufacturing stages will follow, with an eight acre site, adjoining the company's present premises, reserved for this development programme. But if the robot technology is at present exclusively Japanese, its applications to industrial processes are being designed and developed in Lancashire. The range of robots already available can perform a variety of complex operations in manufacturing processes - tirelessly and at speed. Tasks such as palletising, handling, sealing, cutting, machine loading, welding and assembly are child's play. And they can operate round the clock, if necessary, in hostile conditions - for instance, extremes of heat or cold. Their "brains", are, of course, the ubiquitous microchip, and this means that once installed in a manufacturing organisation they can be switched from one function to another simply by modifying the programme. (The Guardian, 17 March 1982.)

Spain has entered the robot age

At the SEAT factory in Barcelona the Unimate 2100 B, in charge of greasing gear boxes, has been christened Robustiano by the workers, who welcome him warmly; he performs one of the most laborious tasks in the whole production process. The robot makes 78 pieces an hour whereas until very recently it took two men to produce only half that number in the same time. At the Talbot factory in Villaverde the two Comau 6000 HT, who weld the back floor of the Horizon car, are affectionately called "lions" because they work protected by a metallic fence; Manuel Fernandez, in charge of their maintenance, is known of late as Angel Cristo (after the Spanish lion tamer). These two latter robots have been operating for a year, and in exactly one minute and 37 seconds they make 138 welding contacts. (Vision, December 1981.)

Robots that talk and listen

Researchers throughout the world are trying to develop computers and robot which can convene in human speech and be capable of learning by experience instead of following strictly to the programs stored within the electronic memory. The work on artificial intelligence is being tackled on both the hardware and software fronts. As regards hardware, researchers are looking at ways of making robots more flexible in operation. For example, a large area of research revolves around the development of robots which can identify one particular component among many different items, pick it up and place it where needed. The difficulties in doing this relatively simple job for a human, are enormous. The robot must be able to see - using some form of camera linked to its computer control system - and identify one component from several angles, let alone differentiate between different components. Known as "pick and place" robots experiments are being carried out in a number of research centeres worldwide including Edinburgh University in the UK and Stanford University in the U.S. At Edinburgh, researchers produced a system which could identify the various parts of a toy tractor and assemble it.

But if artificial intelligence is to emerge, the way in which computers are designed and programmed, has to be altered. A step towards this has been the emergence of Expert systems - which looks to be a major area of interest in 1982. The Japanese alone have committed themselves to the equivalent of $400m over the next 10 years for the development of fifth generation computer systems which will embody many features of the Expert system. The simplest examples which explains an Expert system is a system developed in the U.S. called MYCIN which is an interactive system that simulates a medical consultant specializing in infectious diseases. It engages in question and answer conversation with doctors needing specialist help and in three quarters of the cases gives the same advice as a human expert. The doctor can ask for help on the identification of micro-organisms and the prescription of antibiotica and also for explanation why it has given certain advice. Humans can also

improve the computer's knowledge by telling it about relevant knowledge they realize is missing in the program. Hence a program like MYCIN does contain elements of artificial intelligence because it allows the computer to learn and to explain itself instead of producing streams of information which have to be interpreted by humans which is the most common way in which computers work today.

By comparison with the work on artificial intelligence, progress on producing machines which can understand speech and reply is much more advanced. Many companies are working on the problems of speech synthesis and recognition and include ITT Semiconductors, General Instruments, National Semiconductor and Texas Instruments.

Texas Instruments was among the first to bring out a consumer product using techniques for speech synthesis. This was the well-known "Speak and Spell" toy which had all the circuitry squeezed onto silicon chips. There are a number of electronic chess games which also employ speech synthesis. Work on speech synthesis is divided into two areas. They are recognition, which tries to understand what is being said and synthesis where a computer "talks" using speech information stored in its memory. The earliest application for speech synthesis were in voice coding systems used in telecommunications but companies believe that there are numerous applications ranging from the rather frivolous such as clocks to more serious ones in industry to warn operators monitoring complex or dangerous processes.

One of the most promising areas of research is aimed at telecommunications and computing applications. Companies such as Bell Northern Research and British Telecom are looking at ways in which speech recognition and synthesis can be of benefit. For example, British Telecoms' research laboratory believes that the techniques could be used for man-machine communication using voice input over the telephone lines. Commands range from asking for Prestel pages instead of punching numbers on a keypad to ordering central heating systems to switch on remotely down the telephone line. (Financial Times Survey, 18 January 1982.)

Programs writing programs create intelligence

The automation of the programming task promises to be much more than just a productivity aid. It raises the level of abstraction from coding a problem solution in a computer language to merely describing the problem and letting the computer code the solution itself. Upon reflection, this is precisely the manner in which a person solves a problem. The problem is described to him or her either by another person or by direct confrontation with it. Then the person comes up with a solution plan from that problem description. Automating this sort of higher-level functioning will some day allow computers to simulate human intelligence.

A case in point is the industrial robot. Today the solution plan has to be described to the robot in terms of the myriad small movements that are necessary to perform its task. If the robot were endowed with an automated program-generation capability, it could accept the problem definition - put screw A in hole B - and program its own set of micro-movements to solve that problem. To the onlooker it would appear that the robot had intelligence.

This approach to artificial intelligence is radically different from the traditional methodologies. Those involve large Lisp programs that try to build the intelligence into a single monolithic block of code. If the computer can write its own programs from a skeletal set of solution methods, intelligence can be simulated much more compactly. (Electronics, 2 June 1982.)

RECENT PUBLICATIONS

Software Journal

Britain's first journal concentrating exclusively on software was launched earlier this year by Computer Weekly. Called "Software" it is aimed at the people in the medium and large organizations who are responsible for buying software. That includes the purchase of new packages, or even whole computer systems, as well as hiring outside staff, renting outside software or employing bureaux. The range of systems covered will span mainframes to microcomputers for commercial use.

"The Legal Protection of Computer Software" (edited by Hugh Brett and Laurence Perry; published by ESC Publishing Ltd., Oxford 1981; 197 pp.; price £15.00).

This book is a collection of articles by a variety of authors, all with a special knowledge of legal methods of protecting computer software. After an introductory chapter by the editors on the technical and legal background, the book moves on to consider the patentability of programme inventions in Europe and the US, copyright protection in Europe and the UK and the current copyright position in the US under the 1978 Copyright Act as amended. Various novel proposals for protection of programs by hybrid forms of patents and copyrights are reviewed, and finally the model provisions for protection drafted under the auspices of the World Intellectual Property Organization (WIPO) are considered. (From a review published in Computer Weekly, 28 January 1982.)

International Directory of Software 1982-1983 (published by Computing Publications Ltd. VNU Business Publications, 55 Frith Street, London W.1; price £48).

The 1982 Software Directory sticks closely to the format already well-established and proved with previous issues and the forerunner Computer Users Yearbook of hardware products. There are sections dealing with the products themselves, split into separate categories; indeces dealing with industry-specific products and products by category, followed by detailed profiles of suppliers as well as a quick-reference index of named products with page number. The introduction and explanation on how to use the directory is repeated in French and German. (From a review published in Computer Weekly, 24 June 1982.)

"Industrial Robots: A Summary and Foreast for Manufacturing Managers" by Ronald J. Sanderson, John A. Campbell and John D. Meyer; published by Tech Tran Corp., 134 N. Washington St. Naperville, Ill. 60540; 1982: 167 pp.; paperback $65).

The report illustrates the major robot configurations now being manufactured and used and their individual advantages and drawbacks. It presents in discussions and tables the chief products of the most important manufacturers, along with their specifications and characteristics. It also extensively discusses the principal applications of robots in industry today and the benefits derived from same. The appendices of the report contain an extensive listing of pertinent recent literature, important periodicals and directories; a listing of currently active robotics associations, manufacturers, research organizations and consultants; and a glossary. (From a review published in Chemical Engineering, 28 June 1982.)

UNIDO working papers on structural changes, prepared by the Global and Conceptual Studies Branch, Division for Industrial Studies:

"Restructuring World Industry in a Period of Crisis - The Role of Innovations"; an analysis of recent development in the semiconductor industry; UNIDO/IS.285;

"The Impact of Electronics on the International Economic Setting - The Case of Computer-Aided-Design; UNIDO/IS.297.

The following papers were prepared for the UNIDO/ECLA Meeting on the implications of microelectronics for the CEPAL region, held in Mexico, 7-11 June 1982 (see also "News and Events" on page 2).

		Language	
ID/WG.372/1	Prospects of Microelectronics Application in Process and Product Development in Developing Countries by Michael Radnor	E	S
ID/WG.372/2	Microelectronics and government Policies: The case of a Developed Country by Ernest Braun, Kurt Hoffman and Ian Miles	E	
ID/WG.372/3	Microprocessor and Productivity: Cashing in our Chips by Robert T. Lund	E	S
ID/WG.372/4	Microelectronics and Telecommunications in Latin America by Edgardo Galli	E	S

		Language	
ID/WG.372/5	Microelectronics: Its Impacts and Policy Implications by Juan F. Rada	E	S
ID/WG.372/6	Potential Applications Suitable for Microprocessor Implementations: Some Illustrative Possibilities by Jim Oliphant	E	S

Documents presented at the meeting which will also be available in the ID/WG.372 series:

Elementos para el Establecimiento de un Programa Regional de Acción en el Area de la Microelectrónica
por Carlos Aquirre y Roberto Heredia

Telecomunicaciones y microelectrónica: Algunas Observaciones
por E. Galli, M. Welch y R. Herrera

El Desarrollo de la Microelectrónica en la Argentina
por O. Filipello y R. Sagarzaza

(The above documents are available at present in Spanish only. Translations into English will be available early 1983.)

Cultural Aspects of Microelectronics Technology
by Carlos I.Z. Mammana

Microprocessor Applications and Industrial Development
by Robert T. Lund

Microelectronics and the Development of Latin America: Problems and POssibilities for Action
ECLA/UNIDO Joint Industry and Technology Division and Consultants Mr. Eugenio Lahera and Mr. Hugo Nochteff, Professor-Researcher of the Latin American Faculty of Social Sciences.

(The above documents are available at present in English only. Translations into Spanish will be available early 1983.)

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