4: Development of information technology in Tanzania

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1. History of informatics in Tanzania

Early Problems

The first computer in Tanzania, an ICT 1500, was installed in the Ministry of Finance in 1965. By 1974 there were seven computers in the country and the Ministry of Finance had already acquired a new computer, an ICL 1900. The introduction of computers was beset by problems in almost all installations. These can be analysed under the following headings.

Lack of Qualified Indigenous Personnel

Installations were totally dependent on foreign experts. In some cases these experts were not adequately qualified or experienced. Applications tended not to be properly documented and thus could run only if these foreign experts were around; when they left the country the applications stopped functioning.

Uncoordinated Planning

Uncoordinated planning was most evident with the computer installed at the Ministry of Finance. In the early 1970s the ministry had wanted to computerize the whole government accounting system using an ICL 1900 that was located at the ministry headquarters in Dar es Salaam. The project completely failed and was scrapped after a heavy loss. For two consecutive years the government could not tell how much money it had spent or collected as revenue.

This project failed for two main reasons. First, it was unrealistic to use a centralized card-based computer to process all government accounts. Tanzania covers a vast area with very rudimentary communications. It would therefore be very difficult to get data inputs from all over the country by post or otherwise within a given time. The second cause for the failure of the project was that, while the project was in progress, the government, advised by McKinsey, decided to decentralize its operations and accounting system.

Uncoordinated planning also affected the computer that was installed at the State Trading Corporation (STC). STC was a big parastatal company charged with the task of carrying out import, wholesale, and retail trade for the whole country. The company dealt with over 50,000 different items of stock for the whole country. STC

had to know the economic order quantities and costs to avoid stock shortages and to be in sound financial liquidity by avoiding overstocking. STC had also contracted McKinsey to carry out a study of its operations. Later, STC management, after installation of a computer, invited other foreign experts to implement the applications. The two studies were not coordinated and to some extent contradicted each other. The computerization project failed; STC fell into financial and managerial crisis, and finally the government dissolved the company.

Government Intervention

After the failure to computerize the government accounting system and the consequent heavy financial loss, the government came under great criticism from members of parliament and the general public. They pointed out other failures, including that at STC. In 1974 through the Government Gazette, the government banned the importation of computers and all related equipment into Tanzania.

The Ministry of Finance later appointed two teams to carry out a study of the viability and utilization of computers in the country.[1] The first team was made up of members from the National Institute of Productivity and the International Labour Organization of the United Nations. This team advised the government to formulate a national policy on computer technology (acquisition and utilization), and a national training programme in computer science.

The second team was called the Government Computer Task Force. Most of its members came from the Government Computer Service Centre at the Ministry of Finance. The team was to report on computer utilization in existing installations; applications running on the computers; the manpower base in the country; and those computers that should be surrendered to suppliers. The team recommended that a computer advisory committee be formed to advise the Minister for Finance on computer matters, and that the government should lay down detailed guidelines on computer acquisition in Tanzania. The team advised against returning any computers to suppliers. The government adopted all the recommendations from the second team and implemented them. It adopted some of the recommendations of the first team but did not implement them.

2. Current situation: Computer hardware

All computer hardware in Tanzania is imported. Currently there are no plans to assemble within the country, and this situation seems likely to continue. Importation of computers into Tanzania was greatly affected by the ban of 1974. There was insignificant growth in the number of units installed in the country between 1974 and 1980. In the early 1980s several factors combined to open the doors for the importation of computers. These were the coming of microcomputers, the obsolescence of existing computers, and the collapse of the East African Community.

The Coming of Microcomputers

As in many parts of the world, microcomputers can easily be afforded by small firms and individuals. Microcomputers are also very small in size compared with second-generation computers, which were still in use up to the early 1980s. In Tanzania, many private companies and some individuals started to import computers using their own funds. Although the government continued to monitor the importation, it was soon overwhelmed as the number of units being imported into the country grew, importers of computers being required to obtain a permit before importation.

However, applications for import licences for microcomputers began to be submitted after the computer had already been installed. The government became even laxer than before because, in the case of microcomputers imported by private organizations and individuals, it was not financially involved.

Obsolescence of Existing Computers

The 1974 ban was so effective that practically no public organization managed to import a computer until the end of the decade. In the late 1970s organizations were still using computers bought in the 1960s. These were already obsolete and frequently broke down. Users were also being told by vendors that it was very difficult to get spares for the old computers. One of the users of these old computers was the Ministry of Finance. The ministry had to give in and buy a new computer. It also gave permits to several other organizations to replace their old computers with new ones.

Collapse of the East African Community

Up to 1977 Tanzania, along with Kenya and Uganda, was a member of the East African Community (EAC). The EAC ran all railways, posts and telecommunications, civil aviation directorates, harbours, and an airline for all the member states. Several of these organizations had computerized their operations. When the EAC broke up in 1977, each country had to set up its own organizations to take over the services that had been carried out by the EAC. For most organizations formed in Tanzania there was a problem because they were taking over systems that had been computerized during the EAC and were now reverting to manual operation. The government was therefore under pressure to buy computers for these new organizations. These organizations had the necessary Tanzanian experts who had worked with the EAC. The government therefore allowed the Tanzania Harbours Authority, Tanzania Posts and Telecommunications, Air Tanzania, and Tanzania Railways to install computers.

The above three factors changed the pace of importation of computers into Tanzania. Currently several public organizations continue to buy computers using foreign exchange allocations from the government. Other organizations acquire computers through donations.

3. Trend in growth of hardware acquisition since the 1960s

Numbers

Information on numbers and makes of computers imported is not readily available. Some investigations have been made.[1,2] These authors note that the figures provided are based on inaccurate official statistics. The real number of computers is undoubtedly much higher than those figures. Nevertheless, figures 4.1 and 4.2 show the exponential growth rate of computer acquisition in Tanzania in the 1980s. Table 4.1 shows the number of computers by sector in 1986. As in other countries, what is important is not the number of units but how they are used. This is even more important for computers acquired using public funds.

Computer Vendors in Tanzania

Up to the end of the 1970s, ICL and NCR were the only computer companies with an office in Tanzania. ICL was more dominant, as NCR was more involved in selling business machines than computers. Almost all of the early computers installed in Tanzania were of ICL make.

Currently there are many agents selling computers in Tanzania. Most of these vendors deal with only one make of computer. The following are the main vendors of computers in Tanzania:

- Computer Corporation of Tanzania Limited (CCTL) - Agent for Wang Computers. Currently sells all ranges of Wang computers.
- Computers and Telecoms Systems Limited (CATS) - Agent for ICL Computers. Sells all ranges of ICL computers.
- Business Machines Limited (BML) - Agent for Apple, Olivetti, and recently Digital Equipment Company computers. Currently sells microcomputers and Micro-Vax Computers.

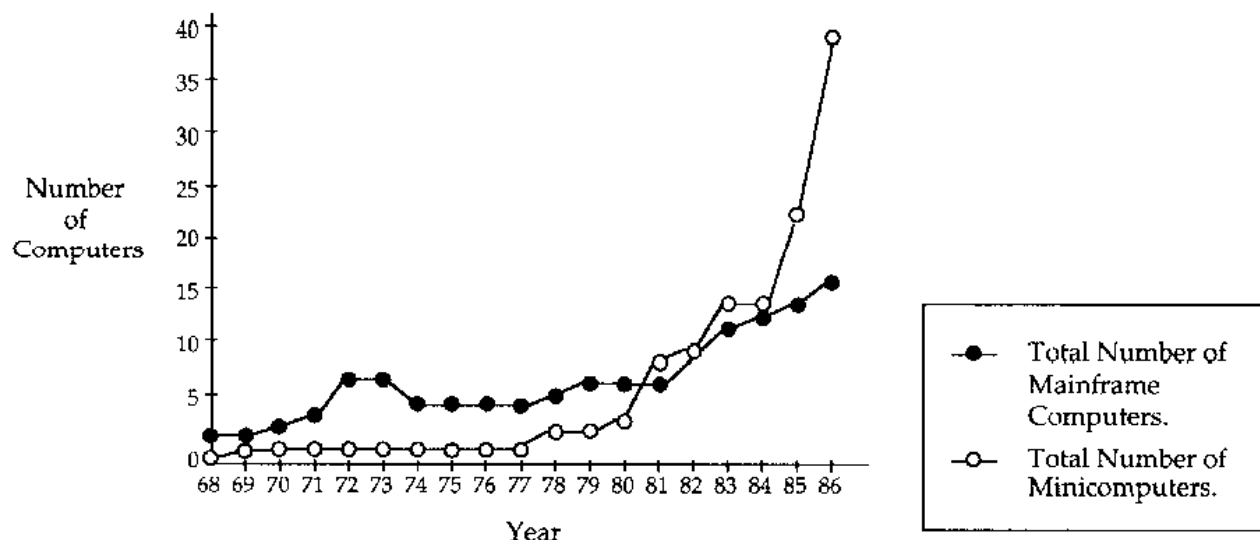**Fig. 4.1. Number of large computer systems in Tanzania, 1968-1986 (Source: ref. 2)**

Fig. 4.2. Number of microcomputers in Tanzania, 1980-1986 (Source: ref. 2)
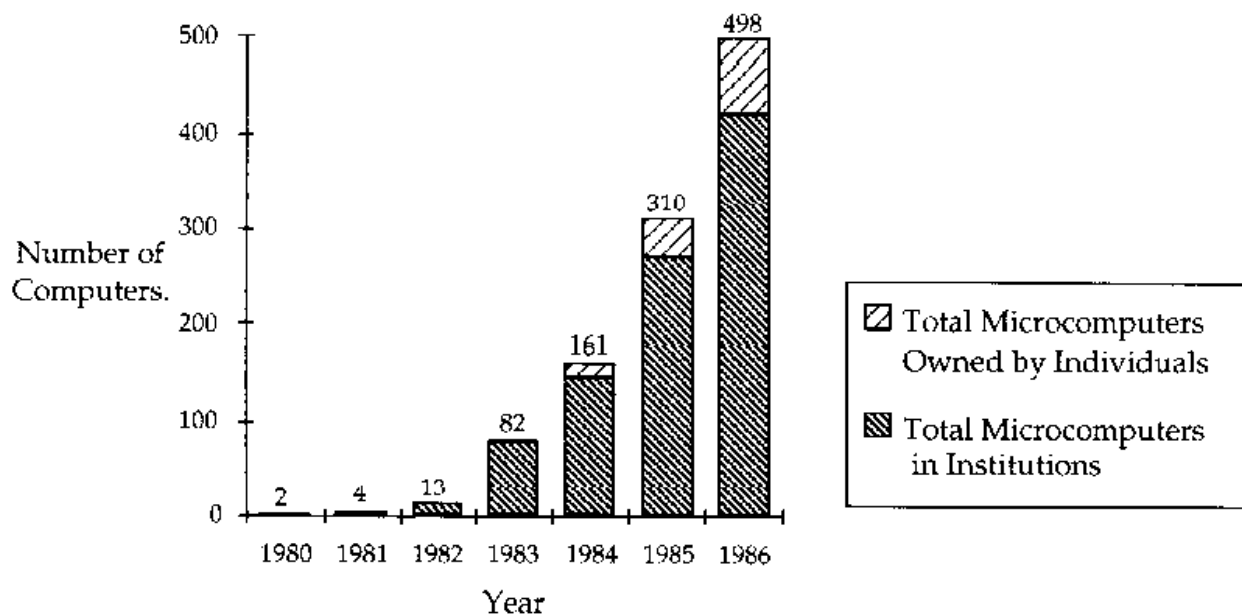

Table 4.1. Distribution of computers by sector, 1986

Sector	Micros	Minis	Mainframes	Other	Total	Percentage
Public						
Government	223	7	3	4	237	30.5

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Parastatal	223	23	15	17	278	35.7
Private	235	16	4	8	263	33.8
Total	681	46	22	29	778	
Percentage	87.6	5.9	2.8	3.7		100.0

Source: Ref. 1.

- NCR Corporation (Tanzania) Limited
Representative of NCR Corporation. Sells all ranges of NCR computers.

- MEECO International Limited (MEECO)
Agent for Unisys Computers. Sells all ranges of Unisys computers.

- International Communications Systems Limited
Agent for IBM computers. Currently deals in microcomputers only.

- IMS Computer Limited
Agent for Amstrad and Tandon computers.

Computer Hardware Market Shares

The computer hardware market shares are still very volatile. Leadership keeps on changing. It is however fair to say that in the minicomputer and mainframe market the most successful vendors so far are JCL, CCTL, and NCR. In the microcomputer market, BML and CCTL may be leading.

Computer Consumables

Apart from the usual computer hardware units, in the case of microcomputers comprised of system unit, monitor, and keyboard, there are consumables that are vital for computer use, including ribbons for printers and floppy disks. These are in short supply within the country and whenever they are available they are sold at exorbitant prices. The price of one high-density floppy disk, for example, is more than US$15.00 in the open market. The same floppy disk sells at around US$1.5 in the Western world.

Servicing of Computer Hardware in Tanzania

Hardware maintenance in Tanzania is a big problem, especially for microcomputers. According to Sheya and Koda,[2] about 80 per cent of mainframe computers, 50 per cent of minicomputers, and 60 per cent of microcomputers are owned by institutions, and only 25 per cent of microcomputers owned by individuals have got local support service. This has resulted in some computers standing idle after purchase, as is the case with the IBM system 36 computer at General Tyre (EA) in Arusha. This situation has also resulted in some computer vendors, such as Business Machines Ltd., opting to service a variety of computers in addition to those that they officially support. The Science Workshop at the University of Dar es Salaam is also equipped with personnel who can service a variety of microcomputers and other electronic machines. Lack of spare parts is a major problem for the Science Workshop.

Scarcity of spare parts for computers is a major problem for the whole country. Many vendors concentrate on importing computer units but not spare parts or other accessories. Some vendors, such as CCTL, which is an agent for Wang Computers, completely refuse to service computers that are not imported into the country through them.

4. Current situation: Computer software

Systems and Applications Software

There are no software houses in Tanzania. Most of the software in Tanzania is either imported or developed in-house. All systems software is imported. The discussion below therefore refers only to applications software. For convenience of discussion we can divide software into two groups:

(1) microcomputer software; and
(2) mini and mainframe software.

Microcomputer Software

Most of the applications that run on microcomputers use imported packages, such as Wordstar, WordPerfect, Lotus, Symphony, Dbase, and so on.

Most of the microcomputers are currently used for word processing and spreadsheets. They could be used in more advanced applications such as processing of accounting records. If this is to happen, the software to be used must either be developed internally or be customized to fit the local needs.

Mini and Mainframe Software

Most of the applications that run on minis and mainframes are developed internally. Some have been developed by foreign experts. The main feature in this area is that there are no integrated systems. Most systems are standalones. Plans totally to computerize the operations of the Tanzania Posts and Telecommunications Corporation started in early 1987, but so far there has been no success. The National Bank of Commerce wanted to computerize its operations. It bought an ICL ME 29, a machine that is clearly not configured for such a task. The efforts started back in 1987 and, again, there has been no progress; the machine was already obsolete at the time of purchase. These were two major projects in which foreign experts were involved.

5. Informatics education and training

Central Planning

Tanzania offers free education to all its citizens, from the primary school to university level. All education matters in Tanzania are handled by the Ministry of Education. The ministry, in collaboration with the Ministry of Manpower Planning, plans all educational matters from the primary school to university level. This is a huge task; it is very easy to lack flexibility and to overlook issues. Informatics education and training in Tanzania may have been adversely affected by this arrangement.

History of Informatics Education and Training in Tanzania

The first informatics training in Tanzania was started by the University College Dar es Salaam in 1965 at the Institute of Adult Education. The university later offered an optional course of programming in FORTRAN to university students who were studying a degree in mathematics; this is still running.

Later, computer courses were offered to students in the faculties of Engineering, Science, Commerce, and Arts (Statistics Department only). These are normally one-subject courses, which in some faculties may be optional.

None of the above courses trains people to be specialists in computing. The courses provide either computer appreciation or how to use computers to solve problems in a specialized area, such as surveying in civil engineering or forecasting in commerce.

In 1974, the University of Dar es Salaam started a Master of Science course in computer science. To many people this was a wrong strategy. There was no reason to start a Masters-level course when no other institution in Tanzania was offering a first degree or even a diploma in the same area. The course had problems and ceased in 1984 after training only 12 Tanzanians, 6 of whom are no longer practising.[1] Currently there are plans to start a diploma course in computer science.

Apart from the University of Dar es Salaam, several other government-owned institutions offer courses in computing:

- *Eastern and Southern African Management Institute (ESAMI)* This regional management training centre offers short courses and seminars in systems analysis and design, computer operations management, and computer appreciation. It is well staffed and has adequate computing facilities.

- *The Institute of Development Management (IDM)* Basically conducts courses that complement accountancy and other courses. The institute is not well equipped with computing facilities.

- *Institute of Finance Management (IFM*) Like IDM, this institute offers computer courses that complement accountancy and other courses. The institute is also not well equipped with computing facilities.

- *College of Business Education* This college offers computer appreciation courses to students taking diploma courses. The college also conducts short courses in computing. The college is equipped with several PCs.

Problems of Informatics Education and Training in Tanzania

Several factors affect informatics training in Tanzania. These factors apply to all institutes in the country. We can classify these factors as follows:

- apathy,
- lack of instructors,
- lack of books,
- lack of hardware.

Apathy

As already discussed earlier in this report, computers initially earned a bad reputation in Tanzania. After the first failures there was a general opinion that using computers was a wrong strategy and that computers were unreliable. Stories that computers might cause unemployment made them generally unwelcome in a country that was trying to achieve full employment.

Naturally, the government affected the development of computing in Tanzania through its misguided publicity, the banning of computers, and its unwillingness to invest in computer training. This is an area that the government needs to tackle now. In March 1989, the Minister for Finance proclaimed that computers are essential for the future development of the country. This is a major change in Tanzania.

Lack of Instructors

Because there has been little effort specifically to train specialists in computing, there is a critical shortage of computer professionals, let alone instructors. If any meaningful training is to start immediately in the country, then expatriates will be needed.

Lack of Books and Journals

Lack of foreign exchange has seriously affected importation of books and journals for many years. Devaluation has also made books and journals expensive and unaffordable by students and instructors.

Lack of Hardware

Owing to the lack of computer hardware, most of the training institutes teach computing as a theoretical subject. Microcomputers are not very expensive and would be adequate for most of the training institutes. The Faculty of Commerce, for example, has only three microcomputers, while it has a yearly intake of 150 students.

Informatics Education and Training in Private Institutions

Many private institutes and even individuals offer courses in computing. Essentially these have arisen to fill the vacuum left by the government and are playing an important role. The following are some of the private institutes that offer training in informatics:

- *International Computers Limited (ICL)* This is the oldest computer training institute in the country. In terms of hardware, it is well equipped. It offers short and full-time courses in computer studies. In March 1989, it announced a one-year full-time diploma programme.

- *Dar es Salaam Institute of Computer Science and Management (ICSM)* This institute offers computer appreciation courses, BASIC programming, and word processing using microcomputers.

- *IMS Computers Ltd*. Offers courses in word processing.

- *Advanced Commercial Institute* Offers a course in word processing.

Several other private training institutes have been announced but they have not started operating. As can be seen from the above discussion, all institutes except for ICL offer very elementary courses. Most of these institutes offer very short courses, which raises doubts about the benefits derived from them.

It is difficult to monitor the course content and quality of the courses offered by these private institutes. Each institute gives a certificate, but it is difficult to compare certificates of any two institutions. This suggests the need for centrally controlling and monitoring the certification.

Although private training institutes are doing a good job, it must be emphasized that, given the educational structure of the country, only the government itself in cooperation with training institutes can plan a meaningful informatics training programme. The government should first of all train trainers, and then buy computer equipment to be used by the training institutes.

Training should be geared towards production of the following types of professionals in informatics:

- systems analysts,
- systems programmers,

- application programmers,
- computer operators,
- auditors for computerized systems,
- electronics technicians.

Tanzania has a critical shortage of systems analysts. Many computer systems that have been installed in various organizations in the country are not realizing their full potential because of the lack of systems analysts and good programmers. Some parastatal organizations computerize their applications using experts from abroad. Some of these expatriates do not train indigenous Tanzanians to use the computers when their contracts expire. Several parastatal organizations have been affected by this. A recent example was at Kilimanjaro Tools Limited, where an expatriate decided to uninstall all the programs when he was leaving the country.

Lack of trained Tanzanian personnel in the area of informatics is further underlined by the complete failure of some firms to make use of computers that they have bought. The National Insurance Corporation of Tanzania is failing to use its computer because of lack of personnel. The General Tyre (EA) in Arusha bought an IBM system 36 in 1982 but it has never been installed because of lack of expertise. These are sad stories and they may be only the tip of the iceberg.

6. Computer usage

Computers are put to a variety of uses in Tanzania, depending on the type of computer and the organization owning it. For example, while many firms that own mainframe computers use them for processing accounting data, the main use of these computers at the university is for teaching and the processing of research data. Again, although many firms that own microcomputers use them for word processing, some use them for planning and forecasting, for example using spreadsheets, while a similar type of microcomputer may be used for simulation in the Physics Department at the University of Dar es Salaam.

We can, however, say that the following sections describe the major uses of computers in Tanzania.

Processing of Accounting Data

The processing of accounting data is by far the major use to which computers are put in Tanzania. Many computers are used in payroll processing, billing, and processing of other types of accounting data. Some organizations have sophisticated applications, while many run simple ones. All of the computers currently used in processing accounting data are of the minicomputer and mainframe types.

Processing Research and Survey Data

Processing research means that computers are used not in hardware or software research but as a research tool in a number of fields. The type of research in which computers are used ranges from the very simple, where the computer is used as a calculator to analyse research data, to where a computer is hooked to a high-performance liquid chromatography machine in the Physics Department of the University of Dar es Salaam. Most of the computers, however, are used in processing simple research data.

The types of organizations that use computers to process research and survey data and the types of computers they use vary considerably. The Ministry of Finance's ICL ME 29 computer, for example, is used in processing labour statistics, statistical and other survey data from various ministries, census data, etc. Although some of the research or survey data processed may be routine or predictable, some are ad hoc.

Most of the microcomputers at the University of Dar es Salaam are used in processing research data.

Teaching

Although all computer installations are frequently used for training users or operators, those installed in training institutions are mainly used for teaching. In Tanzania such computers are found at the University of Dar es Salaam Computer Centre and other training institutes, such as the ICL training centre. The number of computers used for teaching in Tanzania is very small.

Specialized Applications

A few computers in Tanzania are used for specialized applications. Such computers are used directly in aiding other electronic or electro-mechanical processes and include those installed at the Tanzania Posts and Telecommunications Corporation for real-time switching of telephone calls. The Meteorological Department also uses a computer for weather forecasting.

7. Informatics infrastructure

Infrastructure in the area of informatics covers such things as the existence of software houses, hardware maintenance services, and network facilities. The first and second items have been discussed in the software and hardware sections respectively. Network facilities will be discussed in this section.

Tanzania does not have a packet switched data network (PSDN). Data are transmitted using the long-established public switched telephone network (PSTN). The Tanzania Posts and Telecommunications Corporation (TPTC) monopolizes all telecommunication matters in the country.

At present the organization has no intention of setting up a public data network. It is more concerned with the expansion and modernization of the existing facilities, especially the telephone system. In Dar es Salaam alone, for example, about 30,000 people are waiting for telephone facilities.

The TPTC, however, provides leased circuits to customers who do not wish to use the PSTN facilities. Several international companies and foreign embassies use leased circuits for data transmission. Leased circuits may soon be used by the National Bank of Commerce and other financial institutions.

The TPTC has started to install digital telephone exchanges. So far two of them have been installed, one in Morogoro with 2,000 lines and the other in

Zanzibar with 3,000 lines. Digital exchanges could be used to set up an integrated services data network (ISDN), which is capable of transmitting data directly. With this development it seems that Tanzania will jump from PSTN to ISDN, skipping the PSDN.

Also related to data transmission is the installation of facsimile machines. Demand for telefax services has risen very rapidly. Several private organizations have established telefax bureaus. The TPTC is in the process of establishing its own telefax bureau.

8. Informatics policy

Background

There is no informatics policy in Tanzania. As discussed earlier in this report, recommendations to formulate such a policy were made in 1974 by a consulting team from the National Institute of Productivity (NIP) in cooperation with the International Labour Organization (ILO) of the United Nations. NIP had been commissioned by the government to look into the future of computers in Tanzania after the disaster that hit computer projects at the State Trading Corporation and the Treasury. A second recommendation of the NIP/ILO team was that there should be a computer training programme in the country. Neither of these suggestions was adopted. The government was even contemplating making some of the public institutions with leased computers cancel the contracts and return the computers to the suppliers. Following advice from another team drawn from the government, this was not done, but the government banned the importation of any computer equipment into mainland Tanzania.

To soften the ban, it was later announced that computers could still be imported by the Minister for Finance. An ad hoc Computer Advisory Committee was formed after the ban to scrutinize all applications for computer importation and to advise the minister accordingly. An applicant was supposed to seek approval, but for all practical purposes the ban was very effective until the early 1980s.

The ad hoc Computer Advisory Committee has not been dissolved but it is no longer effective. It does not meet regularly as it is supposed to do, and computers are entering the country at an exponential rate.

Towards a National Informatics Policy

In 1985 the Ministry of Planning and Economic Affairs announced the formulation of the National Science and Technology Policy for Tanzania and the establishment of the Tanzania National Commission for Science and Technology. These steps are important as far as informatics in Tanzania is concerned, although this area was not specifically highlighted in the document. Informatics can still conveniently find its place in the policy and, given the tempo that Informatics has already gained in the country, it seems that its place is well assured.

In August 1987 an international seminar on the contribution of informatics to economic development was organized by the Ministry of Finance, Economic Affairs and Planning in cooperation with the University of Dar es Salaam, the Intergovernmental Bureau for Informatics, and the UNESCO Regional Office for Science and Technology in Africa. This seminar was attended by top government officials in Tanzania (Principal Secretaries) and the heads of all large parastatal organizations. One of the recommendations that came through clearly from this seminar was the need to have a comprehensive Informatics policy.

As a follow-up to the conference, in December 1987 the Minister for Finance, Economic Affairs and Planning announced the formation of a Task Force for Informatics Development. The team consists of eight members drawn from the following organizations:

- the Planning Division of the Ministry of Finance, Economic Affairs and Planning,
- the University of Dar es Salaam,
- the Ministry of Communication,
- the Ministry of Works,
- the Ministry of Agriculture,
- the Ministry of Education.

The task force is supposed to recommend to government those actions that are needed to ensure progress in Informatics development in Tanzania.

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