

COMPUTERS AND DEVELOPMENT: THE ZAMBIAN EXPERIENCE

by

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DECLARATION

I, Michael John Finian Kelly, do solemnly declare that this dissertation represents my own work which has not previously been submitted for a degree at this or another University.

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APPROVAL

This dissertation of Michael John Finian Kelly is approved as fulfilling part of the requirements for the degree of Master of Arts (Sociology) by the University of Zambia.

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## ABSTRACT

The use of computers in developing countries is growing rapidly in recent years, particularly as a result of recent advances in computer technology. An understanding of the ways in which computers are used in developing countries, and of the impact which their widespread use will have on development of these countries, is assuming new importance. This study was designed to examine these questions in relation to the practical experience of Zambia.

The primary source for the study was a survey of those people, both computer experts and computer users, who have substantial experience of working with computers in Zambia. A total of 88 people were surveyed, in 55 organisations drawn from all sectors of the Zambian economy.

The main findings of the survey are that -

- (a) Computers in Zambia are being used in ways which are different from those established in the West,
- (b) Computers are not installed to reduce costs or staff, but to remedy the skills shortages which reduce efficiency and productivity in organisations in these countries,
- (c) Computerisation has been accepted readily in Zambian

society, and there is no evidence of any problems caused by computers to date. However, problems may emerge as the scale of computer usage increases in the future.

In relation to development theories, the material from this study would support the modernisation school view that computers have great potential to support and accelerate the development of developing countries. The use of computers does involve dependence to some extent, but it is suggested that this may be less serious than in the case of other modern technologies. The degree of dependence caused by computerisation is also related to the effort made by a developing country to develop its own expertise and safeguard its own interests.

In general, computers have a great potential to assist development, but each country also needs to take steps to exploit the technology in its own best interests, and to ensure that society adapts to the changes involved with a minimum of disruption.

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## PREFACE

In 1986, I came to Zambia under the Irish Aid programme with a mandate to establish third-level computer education courses in Evelyn Hone College, Lusaka. In order to design appropriate courses, it was obviously important to understand how computers were used in Zambia. It was also necessary to understand how computers were contributing to the development of the country. Some sources had suggested that computers were inappropriate to developing countries. If this were so, the very purpose and value of setting up computer education programmes in Zambia would be open to serious doubt.

A detailed examination of the available literature on computers in developing countries did little to help. Some writers were very enthusiastic about the potential of computers, while others seemed to foresee only problems and failures. The literature was particularly frustrating because very little empirical basis existed for any of the conclusions. The authors were, for the most part, theorising about what effects computers might have.

Since I had the opportunity and the technical background necessary to study this issue, and since my work in Zambia

brought me into contact with many of the senior people in the  
Zambian computer industry, this seemed to be an opportunity to  
conduct some original research into the question of computers and  
development in Zambia.

The main source for this research was a series of in-depth  
interviews with many of the people who are most knowledgeable  
about the history and current status of computerisation in  
Zambia. The interviews were conducted in an atmosphere of ready  
co-operation and eagerness to help. Many of the interviewees  
showed a great interest in the issues under investigation and  
devoted a considerable amount of time to discussing them despite  
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## CHAPTER 1

### INTRODUCTION

#### Scope of the Study

Over the past thirty years, computers and computer systems have invaded almost every aspect of society in the developed world. In virtually every field of human activity, computers are having an increasing influence. The scale and scope of these developments are so great that they are undoubtedly having a major impact on developed societies :

There can no longer be any question that the industrial nations of the world are producing another technological revolution of historic importance. (The computer) may well emerge as the single most important influence in the development of a post-industrial society. . . . the question is whether the ramifications of this technological spurt will be comparable to those of the first and second industrial revolutions ( Lowi,1975:454).

However, like all powerful technologies, computer technology can be used for beneficial or damaging purposes, and the effects can be different from those intended. Some commentators have predicted great dangers to society from the extensive use of computer systems, resulting in effects such as increases in unemployment , invasion of privacy and threats to civil liberties :

The uncomfortable question keeps on re-appearing - will society be altered for the better ? Technologists, sociologists, journalists and others have begun to sound warning bells ( Earl, 1978: 360).

Developing countries, although they were late starters in this revolution, are now beginning to experience the dramatic growth of computerisation which may eventually affect all aspects of their societies. As a result of constant advances in manufacturing techniques, computers have become considerably cheaper, easier to use, more rugged and less demanding of support services. It is only since the advent of the microcomputer in the early 1980's that a form of computer equipment exists which seems to be appropriate to the practical requirements in developing countries. There are grounds for believing that developing countries will as a result experience a rapid growth in the usage of computers and computer systems in the future, and that is certainly happening in Zambia at present (Kelly, 1987:286).

In the developing countries, the "computer revolution" will take place within the general framework of development issues, and will itself have a significant effect on those issues. As the UN Secretary General said in his report to the UN on the Second Development Decade :

Computer technology wherever appropriate and through sound application, can significantly contribute to accelerating the rate of economic and social development desired in the developing countries (quoted in Taylor, 1977:4).

The circumstances affecting appropriateness and sound application in a developing society are of major importance. They are also poorly understood. There are various reasons for this. In the first place, it is only in the very recent years that

computerisation in these countries has reached a scale which could cause any noticeable effects. Secondly, the technology is developing so rapidly that findings on its effects go rapidly out of date. Finally, there is the consideration that the assessment of the effects of computerisation, and of their impact on society, is a complex issue, as evidenced by the range of different opinions held on this issue.

No detailed, factual information has been available on the usage and effects of computers in a developing society such as Zambia. Therefore, the main question to be addressed by this study is :

What has been the practical experience in Zambia of computerisation, and in what ways has computerisation contributed to or detracted from the development of the country?

While computers can and will be used in a great variety of situations, the study is concerned only with the use of computers for data processing in administration, commerce and industry. This is the predominant usage of computers, and the one which will have most impact on society for the foreseeable future.

Considerable experience has been gained by now in relation to the effects of computerisation in developed societies. While this experience serves as a background for this study, it has been a central assumption of the study that the interaction between

computerisation and the society will be different in a developing country from that between computerisation and a developed society. In particular, it was assumed that :

- (a) the decisions to install computers in Zambia are generally not designed to reduce staff costs, but to achieve other benefits of improved efficiency and productivity which relate to the particular economic and social circumstances in the country, and
- (b) that computers are appropriate to Zambian conditions, because these other results are very important for the country's development.

#### Objectives of the study

The central objective of the study was to establish a body of knowledge, based on empirical observation, about the effects of computerisation in Zambia to date, and the actual and potential contribution to the country's development. It was felt that this would be valuable because of the perceived importance of computerisation for national development in the future, the differences which were assumed between computer impact in the developed and developing countries, and the lack of empirical information about computerisation in the developing countries.

Based on the experience of some three decades of extensive computerisation, a substantial literature exists on the effects of computerisation in developed societies, and it exhibits a general consensus as to the reasons for, and results of computer

installation. These reasons and results seem to be singularly irrelevant in a country like Zambia, as will be seen when we consider :

- (a) The relationship of wage to computer costs,
- (b) Sources of decisions to computerise, and
- (c) Results achieved by computerisation.

A fundamental reality which lies behind every potential decision to computerise in developed countries is the question of the relationship between wage costs and computer costs. In essence, computers and human beings are in competition for jobs in the administrative, commercial and industrial sector. In the words of one authority :

The computer . . . represents an investment in a capital-intensive, labour-saving device that has to justify itself, in competition with other possible forms of investment, through savings in clerical and other personnel costs together with the improvements it brings about in organisational decisions (Simon, 1977:424).

The most important single question in considering the impact of computerisation is that of the relationship between wage costs and computer costs. If wage costs are such that a job can be done *more cheaply by clerical methods than by computer, it would be reasonable to suppose that computers will not be used in preference to people.* In the developed world, this was largely the case in the early days, until computer costs fell to their present level and became competitive with wage costs. It is usually easy to find justifications for decisions to install computers in the developed world, because wage costs are so high

that even small reductions in manpower requirements can often pay for the cost of the computer and accessories.

In the developing world, the situation is obviously completely different, and the relationship between manpower and computer costs is much more adverse to the case for computerisation. Some general figures to illustrate this fact are given in the following paragraphs.

(a) Taking Ireland as a representative developed country, the average industrial wage in early 1988 was IR pounds 205.66 per week (Irish Department of Finance Economic Assessment: February 1988)

(b) In Zambia, at the same time, the average industrial wage was K3139 per annum, or about K60 per week (Zambia CSO estimates compiled in October, 1988).

(c) In Ireland in late-1988, a typical office microcomputer system cost IR2170 pounds (IBM Ireland Dec. 1988 price list figure for an IBM PS/2 microcomputer, 640K memory, monochrome display, single disc drive, 20 Mb Hard disc).

(d) At the same time, in Zambia, the same microcomputer cost K112,381 (Quotation from Woodgate Computers Ltd., IBM agents in Zambia, dated 5/1/89).

(e) Converting both the Irish and Zambian computer costs to the base of one week at the average industrial wage, we find that, in Ireland, the computer costs the equivalent of about 10.5 weeks'

wages, while in Zambia it costs the equivalent of 1,873 weeks. In very general terms, this indicates that the computer could be cost-justified in Ireland if it saved 10.5 weeks of the average worker's wage, while in Zambia it would have to save some 36 years of the worker's wage to be justified. The ratio between the two figures (1873/10.5) is 178-to-1, suggesting that it is that many times easier to justify computer costs in the developed world than in the circumstances obtaining in Zambia.

These figures are very general, but they serve to illustrate one important issue in comparing computerisation issues in developed and developing countries, and that is the glaring differences in wage costs versus computer costs. To somebody familiar with computer justification exercises in the developed world, these figures give rise to the obvious question of how computer installations could possibly be justified in a society with such high computer costs and low wages.

Another aspect of the question which might be expected to show significant differences between developed and developing countries is that of the source of computerisation decisions - the identity of the persons who take the decisions.

It is assumed in the West that a decision to computerise is a generally an internal decision in the organisation, taken in the interests of greater efficiency or effectiveness. In a modern computer textbook, the situation is summarised as follows :

There are four primary sources of project request . . . inside the organisation are department managers, senior executives and systems analysts. In addition, government agencies outside the organisation may also request information systems projects (Senn,1985:44).

There was no evidence to suggest that the final category mentioned - requests from government agencies - had played any role in determining the computerisation undertaken in Zambia, but a systematic study would reveal for certain if this factor applied. Apart from that case, the sources envisaged are all internal to the organisation. In Zambia, it was obvious that the reasons for computerisation were often found in different, external, sources - for example :

(1) Aid agencies. Especially in the government and parastatal sectors, the initiative for computerisation frequently comes from bi-lateral or multi-lateral aid agencies, and the equipment and/or expertise is often supplied by them. The motivation for doing this, in some cases, is to provide a data-base of information to facilitate project control and review in some of the larger aid projects.

(2) Parent companies. Especially in the private sector, companies which are subsidiaries of foreign-based parent companies frequently install computer systems under direction from the parent company, and without any local involvement or discretion. In some cases, these local systems are required in order to feed data directly to central computers in the parent company - this

is the normal reporting mechanism.

(3) Organisations trading internationally. Zambian organisations which are engaged in international activities sometimes find that it is essential to operate computerised systems in order to compete or collaborate with other organisations abroad. A good example lies in the airline business and other transport and tourism concerns, where computer-based reservations systems are essential.

In the examples given it seemed that the decision to computerise was often made by external agencies, rather than arising from internal needs as in the developed world - perhaps a practical example of dependency in action.

Based on several decades of practical experience of computerisation in developed countries, a general picture has emerged of the types of factors which underlie decisions to invest in computerisation programmes. Taking a representative example, these are summarised as follows :

Greater processing speed - Using the computer's inherent ability to calculate, sort and retrieve data and information when greater speed than that of people doing the same tasks is desired.

Better accuracy and improved consistency Carrying out computing steps, including arithmetic, correctly and in the same way each time.

Faster information retrieval - Locating and retrieving information from storage. Conducting complex searches.

Integration of business areas - Coordinating business activities taking place in separate areas of an organisation through capture and distribution of information.

Reduced cost - Using computing capability to process data at a lower cost than possible with other methods, while maintaining accuracy and performance levels.

Better security - Safeguarding sensitive and important data in a form that is accessible only to those persons having authorization (Senn, 1985: 38).

Considering this list from the perspective of a developing country, one is struck by the difficulty of relating these factors to the practical circumstances here. As we have seen, the achievement of "reduced cost" is considerably more difficult, if not impossible, in the price structure of a developing country. "Greater processing speed" and "Faster information retrieval" do not seem to have the same force as they do in the high-pressure advanced societies, and certainly not sufficient justification for the relatively high costs of computer systems. It is impossible to avoid the thought that the same results could be achieved more cheaply and appropriately by employing more staff. The same is true of "Better accuracy and consistency". "Integration of Business Areas" sounds like a problem more typical of the large multinational corporations than of the typical organisation in a developing country. "Better security" is described here in terms which suggest that the problem is the safeguarding of sensitive information. This is hardly a general problem in developing countries. On the face of it, these standard justifications may be inapplicable to the situation in a

country like Zambia.

There are strong grounds for suggesting that little of the material which has been written in the developed countries applies to the circumstances in Zambia. In that case, the question arises as to what is the justification for computerisation in Zambia. Either there is a set of different factors which justify computerisation here, or the decisions to install computers in Zambia are mis-guided. The study has been concerned with identifying these factors, which were assumed to exist.

The central question addressed by the study has already been stated. In order to examine the practical experience of computerisation in Zambia, a number of subsidiary questions also arise, including :

What is the source of decisions to install computer systems in Zambia? Who decides that computers are to be installed?

Why are computers installed in Zambia? What is the basis for the decision to computerise ?

What results are in fact achieved in organisations in Zambia by computerisation? How do these differ from the original expectations?

Do these results justify the costs of installing computers in Zambia? Do computers make a nett contribution to development?

What, if any, are the broader social effects and implications

of widespread computerisation in Zambia?

The combination of these aspects of the central issue should provide a comprehensive picture of the nature, effects and direction of computerisation in Zambia.

#### Effects of computerisation at national level

When computer systems are first installed in a given country or society, their numbers, usage and impact are limited, and there is no obvious impact on the society. But the experience in every country has been that, once computerisation starts, it continues and expands inexorably, and comes to have a major impact on society. The individual organisations which install computers are concerned only with the costs and benefits for their organisation, and generally have no regard for the wider implications. The effects of computerisation may be totally different when viewed from the broader perspective. It may be, for example, that computerisation is regarded as very desirable in individual organisations because it reduces costs, increases productivity and requires less staff. But the overall effect of many computer installations may be to create or exacerbate an unemployment problem, and to lead to other serious social problems in the community. The availability of better information about individuals may help banks and financial institutions to improve their lending policies and controls, but may also result in injustices in cases where an individual is refused credit

automatically, without any opportunity to challenge or correct the information. The awesome capacity of the computer to store, manipulate and retrieve information on millions of individuals can be used to improve public health programmes, or might be used by a totalitarian government to control and suppress political opposition.

What may appear as an internal advantage to an organisation might pose the threat of serious external dangers to the society at large. Individual organisations cannot be expected to safeguard the general public interest - this is a matter for Government. In the developed world, computers have been accused of posing all sorts of threat to society. Trade Unions have frequently opposed computerisation, often on the grounds that it would cause unemployment among their members, and sometimes leading to bitter disputes and confrontations, as reflected in the statement :

No union, however persuaded they may be as to the ultimate final desirability (of computerisation), can allow the sacrifice of its members in the present situation . . . the Trade Union movement will be forced into the position of resistance (Sherman, 1980:373).

Whether or not the high rates of unemployment in developed countries can be blamed on computers, there is little doubt that computerisation has a differential effect on the job market, reducing the numbers of unskilled and semi-skilled jobs, which can easily be automated, and placing a premium on the higher

levels of skill and education. Organisations concerned with civil liberties have warned of the potential loss of individual freedoms and civil rights due to certain types of computerisation, and the general dangers of loss of privacy as a result of being recorded in many different computer systems. It has even been suggested that widespread computerisation in society will lead to a restriction of political and social freedoms leading to :

a potentially extreme centralization of power to set the fact and value premises of all action. If a government or any other elite comes to monopolize this function, social control itself comes to be monopolized (Lowi,1975:457).

Governments in many countries have become convinced of the need for special controls to prevent the abuse of the power of the computer, and have introduced special legislation to prevent damage to society through computerisation. In relation to the developing world, there is very little material on the actual or possible effects of computerisation on society.

The significance of the study derives mainly from the present scarcity of empirical data on the usage and effects of computers in developing countries, and on the importance of computerisation for the future development of these countries.

The establishment of a body of empirical information about computerisation on Zambia at this point in time should provide a basis for planning and decision-making in relation to computer acquisition and usage in the future. This would be useful at the

level of the individual organisation, in Government, parastatal and private sectors.

But, more importantly, it should also serve a purpose at national level, in providing a basis for national policies in relation to computer acquisition and usage. As the UN Secretary General said in his statement quoted at the outset, the contribution of computers to development will be subject to the criteria of "appropriateness" and "sound application". Any material which can be used at national level to ensure that these criteria are met could be extremely useful.

Finally, computerisation is taking place within the general framework of development, and will form a part of, and be influenced by, the general forces affecting development. As a special case within this context, the experience of computerisation and its contribution to development provides a factual commentary on the applicability and accuracy of the various theories of development to the real events.

### Methodology

The study which was undertaken was, by its nature, purely exploratory, that is, it was designed to discover what the relevant factors are in assessing the contribution of computer to development in Zambia, and, insofar as possible, to assess the importance of each. This was dictated by the present lack of

empirical information on the usage and effects of computerisation in a developing country such as Zambia.

The main source of empirical data was a survey, conducted in the form of a series of interviews with the people most knowledgeable about, and most involved in, the Zambian computer industry. Computerisation has been under way in Zambia for about 25 years, and the people who have direct experience of the development, benefits, costs and other results of this programme are, for the most part, still present and working in Zambian administration, industry and commerce at senior levels. They are generally a well-educated group with a developed capacity for critical analysis and assessment. The study involved, in essence, the collection and analysis of the practical experience of this group. Most of this material was based on factual data and concrete examples, and so should represent objective data rather than opinions. However, responses to questions relating to expected future developments can only be opinions, even if guided by past experience.

Some estimates of the numbers of relevant people in Zambia were made from the survey conducted in 1986 of computer utilisation and staffing in Zambia. Taking in the first case the category of "computer staff", the survey counted a total of 216 such people (Kelly, 1987:285). It can be assumed that this is not the full national total, since a few important organisations failed to respond. An estimate of 350 computer staff in the

country seemed reasonable. Most of these are at junior levels such as computer operators, programmers and junior systems analysts, who would be most unlikely to have anything to contribute to the study. The more senior computer staff with substantial experience behind them would obviously be far fewer - estimated to be no more than 150 in total. These are the computer staff on which the survey concentrated.

While the definition of "computer staff" was relatively straightforward, it was more difficult to define a knowledgeable "computer user". Many people who use computers frequently take a special interest in the subject and may have very useful views on the impact and future of computers. Other users in the same category may work with computers for years without taking any interest or forming any views. It is in practice impossible to lay down a clear boundary between the two types of user.

It was decided that, in principle, the study should reflect the views of both computer staff and users in approximately equal numbers, to achieve a balanced picture of the situation. It was assumed that the two groups are present in approximately equal numbers. This assumption had to be changed as the survey proceeded. The starting assumption was that the total population of knowledgeable people in Zambia was around 300, and the initial aim was to cover at least 25% of this total, that is, at least 75 individual interviews. In the event, a total of 88 interviews

were completed.

Secondary sources for the study included international publications on computers and development (such as the new magazine "Computers in Africa") and current newspaper and other reports from Zambia which were relevant.

All of the major computer suppliers in Zambia agreed to help with the identification of organisations using computers and the supply of suggested contacts in each. This formed the basic frame from which interviews were arranged. Combined with recent published surveys of computers in Zambia (Shitima, 1986 and Kelly, 1987), this provided sufficient information from which to select a sample to represent the various interests and viewpoints involved. The organisations selected, and the individuals interviewed within each, were taken from the main categories of interests and viewpoints involved, to ensure the broadest and most balanced material.

The three major sectors in the Zambian economy - government, parastatal and private - each formed a primary categorisation. Each of these sectors contains a sizeable computerisation programme, and each might be expected to have a different and valid view of the benefits and problems in computerisation. For the same reason, the educational sector was separated from the rest of the government sector, and the private sector was subdivided into "Private - Zambian-based" and "Private - foreign

subsidiary". The survey in the first place attempted to ensure that each of these five categories was fully represented.

A second categorisation observed in sample selection was that of the large versus the small computer user. Each of these two categories should have different experiences and viewpoints. The large users tend to have more experience and expertise, but small users are not unimportant, especially because so many of Zambia's computer users have started computerisation only in the recent past.

The organisations covered by the survey are listed and categorised in Appendix 1.

Within each organisation, there were further categories of person to be considered. Some of the people with extensive knowledge of computerisation were in the category of "computer staff", that is, the specialist Data Processing (DP) managers and other senior staff. Others were computer users who employ the computer during their every-day work as accountants, engineers and so on, and, while not specialists in computers, might have valuable insights into the benefits and problems. The most balanced view of the actual effects of computerisation in a developing country should be gained by combining the views of these two categories, and that again was the aim in selecting interviewees.

Finally, it was thought that there might be value in

attempting to ensure that the views of both Zambian and expatriate staff are fully represented. Expatriates are involved with many of the computer installations in Zambia, and the expatriates have sometimes been instrumental in installing the computers. As "outsiders", and sometimes with extensive experience of computerisation in other developing and developed countries, expatriates should be a useful source of data and views. On the other hand, Zambians could be expected to have a superior understanding of this society, and perhaps a greater concern for the future of the society.

Within each categorisation, the intention was to ensure that each separate category was adequately represented in the cases selected for interview. This could be regarded as an elementary form of stratified sampling, but it is not possible or necessary to ensure proportional representativeness, as it would be if we were attempting to measure public opinion on some issue. The sole purpose in the categorisation is to establish whether or not each separate category has the same or different experiences of computerisation, since this would be significant to the assessment of the contribution of computerisation to development. If, for example, the Government sector suffers more from shortage of expert staff than the other sectors, then that fact will affect the impact of computerisation. So the balance of numbers between each separate category was used as a guide to the selection of cases for interview, and every effort was made to

ensure that sufficient numbers were taken from each category to ensure that its experiences of computerisation are fully represented.

Since the survey was purely exploratory in nature, an interview format was seen as the most appropriate. The requirement was for an in-depth interview, to explore the range of opinions, experiences and supporting evidence of each interviewee. In view of the nature of the material being dealt with, it was felt that the interviews had to be conducted by the author. The interviews were to be open - ended, to admit material and opinions which might not be anticipated at the start of the survey. A rigid questionnaire format would be inappropriate - in order to achieve its aims the survey had to be open to unexpected factors.

On the other hand, in order that the results could be tabulated and analysed, it was necessary to adopt some structure for these interviews. So the appropriate format for the enquiry was a semi-structured interview, with a pre-set questionnaire format administered by the interviewer, followed by a general discussion of the issues. A copy of the questionnaire used is attached as Appendix 2.

The study did not require, and indeed the material would not support, any very complex statistical analysis. The primary purpose in the categorisation of organisations and individuals

adopted was to explore for any differences in experiences or perceptions as between the different sectors of the economy, the large and small computer users, the computer expert and the user, or the Zambian and the expatriate.

This analysis required nothing more complex than tabulations, frequency analysis and cross-tabulations. For this purpose, the survey data was put in a computer file, and was analysed using the Statistical Package for Social Sciences (SPSS) package.

#### Data Collection

The interview campaign began in late 1988 with some pilot interviews to test the methodology proposed and refine the questionnaire, but the bulk of the interviewing took place in the first half of 1989. In the early stages, organisations were selected from the available lists of computer users on the basis of their importance as large computer users. As the survey progressed, the selection of organisations was dictated more and more by the necessity to ensure adequate representation of the different categories of organisation and personnel involved. Since the survey was directed at assessing the effects in practice of employing computers in Zambia, all of the individuals and organisations included are currently involved in the use of computers in Zambia. The degree of co-operation was very high - only one of the organisations approached declined to take part,

on the grounds of the confidentiality of its computer operations.

In the organisations approached, the contact point was generally the Data Processing (DP) Manager, where there was one. This happened not only because this was generally the only named person available for contacting, but also because it was often expected that the DP Manager should be the first to be interviewed.

The composition of the sample interviewed was as follows :

Table 1

Composition of Sample

	<u>Computer Staff</u>	<u>Computer User</u>	<u>Total</u>
<u>Zambian</u>	42	25	67(76%)
<u>Expatriate</u>	11	10	21(24%)
	-----	-----	-----
<u>Total</u>	53(60%)	35(40%)	88(100%)

As might be expected, the majority (60%) of those taking part in the survey were computer staff. While every effort was made to balance the numbers of computer staff and users, it proved impossible to keep the two groups in balance. The number of computer users available for interview was limited by the reluctance of many users to answer questions relating to a technical area in which they felt they had no qualifications. Even allowing for the possibility that many of these users

underestimated the value of their possible contributions, it seems that there are fewer "knowledgeable" users than had been expected. Based on the information now available, it is thought that the total number of people with a contribution to make to this survey may be less than 300, in which case the survey has covered at least 25% of the relevant population. Expatriates are in a small minority in the Zambian computer industry . They constitute some 24% of the sample interviewed, which is a larger percentage than their proportion of the population, but this should ensure that their views are adequately represented.

When analysed by economic sector, the sample interviewed breaks down as follows :

Table 2

Sample composition analysed by sector and staff category

<u>Sector</u>	<u>Computer staff</u>	<u>Computer user</u>	<u>Total</u>
Government	8	10	18 (20%)
Education	6	3	9 (10%)
Parastatal	16	10	26 (30%)
Private - Zambian based	11	3	14 (16%)
Private - Foreign subsidiary	11	7	18 (21%)
Other	<u>1</u>	<u>2</u>	<u>3 (3%)</u>
<u>Totals</u>	53 (60%)	35 (40%)	88 (100%)

This distribution reflects the predominance of the parastatal sector in computing in Zambia, especially in the duration and scale of computer usage . The government sector also has a long history of computer usage but the rate of development has not

been so fast here as in the parastatal sector. The two "Private" categories represent a fairly recent growth of computerisation, especially in the smaller end of the computer range.

The job categories of the people interviewed were as follows :

Table 3

Sample composition analysed by job category

<u>Job category</u>	<u>Number of interviewees(%)</u>
DP Manager	17 (19%)
Other Computer Staff	29 (33%)
General Manager	6 (7%)
Financial Manager	10 (11%)
Other Manager	11 (13%)
Other Professional	<u>15 (17%)</u>
Total	88 (100%)

Note: The total number of computer staff (46) in this table does not agree with the totals (53) in Tables 1 and 2 because some senior managers are themselves qualified computer experts.

The 88 interviews took place in a total of 55 organisations - an average of about 1.5 interviews per organisation. There was often only one person in the organisation with a background which was relevant for this survey, especially in the smaller users.

The 55 organisations represented were distributed as follows :

Table 4

Analysis of organisation involved by sector

<u>Sector</u>	<u>Number of Organisations (%)</u>
Government	8 (15%)
Education	6 (11%)
Parastatal	14 (25%)
Private- Zambian based	11 (20%)
Private- Foreign Subsidiary	13 (24%)
Other	3 (5%)
	--
Total	55 (100%)

This distribution is fairly representative of the usage of computers in Zambia at the moment. The greatest number of users are in the parastatal and private- foreign sectors. However, the coverage of the Educational sector is almost comprehensive, while in the other sectors it is probably in the range of 40% - 60%. The actual organisations covered by the survey are listed in Appendix 1.

Based on the previous surveys of the Zambian computer industry, on the information supplied by the computer supply firms in Zambia, and on the information provided by the interviewees themselves, the total number of organisations known to be using computer in Zambia is currently about 80. There are certainly others, although they could only be recent and small-scale users. The total number of organisations using computers in Zambia is probably just over 100. It seems that the survey can claim to have covered about 50% of the organisations using computers, and almost all of the larger ones.

The total number of employees in the 55 organisations represented in this survey was over 222,000. Since the total formal sector employment in Zambia is currently about 360,000 (Source: Zambia in Figures 1988, Zambia CSO, 1989), and since computers are associated exclusively with the formal sector, the survey can claim to represent the experiences and perspectives of the computer environment in which around 60% of Zambian employees work. This statistic is relevant to later examinations of the impact of computers on employment and other aspects of the work force.

### Literature Review

For reasons already discussed, there is relatively little published material on the question of computerisation and development. The most relevant publication to the present field of study is Taylor and Obudho's The Computer and Africa: Applications, problems and potential, which explains that :

Little has been written about the computer in Africa and much of what has is buried in conference documents or in inaccessible sources. . . the computer and its technology require and generate a broad sociotechnical environment in which all are involved (Taylor, 1977:2).

This book was published in 1977, before the introduction of microcomputers, and its findings on the effects of computerisation, which were generally favourable, would require radical updating at this stage.

Because of the special features of computerisation, in particular the fact that computers have only recently become important in development studies, there is as yet no general "theory of computers and development". But computers and computerisation are inextricably linked with the modern and largely urban sector of the developing countries, and their effects will take place within this context. Computerisation in developing countries can therefore be regarded as a special case within the general debate on development issues which falls into the "modernisation versus dependency" arena. This general debate involves broad issues such as the relationship between developed and developing countries, the tension within developing countries between the development needs of urban and rural sectors, the role and problems of technology transfer from developed countries and so on. The scope of these issues is far too wide to be tackled here - we can only acknowledge that the whole question of conflicting demands and values in development remains to be resolved. The particular concern of this study will be the evidence of the impact of computerisation in development, which is only one aspect of the overall issue. But the analytical frameworks and ideological standpoints which are adopted in the more general debate can also be applied to the case of computers and development, and they do provide the two main perspectives which are present in the literature on computers and development.

On the one hand, there is the group of Liberal theories, with their emphasis on the modernisation process. In this view, developing countries are assumed to be following the developed countries along an established development path. The process of modernisation - of transferring the benefits of modern methods and technology to the developing countries - is seen as a major contribution to speeding the development process. This view is summarised as follows :

Late-industrializing countries can take advantage of the experience gained, often slowly and at great cost, in the countries where the industrial revolution began. By adopting solutions already devised, their later development can be telescoped, sometimes dramatically so (Goldthorpe, 1975:87).

Computerisation would naturally be taken in this view to be a desirable if not inevitable part of the process of modernisation.

Many of the writers who have considered the question of computers and development agree with the general view that computerisation represents a desirable form of modernisation. For example, there is the view that :

While . . . computerisation. . . will (not) cure all the ills of developing nations, it is fair to say that these nations would obtain the same advantages of economy, accuracy, speed, superior management information and productivity (as developed countries) (Okogbaa, 1987:127).

Some authors have even claimed that computerisation in developing countries can be justified on direct cost grounds, despite the adverse relationships between wage and computer costs

considered earlier :

Often because of the much improved accuracy and efficiency possible by using computers, computerized systems are economically attractive to use even in the developing countries (Gupta, 1986:43).

Some commentators even take the view that recent trends in technology may have had the effect of tipping the balance in favour of developing countries. This point of view is based on the fact that the characteristics of the modern microcomputer (Low cost, ease of use, ruggedness) are those of "appropriate technology", and that this technology is especially suited to eliminating some of the traditional handicaps of developing countries. For example, one authority says :

In a sense, the microprocessor is likely to provide developing countries with a comparative advantage viz-a-viz developed countries by helping to eliminate their shortage of semi-skilled workers and by reducing the incidence of errors and other problems caused by low skill labor-intensive operations (Radnor, 1982:7).

On the other hand, there is a less optimistic view of development, represented by both the centre/periphery school and the general Marxist schools, which takes the view that the superior power, influence and resources of the developed world will always be used to ensure the subordination and exploitation of the developing countries. In this view, the developing countries are locked in a permanent relationship of dependency with the developed world, and all apparent progress towards closing the gap tends to be a form of selective and selfish

exploitation. Even within a developing country, the main urban centres are often considered to exercise a similar exploitative relationship with the rest of the country.

In this view, modern technology is generally seen as an imposition from outside, inappropriate to the real needs of the developing country, and probably causing more damage than benefit. This situation is summarised as follows :

the technology available to be 'borrowed' from countries now at an advanced stage of economic development is characteristically capital - intensive, making available highly- paid employment for the few, and quite inappropriate to the circumstances of low- income countries.... . (Goldthorpe, 1975:88).

The published material on computers and development does sometimes support the view that the superior expertise of the West will enable them to exploit the benefits of computer technology to the increasing disadvantage of the developing world - a view expressed in the statement :

Information maturity . . . is achieved by nations with solid socio-economic development: this maturity is normally a subsequent stage of industrialization. Most nations that missed the industrial revolution. . . are likely to miss the information revolution too (Lau, 1986:516).

Because of the shortage of computer skills in developing countries, it is sometimes suggested that the North/South gap will in fact increase - a view put forward by F.K.A. Allotey :

many African countries have not been able to participate fully in the information phenomenon for various reasons including the lack of financial support and skilled manpower

. . . Information technology instead of helping to bridge the economic gap between the richer North and the poorer South, may be widening it (Allotey, 1985:1).

In another article , Sheya agrees as to the dangers of dependency, and suggests that the answer lies in expanded computer education in developing countries :

Given the present imbalance in the mastery of modern technology and the resultant producer - consumer relationship in manufactured goods between the industrial countries and the third world, the latter will inevitably be affected by the new wave of technology. There is an urgent need to arm these nations for the inevitable technological shock and to safeguard them against overdependence on the industrial countries (Sheya, 1985: 245).

The dangers of uncritical adoption of computer technology are also described as follows :

in the early 1970's the desirability of direct and massive transfer of advanced technology began to be widely questioned. By then, it was becoming increasingly clear that the introduction of highly sophisticated , capital intensive functions could cause more problems than it would solve (Marghalani, 1987:355).

Another pessimistic view of the role of computerisation in development is that expressed in the following extract :

Multinational companies . . . sometimes use the technology transfer as a cover for a new form of selling their products and services to developing countries. Experiences show that such transplanted technologies are tightly controlled by foreign advisers: local participation has been resisted beyond certain harmless thresholds and important secrets are often withheld ( Mavaddat,1986: 97).

There is also a view in some quarters that computerisation may have the effect of reversing recent trends towards the industrialisation of the developing countries, by allowing

developed countries to compete with the low wages in the Third World through the use of advanced manufacturing technology, using computer- based production methods :

There is evidence also that new production technologies are being developed which may allow the re-importation of some manufacturing to the core countries (Corbridge, 1988:55 - emphasis in original).

Some authors suggest that computerisation in developing countries **contributes both** to the modernisation of the country, and to exploitation and increasing dependency. For example, Mazrui has come to the conclusion that :

The computer in Africa probably helps to promote modernisation but it also aggravates Africa's technological and intellectual dependency on Western Europe and North America (Mazrui, 1978: 340).

In these various writings on the specific issue of development and computerisation, there is no evidence of any soundly- based empirical observation of what is in fact happening to the computer users of the developing world. Computers seem to be taken simply a special case of whatever development theory the author subscribes to, and the effects seem to be hypothesised rather than established empirically. Thus, this study will add an empirical bias to the discussions on the impact of computerisation.

### Operational Definitions

This study is concerned with the application of computers in a

working environment, in administrative, commercial or industrial sectors. Terms such as "computerisation", "computer system" and so on should be taken as referring to this type of application only. This excludes the use of computers in settings such as :

- (1) Use of computers in the home, for entertainment or educational purposes,
- (2) Use of computers as sub-components in other manufactured devices, such as motor-cars or washing machines, and
- (3) Use of computers in highly specialised applications such as air traffic control, weapons systems and so on.

"Computer" will be taken to refer to a modern, digital, electronic device for data processing.

"Computer System" means the assemblage of parts and facilities needed to create a viable, independent computer, including both hardware (Central Processing Unit, Peripherals, terminals and telecommunications facilities) and software (Operating System, Utilities, packages and programs).

*"Computerisation" refers to the process of transferring work from another method (usually clerical) to a computer system. It embraces all the various stages of systems analysis, design, development, testing and implementation.*

The term "Justification" is used in the technical sense of the total collection of costs and benefits associated with the

installation of a computer system, which is judged to provide the initial rationale for proceeding with the installation of the computer.

"Clerical", "Clerical System" and "Clerical processing" refer to the employment of human staff to perform data processing functions, in contrast to the use of computers to do the same function, after computerisation.

For the purposes of this study, the significance of the different classes of computer lies only in the different levels of computer expertise required to develop, maintain and operate each. In these circumstances, this study will adopt the practical definitions that a "microcomputer" is a small computer capable of serving only one user at a time, and that "mainframe computers" and "minicomputers" are larger computers capable of serving many users at the same time. (Technical definitions of these classes are extremely complex, and are in any event constantly being invalidated by technological advances).

"Large computer users" are defined as those organisations which operate one or more mainframe or minicomputers, or at least a total of over five microcomputers: that is, organisations which are operating on a scale of computer usage which should require an expert computer staff. "Small computer users" are, obviously, those which have not reached that level of computer usage.

"Computer Staff" are those who have received specialised training

in excess of 3 months (full-time) in some aspect of computer technology and usage, and who have worked full-time for at least three years on the development or operation of computer systems.

"Computer Users" are those who do not qualify as computer staff under the definition above, but who have received some training in computers, and have used a computer in the course of their normal work for at least one year.

Finally, it will be necessary to define the concept "development". Many of the definitions used are unsuitable for present purposes because they are too general (Computers may well have influence on cultural development in fields such as music and art, but that is outside the defined scope of this study) or too mechanistic. Given the central focus in administrative and business uses of computers, we are concerned in the first place with the economic impact of computerisation, and with the consequent social impact.

This is the emphasis adopted in the definition of development at its simplest as "the process by which poor countries get richer, or try to do so ..." (Berger, 1974:34), with the additional qualification that :

usage of the term usually implies a general improvement in the well-being of the population undergoing the process - if not immediately, then at least as a future prospect. . . Put simply, development means good growth and desirable modernisation (Berger, 1974:34 - emphasis in original).

This view, including its emphasis on the future potential of

current modernisation, lends itself readily to the present study, and so we will adopt Berger's definition that :

Development will . . . refer to such instances (actual or potential) of economic growth and sociocultural modernization as are deemed desirable in the contexts of moral judgement and public policy (Berger, 1974: 35).

### Outline of Chapters

The findings of the survey are presented and analysed in Chapters 2 to 4. In each of these chapters there are three sections. The first presents the factual data collected through questionnaire. The second section in each case summarises the points made in discussions with the interviewees, which provides a commentary on the basic facts. The third section sets out the conclusions.

In Chapter 2, the present computer environment in Zambia is examined - the numbers of computers and computer staff, the duration of computerisation programmes, the types of computer systems in operation and the sources of these systems. The chapter also examines the factors surrounding the initial acquisition and selection of computers.

Chapter 3 examines the results achieved by installing computers in Zambia. This includes both the problems and benefits experienced, the effects on staffing and general problems of computer maintenance in Zambia. The chapter also considers the future plans for computerisation in Zambia, and the implications

of these for future development.

Chapter 4 considers the evidence from this survey of the developmental impact of computerisation in Zambia.

In Chapter 5, the results of the study are summarised, and the resulting conclusions about the contribution of computerisation to development in Zambia are detailed.

## CHAPTER 2

### COMPUTER ENVIRONMENT

#### Introduction

In this chapter the current state of the Zambian computer industry is examined. The main focus is on the numbers and types of computers in use, the distribution of computer staff, the types of computer system in operation and the sources of these systems. Also of interest are factors relating to the historical background to this current situation - the duration of computer usage, the sources of the initial decision to acquire a computer, the methods adopted for computer selection and the reasons for the decision to computerise.

This information should convey an accurate picture of the present state of computer usage in Zambia, and an understanding of how this situation developed, and should provide the factual basis for the rest of the examination. Of particular interest will be the evidence of current trends in computing, and differences between the Zambian experience and the developments in computer usage in the developed countries.

#### Computer resources

The 55 organisations covered by the survey operate between them a total of over 660 computers.

The distribution of these was as follows :

Table 5

Numbers of computers covered by survey.

<u>Sector</u>	<u>Number of Mainframes</u>	<u>Number of Minis</u>	<u>Number of Micros</u>	<u>Total</u>
Government	3	1	65	69(10%)
Education	1	1	126	128(19%)
Parastatal	8	15	286	309(47%)
Private - Zambian	0	9	29	38(6%)
Private - Foreign	4	3	75	82(12%)
Other	<u>0</u>	<u>1</u>	<u>39</u>	<u>40(6%)</u>
<u>Totals</u>	16(2.5%)	30(4.5%)	620(93%)	666(100%)

The total number of computers covered here is far greater than in a 1986 survey (Kelly, 1987:285), due partly to the superior coverage of this survey but also to the great expansion in computer installation which has taken place in the intervening years. The total number of business computers in the country is now certainly over 700, whereas it was probably less than 300 at the time of the previous survey. The total has more than doubled in a period of less than three years.

The ratios between mainframe, mini and micro are also quite different from those in the earlier survey, in that the smaller computers make up a far greater proportion of the total. As a result of the rapid growth in microcomputer numbers, these now constitute about 93% of the total, as against 85% three years ago. It must however, be remembered that a single mainframe may have the power of many micros, so the growth in computer capacity in the country is not as rapid as the simple count of computer

numbers would suggest.

The Zambian distribution of computer types is apparently also quite different from the average of other African countries, in which :

The market is about 50% PC and 35% small systems and the rest is made up of large and medium-sized systems (5%) and replacements (Birindelli,1989:51).

While it is not possible to relate this categorisation directly to that used in this report, and it is not clear whether the market is being measured in terms of computer numbers, computer power or value, it does seem that the proportion of microcomputers (or PC's) in Zambia is higher than average. The significance of these figures is to emphasise the extent to which the Zambian computer industry has rapidly adopted the microcomputer. The large computer centres which became established in Zambia in the years before 1980 are numerically overwhelmed by the recent flood of new centres using microcomputers.

The figures in Table 5 point to the predominant position of the parastatal sector in the computer industry, especially in the larger machines. The parastatal is the largest sector in the economy , but it also seems to have been more dynamic in applying computers, and perhaps more successful in securing finance, including foreign exchange, for its computer purchases than the government centres. While the government sector was an early

computer user, it has failed to keep pace with the development in the other sectors. The usage of computers in the private - Zambian-based sector is especially noteworthy, since this is a recent development.

The government and education sectors, as might be expected, have almost no small users, while the other sectors are mixed :

Table 6

Distribution of user organisations surveyed

<u>User type</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F.</u>	<u>Other</u>	<u>Total</u>
Large	7	6	12	7	7	3	42
Small	<u>1</u>	<u>0</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>0</u>	<u>13</u>
Totals	8	6	14	11	13	3	55

Most parastatals are large-scale undertakings and could be expected to grow to large-scale computer usage eventually, but some are at the very early stages of computer utilisation. In the case of the other sectors, the undertakings are sometimes large and sometimes quite small, and the mixture of large-scale and small-scale computer usage could be expected to continue. It is interesting to note that the two private sectors are the only ones in which small installations are common.

The organisations surveyed were asked in what year they installed their first computer , with the following results :

Table 7  
Year of installation of first computer  
Number of organisations installing  
first computer.

<u>Period</u>	
Before 1964	3
1965 - 69	2
1969 - 74	4
1975 - 79	6
1980 - 84	17
1985 - 89	22
Not known	<u>1</u>
Total	55

These figures illustrate the dramatic expansion in computer installation which has taken place in recent years. Two-fifths of the current computer users have installed their first computer since 1985, and almost three-quarters have started since 1980.

The earliest computer installations in Zambia took place in the early 1960's, and all were in the government and parastatal sectors. In Taylor's book, the estimated number of computers in Zambia is stated as 5 - three "small" and two "medium-sized" computers (Taylor, 1977: 16). Even if this figure were taken to refer to 1975, it is still too low, since 9 of the organisations covered by this survey already had computers in 1975. Elsewhere in the same book, an estimate of 15 computers is given for Zambia in 1969 (Taylor, 1977:6). This figure seems too high, remembering that the microcomputer had not yet arrived at that time, and all computers were, by definition, medium- to large-scale machines. The likeliest figure for the number of computers in Zambia in 1975 seems to be about 15. This had grown to about 250 by 1985,

and to over 700 by 1989.

Naturally, the expert computer staff in the country is almost exclusively employed in the large user organisations. The total computer staff employed by the organisations covered by the survey was as follows :

Table 8

Distribution of computer staff in organisations surveyed.

<u>Sector</u>	<u>Comp. Managmnt</u>	<u>Systems Staff</u>	<u>Programming Staff</u>	<u>Operat-ions</u>	<u>Data Prep.</u>	<u>Total</u>
Government	12	28	47	27	68	182(23%)
Education	4	10	7	7	11	39(5%)
Parastatal	34	67	62	108	98	369(46%)
Pvt - Zam.	22	29	12	21	21	105(13%)
Pvt - Fgn.	12	19	14	46	18	109(14%)
Other.	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0(0%)</u>
Totals	84	153	142	209	216	804(100%)*

\* The percentages do not add to 100 because of rounding errors

The parastatal sector possesses almost 50% of all computer staff in the country, and the government sector almost another quarter. The "other" category, representing aid agencies in Zambia, does not employ any specialist computer staff in the country.

The expatriate computer expert is very rare in Zambia at this stage. Of the experts interviewed, only 11 were expatriates, and half of them were working in or for aid agencies. This situation is in contrast to that described by Maxwell Stamp (Africa) Ltd.

in 1969 :

Although some progress has been made many African computer centres are still heavily dependent on expatriate personnel. For example, in 1969 there were 314 computer personnel in Zambia, of whom 119 were Zambians (Quoted in Taylor, 1977:8).

By 1989, the "Zambianisation" of the country's computer personnel has been effectively completed. It is interesting to reflect on how this process of Zambianisation was achieved so effectively, when Zambianisation has proven difficult in other areas. It is remarkable that the computer industry was Zambianised despite the absence of educational support in the country ( the first Zambian computer diplomas will be awarded in 1990, and the first degrees not before 1993). It was also achieved despite the absence of government pressure - computer professionals are still among those for whom employment permits may be granted for expatriates. In fact it happened because organisations using computers - especially in the government and parastatal sectors - were convinced of the value of computers, and devoted a great deal of effort and money to train their staff, both in Zambia and abroad. The lesson to be taken from this is apparently that a strong conviction on the part of enterprises concerned is far more effective in achieving rapid Zambianisation than any amount of government exhortation or planning.

When the totals of staff in the different categories are divided by the number of organisations in each category, the

average staff in each sector is as follows :

Table 9

Average numbers of computer staff by category and sector.

<u>Sector</u>	<u>Average no. of staff in category -</u>					
	<u>Computer Managmt.</u>	<u>Systems Staff</u>	<u>Programming Staff</u>	<u>Operat- ions</u>	<u>Data Prep.</u>	<u>Total Comp.</u>
Government	1.5	3.5	5.9	3.4	8.5	22.8
Education	0.7	1.6	1.2	1.2	1.8	6.5
Parastatal	2.5	4.8	4.4	7.7	7.0	26.4
Private						
Zambian	2.0	2.6	1.0	1.9	1.9	9.4
Private						
Foreign	1.0	1.5	1.0	3.5	1.4	8.4
Other	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Overall						
Averages	1.3	2.3	2.2	3.0	3.4	12.2

Again we see that the centres in the government and parastatal sectors tend to be larger than in the others. However, even those centres are not large by international standards. The average staffing of all the centres - 12.2 heads of staff - indicates a small scale of operation with very limited capacity for systems development.

The most common types of system in operation in each sector are indicated by Table 10 :

Table 10

Types of system in use in various sectors

<u>System Type</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	<u>Total</u>
Standard accounts	0	0	9	6	8	1	24(22%)
Other financial	3	1	8	4	4	2	22(20%)
Word Processing	3	3	0	2	4	3	15(14%)
Stock control	0	0	3	3	4	0	10(9%)
Teaching/training	1	6	0	3	0	0	10(9%)
Statistics	5	1	1	0	0	1	8(7%)
Banking	0	0	2	2	3	0	7(6%)
Special systems	3	1	5	0	1	2	12(11%)
Not applicable	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>2(2%)</u>
Totals	15	12	28	21	25	9	110(100%)

("Special systems" indicates systems which are specialised to a particular industry or organisation and cannot be classified with any others).

These figures highlight -

(a) The different patterns of usage as between the government and educational sectors on the one hand, and the remaining sectors on the other,

(b) The predominance of accounting and other financial systems in the parastatal and private sectors, no doubt reflecting the importance of profit and viability in those sectors,

(c) The fact that word processing has already become quite common in most sectors (but not yet, for some reason, in the parastatals).

The same variety of activity is seen when we consider the sources of the systems used by the various organisations :

Table 11

Source of computer systems in use (Numbers of mentions)

	<u>Own</u> <u>development</u>	<u>Purchased</u> <u>Package</u>	<u>Supplied</u> <u>by parent</u>	<u>Supplied</u> <u>other</u>	<u>Total</u>
Government	4	5	0	3	12
Education	1	6	0	0	7
Parastatal	11	9	0	1	21
Pvt- Zam.	5	8	0	1	14
Pvt- Fgn.	3	10	7	0	20
Other	<u>0</u>	<u>3</u>	<u>2</u>	<u>0</u>	<u>5</u>
Totals	24	41	9	5	79

The government and parastatal sectors design and program their own systems as well as using purchased packages, but in all other sectors the purchased packages predominate. Government has an additional source of supply in the special systems which are sometimes supplied by aid agencies or other governments. Private subsidiaries of foreign companies also frequently receive their systems from the parent company, and do little development of their own systems in Zambia.

A similar difference in potential shows up as between the large and small users :

Table 12

Source of computer systems in use (Number of mentions).

<u>User Type</u>	<u>Own Development</u>	<u>Purchased Package</u>	<u>Supplied by parent</u>	<u>Supplied other.</u>	<u>Total</u>
Large users	23	31	7	3	64
Small users	<u>1</u>	<u>10</u>	<u>2</u>	<u>2</u>	<u>15</u>
Totals	24	41	9	5	79

As might be expected, the small users make virtually no contribution to the development of expertise in systems development.

Computer acquisition

The decision to computerise in developed countries is generally an internal decision, taken by the management of the organisation in order to secure expected benefits for the organisation. The most important question in this section is whether the evidence suggests the same or a different pattern in Zambia.

The original source of the decision to install a computer in each organisation surveyed was as follows :

Table 13

Source of the decision to computerise

<u>Source</u>	<u>Govt.</u>	<u>Eductn.</u>	<u>Parastl.</u>	<u>Pvt.-Z</u>	<u>Pvt.-F</u>	<u>Other</u>	<u>Total.</u>
Own Mgmt.	2	2	13	5	7	0	29 (53%)
Aid Agency	4	3	1	0	0	2	10 (18%)
Joint (Mgt+extrnl)	1	1	0	0	2	0	4 (7%)
Parent company	0	0	0	0	1	1	2 (4%)
Not known/ not applicable	<u>1</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>3</u>	<u>0</u>	<u>10 (18%)</u>
Totals	8	6	14	11	13	3	55(100%)

The Parastatal and Private Zambian sectors seem to follow the pattern established in the West - the decision to computerise is almost always a decision taken purely by the organisation's management for internal purposes. But the other sectors show a different pattern, with aid agencies prominent in the government and education sectors, and parent companies in the Private - Foreign sector. Of the 45 cases in which the original source is identified, 16 involve an outside agency in the decision. In the government and education sectors combined, 9 of the 13 identified sources involve outside agencies. The high rate of involvement of outside interests is clearly very different from the conditions in which decisions to computerise arise in the developed countries.

The next important question to be addressed is that of how the equipment was selected, given the decision to proceed. In the developed countries, the selection is generally done by the organisation's own staff, or by consultants hired for the

purpose, and often involves a formal tendering and testing process. The practice in Zambia is summarised by sector below :

Table 14

Agency which performed selection of computer equipment

<u>Selection by</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	<u>Total</u>
Own staff	1	2	5	1	3	1	13 (24%)
External agency	4	4	1	0	2	1	12 (21%)
Joint staff							
/extrnl	1	0	1	0	2	0	4 (7%)
Consultants	0	0	2	1	1	0	4 (7%)
Supplier	0	0	1	2	0	0	3 (6%)
Not applicable/ not done	<u>2</u>	<u>0</u>	<u>4</u>	<u>7</u>	<u>5</u>	<u>1</u>	<u>19 (35%)</u>
Totals	8	6	14	11	13	3	55(100%)

These results show a consistent pattern which differs significantly from that in the developed countries. The total number of cases in which a formal selection exercise was attempted - combining the first four categories - is 33, out of a total of 55. The remaining 22 cases - 40% of the total - appear to have had little knowledge or guidance on the issue of how computers should be selected. It is generally regarded as dangerous to let a supplier select equipment, and it is also dangerous to start installing computers without any attempt to assess their suitability, and yet that is what has happened in almost half of the cases. This emphasises the problem of the shortage of expertise in computer selection. It should be noted that the table shows once more the high level of reliance on outside agencies by the Government and education sectors. The

parastatal sector seems to be more self-sufficient in expertise than the others, and the Private- Zambian sector especially short of expertise and guidance.

As in the case of the decision to computerise, very often the selection of the equipment involves external interests. In 16 of the organisations covered by the survey (28% of the total) the selection of equipment was done entirely by an external agency, or by local and external staff working together.

When asked about the reasons behind the decision to computerise, respondents produced a great variety of reasons and expected benefits.

Table 15

Reasons for the initial decision to acquire computers

<u>Reason</u>	<u>Sector :-</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	
Better management information	4	0	10	4	4	2	24(33%)
Better service	1	3	3	2	2	1	12(16%)
Greater accuracy	2	0	4	0	1	1	8(11%)
Prestige	1	1	2	0	0	0	4(5%)
Save money	0	0	2	1	1	0	4(5%)
Learn about computers	0	0	1	1	1	0	3(4%)
Other	1	1	0	0	2	0	4(5%)
Not known/ not applicable	<u>1</u>	<u>1</u>	<u>1</u>	<u>7</u>	<u>4</u>	<u>0</u>	<u>14(19%)</u>
Totals	10	6	23	15	15	4	73(100)*

\* The percentages do not add to 100 because of rounding errors

Number of organisations	8	6	14	11	13	3	55
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The desire for better management information is by far the most common reason given for installing a computer, followed by the aim of improving service levels. In the education sector computers were first installed in three of the six institutions in order to provide a better service to staff and students. The high rate of "not known/not applicable" in the Private - Zambian sector is due to the presence of a number of computer suppliers, whose reasons for installing computers are self-evident. The low incidence of computers installed in order to save money is worth

noting. In four cases computers were installed for the purposes of prestige, and in another three cases in the hope that the staff would learn something about computers by using some simple systems.

### Discussion

It is clear from this material that the computer industry in Zambia is not a homogeneous entity. In the first place, there are various centres, mainly in the government and parastatal sectors, which installed large computers many years ago, have at this stage a large expert computer staff and considerable experience of computer usage, and who design and develop many of their own systems and programs. On the other hand, there is a large number of recent computer users who have installed small systems, typically one or more microcomputers, have little or no computer expertise or staff and use mainly packages in their work. For the purposes of assessing the contribution and potential of computerisation for development in Zambia, each of these groups has a different set of characteristics.

As we will see later, the issue of local computer expertise in a country like Zambia is crucial not only to the future success of computerisation in the country, but also to the effects of computerisation on the development of the country. It will affect the speed at which computerisation proceeds, the cost of computerisation and the degree of dependency which

computerisation will cause. It will also be crucial for the prospects for the establishment of a Zambian computer manufacturing industry at some stage in the future.

From the above results it is clear that the government and parastatal sectors are the main sources of trained computer staff at present. (The education sector is obviously important for the future supply of trained staff, but it has no large reservoir of computer staff or other resources at the moment). Both of these sectors have devoted great effort and expense to training computer staff, both locally and abroad, whereas the private sector has largely secured its computer staff by "poaching" them from these other sectors.

An organisation which has developed most or all of its own systems, and has a trained and experienced computer staff, is more independent and self-sufficient than one which relies on outside expertise. It should also be less of a drain on foreign exchange. Some of the larger and better-established Zambian computer centres have developed sufficient capabilities to limit their "external" needs to the minimum of new computer hardware and basic operating systems. This is a very desirable position, as it minimises the dependency involved in computer usage.

From discussions with the interviewees it is clear that the systems in operation in Zambia, both locally-developed and based on packages, are relatively low-level or unsophisticated

systems. The features of the clerical systems which preceded computers have generally been continued into the computerised systems, resulting in relatively simple computerisation. In some cases, the computer is used for little more than collecting data, tabulating it and printing the end results. This limited application of computerisation is due to factors such as the shortage of expertise, scarcity of machine capacity and specialised software, and heavy demands for systems development and maintenance on the available staff. This does not imply that the systems are of low value or little benefit. In most cases, the environment in which the systems operate would not support and does not need a very sophisticated system. In Zambian conditions a relatively straight-forward system is often the most appropriate and can convey major benefits without very sophisticated designs. Respondents to this survey reported a number of cases in which packaged systems supplied or procured from abroad were abandoned because they proved too complex and sophisticated for local conditions.

In relation to the practice of computer acquisition, we again see marked differences between the different parts of the Zambian computer industry. In the government and education sectors the support of the aid agencies looms large in much of the computerisation programme. In the private sector, in the case of subsidiaries of foreign companies (which are often multi-nationals), the presence of the parent company or corporate HQ is

often crucial in the computerisation programme, both in controlling and delimiting the local autonomy to computerise and in assisting the process with expertise in selection, by providing special software designed for the company, and in other respects. In these circumstances, many organisations are obviously heavily dependent on outside interests for the funds to computerise, the expertise to select the equipment, and even, in some cases, for the approval of outside concerns before they can proceed.

It seems that the private sector Zambian companies and, to a lesser extent, the parastatals, are closer to the Western model in having little or no outside support or, to put the same situation differently, in having full autonomy in the decision to computerise and in the selection of equipment. There is far less evidence of dependence in these cases, although the corollary is that there is also greater danger of mistakes in selection because of lack of expertise and advice.

Many organisations admit that the initial selection of their computer equipment was badly done. (In some other cases, even though the staff were understandably reluctant to admit to errors, the speed at which the original computer installed was replaced by a different model strongly suggests that the initial selection was wrong. For example, one large parastatal started with a mainframe from one supplier in 1972, substituted a minicomputer from another supplier some years later and has now

installed a mainframe from a third supplier). Even where an attempt at formal tendering was made, very little analysis and statement of needs was done, and the documentation consisted in many cases of little more than an invitation to propose equipment. In the selection exercise, there was again little analysis of needs against functions. The most important considerations in many selection decisions were the previous experience of working with a particular supplier, and the availability of support and spares in Zambia.

There have been many cases where computers were bought at great expense which were subsequently very difficult to use and grossly under-utilised. Even to-day, a low level of utilisation and availability is common in Zambian computer installations, sometimes, according to data provided during this survey, as low as 15%. This is, of course, a waste of scarce resources, especially financial resources, which could have been applied to other development purposes. However, it must also be accepted that there is a "learning curve" involved in the application of any new technology. It is not possible to conduct a professional computer selection exercise without substantial experience of computers, and it is often impossible in practice to gain that experience until after the computer has been installed. There are good grounds for believing that computer acquisition in Zambia will be better done in the future. There is now a general recognition of the importance of correct selection. There is a

body of relevant experience, and concrete proposals have been made for national measures to avoid serious mistakes in computer acquisition. These are considered later.

There has, in fact, been a far greater degree of external control over computer acquisition than there would be in the West. In the government sector, all computer purchases have been subject for many years to the approval of a central committee known as the Computer Utilisation Committee, which is chaired by a Deputy Secretary in the Cabinet Office and includes internal and external computer experts among its members. Before the period of currency auctioning which Zambia introduced in October, 1985, any organisation in the country requiring an allocation of foreign exchange to purchase computer equipment had to secure the approval of the Committee. The Committee "required a detailed project appraisal from each applicant justifying the need for a computer system" (Shitima, 1986:164). With the greater access to foreign exchange under the auction system, the role of the Committee was effectively reduced and its control now applies only to the government sector. Many people in the Zambian computer industry feel that the requirement for approval by the Computer Utilisation Committee provided some effective protection against the worst errors in computer selection, and would support its re-introduction in relation to all proposed computer purchases in Zambia.

Apart from the operations of this Committee, there have been other controls on computer acquisition. The parastatal sector is organised into large conglomerates in which the corporate centre or holding company sometimes controls or advises member companies in their computer selection. In the private-foreign sector a varying degree of central control is exercised. Sometimes the foreign parent company dictates the computer equipment totally, and the local subsidiary has little or no say in the matter. Alternatively, the corporate centre may provide advice and standards to guide computer selection by subsidiaries, and work on the computer selection jointly with the local staff. In a few cases, no central control is exercised. The situation of the Private - Foreign sector can best be summarised by saying that it has far less autonomy than the Private- Zambian sector in the decision to computerise, and generally more support and advice in the selection when it does.

The special position of the aid agencies should also be mentioned. While these might be expected to be particularly sensitive to the issues of local autonomy and development, it seems in practice that they almost always supply equipment which was selected externally, without any reference to the local opinions, and almost always in the form of microcomputers. In response to the question of why this was so, a number of reasons were suggested. Some suggested that the microcomputer is a particularly attractive form of aid from the donating agency

viewpoint, in view of the size of expenditure, lack of need for infrastructure and limited need for "follow-up" expenses. It is suggested that microcomputers are supplied because this suits the donating agency, even if they are not the most appropriate equipment for the particular situation. Another reason advanced was the widespread conviction that microcomputers are the only appropriate type of computer for a developing country. Two computer experts from government agencies and one from an educational institution mentioned the suspicion that the selection by aid agencies was sometimes motivated by the desire to support and market the home industry of the donating country.

In a minority of cases, the decision to computerise was forced by technological and market developments. For example, organisations using older, pre-computer technology such as mechanical cash registers, ledger posting or tabulating machines have been forced to move to computer equipment simply because it is no longer possible to buy or get spares or support for the older machines. Even earlier computer models sometimes have to be abandoned for the same reason.

This effect is particularly noticeable in the banking sector, and three interviewees from this sector - two of them expatriates - were unhappy about this situation. They felt that the older technology was perfectly adequate for the local conditions, and that the move to modern computers was in the interests of the computer manufacturer rather than the Zambian user. Whereas the

users in developed countries needed and could afford the latest technology, there was no necessity in local circumstances for such short product cycles. There is a suggestion here that the international market operates to the disadvantage of developing countries, whether by accident or design.

### Conclusions

In examining the contribution, past and future, of computers to Zambian development, it is important to recognise the different sets of circumstances and practical experiences which exist. The Government sector has worked very hard at computerisation over the years and has faced considerable difficulties. In recent years, the computer-related activity in government has changed from the original mainframe operation to one increasingly dependent on aid-funded microcomputers, due, apparently, to the lack of finance for government purchases and the increasing readiness of aid agencies to provide computers. While these new systems may be desirable in their own right, the trend is to diminish the proportion of home-developed systems in use.

The education sector is a very recent area of computerisation, and is again very heavily dependent on aid agencies for resources. The education sector in Zambia has made practically no contribution to computerisation in Zambia until the very recent past (Instead, the Government and parastatal sectors have borne

most of the burden of staff training, by a combination of "on-the-job" training and sponsoring their employees on courses abroad), but it now seems to be preparing for a more important contribution in the future.

The parastatal sector is the most important in terms of computer resources and development. Computer usage is expanding rapidly, and is mostly funded from internal sources. A few of the more advanced users in Zambia are operating at a level of computerisation which would be impressive in any country. For example, the computer operation in ZCCM is very advanced in the scale and nature of computer application and in the level of the computer support operation.

Private Zambian - based companies are generally recent users of computers, and in most cases they have purchased microcomputers in the recent past and are just beginning to exploit their possibilities.

Some private foreign- based companies have used computers in Zambia for a long time, but most are again recent purchasers of microcomputers. The two parts of the private sector are the fastest- growing area of computer introduction at present.

The "other" organisations mentioned are aid- oriented , externally funded organisations whose presence here is justified by their special view of computerisation and development in

Zambia. These organisations are working in a Zambian environment but without the constraints of funding which affect Zambian undertakings. They are aware of the computer usage and problems of their Zambian colleagues, and of the level and type of computer application emerging in the developed countries. This puts them in a unique position to comment on the Zambian situation.

Given this background, the only parts of the Zambian economy with sufficient experience of computerisation to have made any significant contribution to the development of the country are the government and parastatal sectors. These are also crucial to the future of Zambian computerisation because they are the main sources of computer expertise and experience.

The material on duration of computer usage emphasises the recent origin of most of the current computer usage. It is only those centres with 10 years or more of computerisation behind them - only about one-quarter of the total - who have had the opportunity to demonstrate any significant results from computerisation. This of course means that, even without allowing for any future additions to the number of computers in Zambia, the impact of computerisation will grow rapidly in the coming years.

The extent and nature of computer impact will also depend on the trends which develop in computer application. If the newer

users follow the path of the established centres, and grow to be large centres with local expertise and systems, the degree of dependence will be less than if they continue to rely on imported systems and systems support. This question is further explored in the later chapters.

The patterns of computer acquisition and selection which appear here are significantly different from those in a developed country. In the latter case, the decision to computerise is usually taken on the basis of internal requirements, and is based purely on the expectation of benefits to the organisation.

In Zambia, a series of other, external, interests are involved, ranging from aid agencies to the foreign headquarters of multi-nationals. In many cases, the power to decide on whether to install computers is exercised from outside Zambia, and the selection of the type of computer is also frequently in outside hands. This may introduce foreign expertise into the process, which may help to support, advise and up-date local expertise. But it also means that the local staff have experienced considerable frustration in their inability to influence or control the process. Sometimes useful local knowledge of computer requirements and the local computer market seems to have been ignored. For example, one subsidiary of a foreign company was obliged to install a number of microcomputers which had been selected as standard for all its subsidiaries by the Head Office,

and the local staff were worried about relying on this equipment because they will apparently be the only organisation in Zambia using this particular equipment. The availability of maintenance services and spares in Zambia is very much in doubt. In another case, an educational institution was obliged to take computers from an aid agency which were not supported in Zambia despite the objections of the local staff.

The degree of local autonomy in computer acquisition varies greatly between the different sectors, and is greatest in the parastatal and private- Zambian sectors. At the same time, these sectors are the most vulnerable to lack of funds for computerisation because they rarely receive donations of computer equipment from aid agencies, and in many cases they are the most exposed to bad decisions in computer selection, due to lack of expertise.

In general, the involvement of external interests in computer acquisition in Zambia is far greater than would be the case in a developed country, and there is some evidence that the best interests of Zambia may be subordinated to other interests. At the same time, the danger and impact of wrong decisions in computer selection are far more serious than they would be in a developed country, because of the national shortage of foreign exchange and other resources. The importance of procedures which are designed to minimise errors can hardly be exaggerated, and it is encouraging to note that this is now widely recognised in

Zambia. Zambian enterprises have been subjected to far more control and supervision in their computer acquisition than would be the case in a developed country. Instead of regarding this as an imposition, many Zambian managers welcome it as a desirable protection against serious errors in decision-making and selection. It is generally accepted that the Computer Utilisation Committee did a very professional job, and it would be widely accepted as the authority to review and control proposals for computer purchases.

The objectives in introducing computers are again different in Zambia from those familiar in the developed countries. The intention to save costs is relatively rare here. Instead, computers are usually expected to improve the systems in operation, by speeding the output, improving accuracy, improving access to information and so on.

In a minority of cases, there is a feeling that Zambian organisations using computers suffer certain disabilities in comparison with their counterparts in the West. This is based on factors such as the high rate of involvement of external organisations (which may have interests to protect other than those of Zambian development), the inability of the local people to influence developments, and the speed of technology change, which is geared to developed rather than developing countries. All of these effects can be regarded as the direct and inevitable

consequence of the weakness of a developing country in pressing its own interests in competition with other, more powerful, interests, and would support the perspective of the dependence school.

## CHAPTER 3

### COMPUTER EXPERIENCES AND PLANS.

#### Introduction

The main source for this survey lies in the practical experience of computer staff and users in Zambia. In this chapter we try to analyse the common experiences of these people - the main problems, achievements and other effects which computers have brought to Zambia. We also examine the future plans of organisations using computers in Zambia, to establish the current trends and likely future direction and effects of computerisation.

#### Problems and benefits of computerisation

Interviewees were asked what, in their experience, had presented the greatest difficulties in the course of computerisation in their organisations. The results were as shown below :

Table 16

Main problems experienced in using computers.

<u>Problem</u>	<u>Number of mentions by :</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	
Lack of expertise	10	4	9	5	5	0	33(28%)
Maintenance of computers	1	3	2	0	4	1	11(9%)
Lack of systems	4	1	3	1	1	0	10(9%)
Excessive reliance	2	0	4	2	0	0	8(7%)
Heavy investment	1	2	2	1	1	0	7(6%)
Management awareness	1	1	5	0	0	0	7(6%)
Software	2	0	2	1	2	0	7(6%)
Computer time	2	0	1	1	2	1	7(6%)
Other problems	1	0	0	0	3	0	4(3%)
None	<u>2</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>5</u>	<u>1</u>	<u>23(20%)</u>
Totals	26	13	34	18	23	3	117(100%)
Number of interviewees	18	9	26	14	18	3	88

The "Lack of systems " is a reference to the difficulty of getting staff to adhere consistently to the disciplines of systems and procedures. "Excessive reliance on computer" arises from a tendency to expect the computer to do everything - in particular, to produce accurate output irrespective of the data supplied to it. The relatively high incidence of "No problems" appears to indicate that computerisation has proceeded very smoothly in some cases.

The lack of expertise is by far the most common problem. It is in relative terms at its most severe in the government sector, and least severe in the parastatals. On the other hand, some

parastatals have problems with the level of awareness or appreciation of their management.

The same results, tabulated by the separate perspectives of computer staff and users, are as follows :

Table 17  
Problems experienced in use of computers

<u>Problem</u>	<u>Number of mentions by:-</u>			<u>Total</u>
	<u>Computer Staff</u>	<u>Computer Users</u>		
Lack of expertise	25	8		33(28%)
Maintenance of computers	5	6		11(9%)
Lack of systems disciplines	7	3		10(9%)
Excessive reliance on computer	4	4		8(7%)
Heavy investment	4	3		7(6%)
Management awareness	5	2		7(6%)
Software	3	4		7(6%)
Computer time	3	4		7(6%)
Other problems	0	4		4(3%)
None	<u>13</u>	<u>10</u>		<u>23(20%)</u>
Totals	69	48		117(100%)
<u>Number of interviewees</u> -	53	35		88

The lack of training, and of experienced colleagues to consult, constitutes by far the greatest problem for both computer staff and users. In fact there is little difference in the incidence of problems as between the two groups.

When the problems reported are tabulated by large user/ small user, however, a distinction in experience does emerge :

Table 18

Problems experienced, analysed by scale of user

<u>Problem</u>	<u>Number of mentions by staff from-</u>		
	<u>Large users</u>	<u>Small users</u>	<u>Total</u>
Lack of expertise	30	3	33(28%)
Maintenance of computers	8	3	11(9%)
Lack of systems disciplines	10	0	10(9%)
Excessive reliance on computers	8	0	8(7%)
Heavy investment	6	1	7(6%)
Lack of management awareness	5	2	7(6%)
Shortage of computer time	4	3	7(6%)
Problems with software	5	2	7(6%)
Other problems	2	2	4(3%)
No problems	<u>17</u>	<u>6</u>	<u>23(20%)</u>
Totals	95	22	117(100%)
Number of interviewees -	70	18	88

The problems of lack of training/expertise, lack of disciplines and excessive reliance on computers seem to be largely confined to the larger users. This is the opposite of what would be expected. The larger users have considerably more expertise and experience at their disposal than the small ones. The explanation seems to be that small users are generally in the very early stages of computer application, and have not yet run into the problems of large systems and heavy reliance on the computer. It may also be that the expectations of small users are much lower and more easily satisfied. Again it should be noted, however, that a fairly high proportion of both groups report no problems.

When asked about the main benefits experienced from computerisation, computer staff and users reported the following:

Table 19

Benefits secured through computer usage

<u>Benefits</u>	<u>Number of mentions by -</u>		
	<u>Computer staff</u>	<u>Users</u>	<u>Total</u>
Greater speed in output	19	23	42(25%)
Improved management	19	12	31(20%)
Better access to information	13	9	22(13%)
Greater accuracy	9	7	16(10%)
Better control of expenditure	12	2	14(8%)
Better service to public	7	7	14(8%)
Cost saving	6	2	8(5%)
Other	2	0	2(1%)
Not known/not applicable	<u>12</u>	<u>5</u>	<u>17(10%)</u>
Totals	99	67	166(100%)
Number of interviewees -	53	35	88

A large percentage of both groups agree that greater speed in output and improved management are the main benefits secured by computerisation. However, computer staff also see great advantage in the areas of better control on expenditure and improved access to information. Both groups agree on the low priority of cost saving.

It is interesting to examine the incidence of the reports by sector :

Table 20

Benefits secured, analysed by sector.

<u>Benefit</u>	<u>-</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	<u>Total</u>
Greater speed		15	0	12	6	8	1	42(25%)
Improved management		2	5	14	3	5	2	31(20%)
Better access to info.		6	2	8	0	3	3	22(13%)
Greater accuracy		2	0	2	4	8	0	16(10%)
Better control		3	1	6	0	3	1	14(8%)
Better service		4	2	2	2	3	1	14(8%)
Cost saving		2	0	2	1	2	0	8(5%)
Other		0	1	0	0	1	0	2(1%)
Not known/ not applicable		<u>0</u>	<u>2</u>	<u>4</u>	<u>7</u>	<u>4</u>	<u>0</u>	<u>17(10%)</u>
Totals	-	34	13	51	2	37	8	166(100%)
Number of interviewees	-	18	9	26	14	18	3	88

The speed of operation is the most striking advantage in government. Government systems are highly centralised, and involve the processing of very large data files. This presumably explains the fact that the speed of operation is seen as the most striking advantage for government users. On the other hand, the benefits of improved management, better access to information and better control are seen as more important for those organisations in the business sectors.

On the question of the general impact which computers had had on their organisations, there was no significant difference between the sectors, but there was as between large and small users :

Table 21

Organisational impact of computerisation.

<u>Impact</u>	<u>Large-scale users</u>	<u>Small-scale users</u>	<u>Total</u>
Better managed	18	3	21(24%)
Better service	10	1	11(12%)
Increased awareness of potential	7	0	7(8%)
Other	7	0	7(8%)
Not applicable	13	5	18(21%)
None	<u>15</u>	<u>9</u>	<u>24(27%)</u>
Totals	70	18	88(100%)

While a substantial proportion of both groups felt that the impact of computerisation had been "none" or "not applicable" (the latter frequently because computers had been so recently introduced), it is obvious that more people in the large-scale users had seen more actual change and impact. It seems likely that the impact of computers on organisations will increase as the level of computer usage increases in the future.

When asked specifically about the effects, if any, of computerisation on staffing, the responses were as follows :

Table 22

Effect of computerisation on staffing.

<u>Effect</u>	<u>Number of mentions in -</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z.</u>	<u>Pvt-F.</u>	<u>Other</u>	
Saved staff	1	1	9	2	3	0	16(17%)
Extra (computer) staff	6	1	5	0	1	0	13(14%)
Higher quals.	1	2	7	2	2	0	14(15%)
Other	0	1	0	0	0	0	1(1%)
None	<u>10</u>	<u>5</u>	<u>10</u>	<u>10</u>	<u>12</u>	<u>3</u>	<u>50(53%)</u>
Totals	18	10	31	14	18	3	94(100%)
Number of interviews	18	9	26	14	18	3	88

This table is remarkable for the apparently insignificant overall effect on staffing. Over half of all answers said that there had been no effect on staffing. Almost one fifth of answers suggested that staff had been saved, and almost the same number said that staff had been increased. The reasons for this general absence of staff reduction are considered in detail in the discussion which follows in this chapter. In the government sector in particular the effect of computerisation has been to increase rather than reduce the total staffing. Where staff were saved, they were transferred to other parts of the organisation - no organisation reported the actual dismissal of staff because of computerisation.

Again there is a clear difference between the large and small users :

Table 23

Effects on staffing in large and small users

<u>Effect</u>	<u>Large-scale users</u>	<u>Small-scale users</u>	<u>Total</u>
Saved staff	14	2	16 (17%)
Extra staff	12	1	13 (14%)
Higher quals.	13	1	14 (15%)
Other	1	0	1 (1%)
None	<u>36</u>	<u>14</u>	<u>50 (53%)</u>
Totals	76	18	94
Number of interviews-	70	18	88

This table makes it clear that the only cases in which a noticeable impact on staffing is likely is in the large-scale users. This in turn means that the assessment of impact of computerisation will hinge very much on the question of the eventual scale of usage among Zambian computer users. If most users can be expected to grow to the level of "large" users, then it could be expected that the impact of computerisation on staffing will be more significant than it now appears. It is also clear from this table that the demand for higher qualifications results from the large-scale use of computers, and is not generally experienced in the smaller users.

In response to a question about problems in maintaining their computer systems, a high proportion (49 of 88) reported no serious problems. This proportion was consistent through all sectors. Where problems were reported, they included bad support

from computer suppliers (24 mentions), shortage of expertise to solve problems (6 mentions), non-availability of foreign exchange to pay for support, supplies and spares (4 mentions), long delays in getting maintenance performed (3 mentions) and other problems (2 mentions).

Eleven of the organisations involved, or 20% of the total, said that they had no long-term computer plans. These were in the following sectors :

Table 24

Organisations with no computer plans prepared, by sector

Government	2
Education	1
Parastatal	3
Private Zambian	1
Private Foreign	3
Other	<u>1</u>
Total	11

While this may seem a high ratio of computer users without plans, it is due to a combination of the special factors applying to the situation in Zambia which have already been identified. Some organisations are dependent on an aid agency or foreign parent company to decide and supply any upgrade. In many cases, computers have been introduced so recently that there is no base of experience on which computer plans could be founded, and little or no expertise in how to plan.

The plans of the remaining organisations have the following features :

Table 25

Features of computer plans, by sector

<u>Feature</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z.</u>	<u>Pvt.-F.</u>	<u>Other</u>	<u>Total</u>
Install more micros	2	3	2	4	5	1	17(26%)
Upgrade existing mainframe/mini	0	1	8	4	2	1	16(25%)
Acquire main- frame/mini	1	0	0	1	1	0	3(4%)
Decentralise processing	2	1	5	1	1	0	10(15%)
Introduce local network	1	3	0	2	3	0	9(14%)
Introduce telecomms	2	1	3	0	2	0	8(12%)
Other	<u>0</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>3(4%)</u>
Totals	8	9	19	13	14	2	65(100%)
Number of organisations	6	5	11	10	10	2	44

A total of 17 organisations, or almost 1/3rd of the total, plan to expand their computer facilities by adding further microcomputers to those existing. This confirms, to some extent, the popular view that microcomputers will represent the vast bulk of computer purchases in Zambia in the future. However, almost as many (16) expect to expand by upgrading existing mainframes or minis, and a further three who do not have a larger computer at present plan to install a larger machine. There is no evidence of any existing large- machine user planning to down-grade to smaller machines. The overall position seems to be one of a slow

drift towards larger machines, presumably as newer users come to outgrow the facilities available on microcomputers.

Another feature of these plans worth noting is that over half of the organisations involved mention the intention to advance into some form of distributed processing, using decentralised data capture, telecommunications, local networks or some combination of these features. Distributed processing is frequently adopted by organisations who have started with a centralised computer facility, and progress to more effective decentralised arrangements. This suggests a progressive and well-informed approach by many Zambian computer users. It will also pose requirements for higher levels of computer and telecommunications skills in the future, which is significant for the future educational and skill demands of the Zambian computer industry.

Interviewees were asked what, if any, were the major obstacles to expanded computer usage in the future. The following were indicated :

Table 26

Obstacles to expanded computer usage

<u>Obstacle</u>	<u>Number of mentions in sector -</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z.</u>	<u>Pvt-F.</u>	<u>Other</u>	
Shortage of expertise	9	6	3	3	5	0	26 (25%)
Lack of Forex	0	3	5	7	4	0	19 (19%)
Shortage of machine capacity -	5	2	5	2	1	0	15 (15%)
Management awareness	0	0	9	1	1	0	11 (11%)
Quality of PTC lines	0	0	1	2	1	0	4 (4%)
Other	0	0	1	0	0	0	1 (1%)
No obstacle	<u>4</u>	<u>1</u>	<u>7</u>	<u>3</u>	<u>8</u>	<u>3</u>	<u>26 (25%)</u>
Totals	18	12	31	18	20	3	102 (100%)
Total interviews	18	9	26	14	18	3	88

It seems that the common obstacles differ from sector to sector. Shortage of expertise is the prevailing obstacle in government and education sectors. This is obviously linked to the fact that salaries in these sectors are low compared to the other sectors, and trained staff move in large numbers to better-paid work in parastatal and private sectors. In the parastatal sector, management awareness, or rather the lack of it, is seen as the most common obstacle to progress, whereas in the private sector the non-availability of foreign exchange to buy computer supplies is the biggest problem. Again it should be noted that about one-quarter of interviewees saw no major obstacle to increased computer usage.

When the responses are examined by scale of operation,

significant differences again emerge :

Table 27

Obstacles to expanded computer usage, by scale of user

<u>Obstacle</u>	<u>Large-scale users</u>	<u>Small-scale</u>	<u>Total</u>
Shortage of expertise	23	3	26 (25%)
Lack of Forex	15	4	19 (19%)
Shortage of machine capacity	14	1	15 (15%)
Management awareness	8	3	11 (11%)
Quality of PTC lines	4	0	4 (4%)
Other	1	0	1 (1%)
No obstacle	<u>18</u>	<u>8</u>	<u>26 (25%)</u>
	Totals	19	102 (100%)
Number of interviews	70	18	88

Many small-scale users foresaw no obstacles to increased computer usage. It must be assumed that this was because of their limited scale of operation at present, and because they have not yet developed sufficient experience to identify the eventual problems.

A different view of obstacles to future expansion emerged as between computer staff and users, with the computer staff apparently more conscious of the problems involved in expanded computer usage :

Table 28

Obstacles to expanded computer usage, by staff category

<u>Obstacle</u>	<u>Number of mentions by -</u>		<u>Total</u>
	<u>Computer Staff</u>	<u>Computer users</u>	
Shortage of expertise	20	6	26(25%)
Lack of Forex	15	4	19(19%)
Shortage of machine capacity	11	4	15(15%)
Management awareness	9	2	11(11%)
Quality of PTC lines	4	0	4(4%)
Other	1	0	1(1%)
No obstacle	<u>7</u>	<u>19</u>	<u>26(25%)</u>
Totals	67	35	102(100%)
Number of interviewees	53	35	88

Over half of the computer users see no obstacle to the expanded use of computers in their organisations whereas only 10% of computer staff are confident of the lack of obstacles. This presumably comes about because computer staff are closer to the problems which are occurring, and may indicate a slow-down in expansion of computerisation in the future.

Finally, the questionnaire asked about expectations for the usage of computers in Zambia over the next 10 years. In the most consistent result in the whole survey, all interviewees but two foresee a constant expansion of computers in Zambia over the next 10 years (One person thought that the expansion would stop before the end of the period due to saturation of the market, and the other had no opinion).

Over one-third of the interviewees (29), spread across all

sectors, emphasised the dramatic influence of the microcomputer on computer usage in Zambia in recent years, and expected that the expansion will consist largely of microcomputers. This judgement was based in part on the evidence of computer development in Zambia in recent years, and in part on the view that microcomputers are particularly suitable for Zambia, especially because of their relatively low cost. However, a minority (6 cases) predicted that, as computer usage grows, at least the larger organisations will find it increasingly desirable to install larger computers rather than continue to rely on microcomputers. This view seems to be supported by the actual long-term plans of organisations, reviewed above.

### Discussion

It was pointed out earlier that the use of computers is of very recent origin in many Zambian organisations. In this chapter we find that many of the problems of computerisation have been experienced only by the larger and, therefore, longer-established users. It seems that many organisations will face these problems in the future, as their usage of computers expands. This is particularly significant in the case of the effects on staffing, which are obviously associated with the larger-scale users. The fact that staff losses and unemployment resulting from computerisation have not been a problem to date may not be any indication of what the future holds. Similarly, the demand for higher qualifications which results from extensive computer usage

is only now beginning to take effect in most organisations using computers.

The possibility that many of the problems associated with computer usage lie in the future of the newer users is borne out by the experience of many of the more experienced users. These often speak of the unrealistic expectations which marked the earlier years of computerisation in their organisations, and of the disillusionment which often marked the long years of learning to cope with computers. While still convinced of the value of computers, they caution against the expectation of easy or rapid results.

In Chapter 1, the "text- book" benefits of computerisation were given as -

- Greater processing speed
- Better accuracy and improved consistency
- Faster information retrieval
- Integration of business areas
- Reduced cost
- Better security

and it was suggested that a different set of factors and priorities might be expected in a developing country. This proved, in fact, to be the case. The last three effects on the list above can be largely discounted in Zambian conditions. The first three effects are mentioned frequently in this survey, but so are a number of other effects including improved management, better control of expenditure and better service to the public.

Our main interest in this material is to establish clearly what, if any, are the benefits which computerisation brings in a society like Zambia. We have seen that the possibility of reducing costs by replacing staff with computers in a developing country is remote. If a justification exists for installing computers in a country like Zambia, it should be found in these responses.

When the responses are analysed in detail, it emerges that the perception of benefits achieved from computers depends very much on the viewpoint of the observer. It is clear from Table 19 that proportionately more users than computer staff are impressed by the speed of output and greater accuracy. Computer staff, on the other hand, are more interested in the scope for better control of expenditure. It is only natural that the two groups see the situation differently.

A significant difference also emerges when we compare the lists of benefits which were expected when the initial decisions to install computers were taken (Table 15) with the actual benefits secured (Table 20). In the former case, the desire for better management information was by far the most common reason given for computerising, and greater speed was not mentioned. It would seem from these figures that Zambian enterprises tended to be very unsuccessful at achieving the effects they sought when computerising, but nevertheless achieved other benefits and were satisfied with the end result. From discussions with the people themselves it appears that this is not the true position, and

that the differences between the various responses are more apparent than real. For example, the fact that a particular computer system provides greater speed in processing may have the effect of providing improved opportunities for control and management. This effect will be reported as "Greater speed" by a clerk who is impressed by the speed of output, and as "Improved management" by an accountant who values the information provided. Similarly, the ability of the computer to validate data and perform many calculations without error might be seen as "Greater accuracy" by one person, and as "Improved control" by another. The perceptions of what form the benefits of computer installation takes are obviously related to the role and circumstances of the observer. In fact, many of the benefits mentioned in the survey are not ends in themselves, but means to an end. An organisation does not prosper because it has better access to information, or faster processing, or greater accuracy, but because of what these effects can lead to in terms of the overall efficiency of the organisation.

In order to clarify this important issue, detailed discussions were held with interviewees on exactly what end results were achieved as a result of their computerisation programmes. A common theme did emerge from these discussions, and it related to the impact of the computer on the levels of general efficiency in the clerical systems affected. It emerged that the central effect of the computer was to transform an inefficient system

into an efficient one. Before computerisation, it was in effect impossible to manage and control the organisations involved. The most basic information about what was going on was typically lacking, it often arrived months late and was totally out-of-date. Important parts of the data were often missing, and that which was provided often contained gross errors. In short, the main difference between the pre- and post-computerisation stages in these organisations was that detailed, current and accurate data was impossible to secure before computerisation, and became possible only after the computer system was installed.

This point is crucial to the understanding of the differences between developing and developed countries in computer application. The view that computers are inappropriate for developing countries, and that the plentiful manpower should be used instead, is based on the assumption that manpower and computers are freely inter-changeable, and that the same results can be achieved with either. If this were true, high levels of efficiency should be possible without using computers, but simply by hiring appropriate staff in sufficient numbers. While this may be true in the developed world, it is not the view which emerges here. The bulk of interviewees, asked why they did not employ more staff rather than spend money on a computer, were emphatic that their problems could not be solved by the addition of staff, in whatever numbers. These organisations generally suffered from the problems of excessive staffing and inefficient systems at the

same time. As one systems analyst in a government centre put it "people are the problem - you can't solve it by adding more."

Since this point is central to the issues under examination, respondents were closely questioned as to why it was that an efficient system could not be organised before the introduction of computers, and what were the specific problems with clerical staff. The factors mentioned in reply related to a wide variety of the features of life in a developing country, including the following -

(a) Education and experience levels. Despite the efforts made in the educational field in Zambia since independence, it is commonly agreed that the country still suffers from severe shortages of skilled people. The quality of formal education is only part of the problem. There was also frequent mention of the lack of business experience and understanding among even well-educated employees, leading to lack of appreciation of the workings of the organisation, of the need for information or of the significance of speed and accuracy. Errors in the data were attributed to factors like poor facilities (lack of proper forms and writing instruments, poor accommodation, deterioration of forms in transit), lack of numeracy on the part of clerks, the absence of a "business sense" in the same clerks (with the effect that gross errors, which would immediately be obvious to anybody familiar with the significance of the figures, are accepted and recorded uncritically), and a general absence of the type of

system which would ensure that data was collected and collated properly.

(b) Infrastructure and Services. In the developed countries, clerical workers can be supported with the provision of the appropriate office equipment, filing systems, desk calculators, document reproduction services etc., whereas even the most basic facilities are often missing in the developing countries. In the former, the rapid completion and transmission of documents is aided by efficient telephone, postal and telex services which are missing in the latter. The physical transport of people or documents is hampered or prevented in developing countries by the shortage, cost and unreliability of public and private transport.

(c) Lack of systems, supervision and management. The organisation of an efficient clerical system of any size requires considerable organisational and managerial expertise, which is often lacking in developing countries. It also requires the development of appropriate work attitudes and disciplines, which are slow to develop in the newer economies. Efforts to impose discipline on a work force in these circumstances are often hampered or prevented by economic, cultural, ethnic or other social considerations. There may be a resistance to accepting orders from supervisors because of social or tribal circumstances.

(d) Availability of the work-force. Finally, but most importantly, efforts to develop efficient manual systems are

hampered by the low availability of workers. (In this case "availability" is used to refer to the proportion of the working day for which an employee is in fact working). This was judged to be a major factor in the low productivity and long delays which characterise clerical systems in a developing country. The reasons for this lie, according to the interviewees, in a complex of social and economic circumstances including -

- low standards of living and housing, leading to low resistance to disease and high absenteeism
- the extended family system, which places extensive social obligations on people with low levels of resources
- a social ethos which accords to social obligations a much higher priority vis-a-vis work demands than is the case in the developed countries
- poor transport facilities to and from work, causing inevitable delays and absences
- poor retailing arrangements and supplies, which require frequent absences from work to find and queue for essential commodities, and to negotiate and arrange for supplies
- the security situation, which limits almost all work and social activities to the day-light hours
- rigid bureaucratic procedures which make it impossible to

progress work in the absence of particular individuals

- general demotivation of staff required to work for a very low levels of pay and with little prospect of advancement.

In summary, the picture emerges of a set of circumstances in which it is not possible to organise an efficient data processing system using clerical methods. The information collected in this survey indicates that the choice was not between alternative methods of processing, but rather between acquiring a computer and being able to run an efficient organisation, or continuing the waste, inefficiency and frustration of the clerically- based system.

This view of clerical systems in developing countries suffering from a list of serious deficiencies has been noted before. The features of systems in developing countries have for example, been described as :-

- Low productivity
- labour intensive
- underemployment
- poor work habits
- inadequate maintenance
- low educational levels
- material shortages
- improper supervision
- resistance to change (Damachi, 1987:10).

With the exception of the last-mentioned , all of the other effects have been noted here. The most important finding emerging from this study is that computer systems can function to overcome most or all of these problems at the same time, by removing the

constraints involved in clerical systems. It is not just that computers convert low productivity to high productivity, or that they remove the need for supervision. It seems that they have the effect of raising the general level of operation.

It has been assumed in much of the literature on computers in developing countries that the application of computers would follow a similar pattern to the developed countries, and that the first stages would be involved mainly with staff savings. For example , one author maintains :

There are few exceptions (in developing countries) to the preponderance of simple, clerical- replacement applications (Wallace, 1977:21) ;

and continues :

Clerical workers must be replaced before any benefit accrues from the present type of computer applications . . . If, as the interviewees claimed, there is no employment impact, it is likely that computers are duplicating rather than substituting for clerical resources and that the countries are paying foreign exchange for no benefit, at least in the short term (Wallace, 1977:23).

It is true that the earlier applications of computers in the developed countries related to relatively simple and basic systems like payroll, stock control and so on. It is also true to say that these were, in the developed setting, primarily "clerical replacement systems". It is also true to say that the level of computer applications in Zambia is relatively unsophisticated, and consists largely of the basic payroll, stock

control and other similar systems. It would be wrong, however, to conclude that they must therefore be "clerical replacement" systems in a developing country. As we have seen, they do not and were not intended to replace staff. Instead, they are used to improve the operation and efficiency of systems.

This belief in turn caused some logical problems because, as expressed above, there were obvious difficulties in justifying computerisation in developing countries if their main purpose was to save staff. As well as economic and social objections to large-scale employment reductions in a developing country, there is the fact, illustrated earlier, that the level of salaries in a developing country makes it virtually impossible to justify computerisation on grounds of saving staff costs - computers are too expensive in comparison with local wage levels. If wage and cost reduction were the only possible justification for computerisation, then it would be very difficult to justify computers in a developing country like Zambia.

The findings in this survey suggest a solution to this problem. In the developed world, efficient systems could be and were operated by clerical methods, but at high cost because of the high salary levels. When computers became available, the initial emphasis was on cost reduction. But in the developing world, the low skill, availability and experience levels of staff made it impossible to run large systems efficiently. Cost was not a problem, but skill levels were. So, when computer facilities

became available here, the thrust has been to remedy the organisational deficiencies, and not to reduce staff numbers or costs.

In practice, computer are used in Zambia not so much because of their ability to substitute for clerical staff, as for the effect which they can have on achieving general efficiency across the organisation. Computers in this role are best seen as a catalyst to improve the functioning of the organisation, by remedying the problems which prevented efficiency before.

The potential of computers is therefore much greater than the direct effects of increasing speed or improving accuracy. By improving the efficiency of the organisation, they can have a multiplier effect which is far greater than the direct ones. For example, an accountant in the Dairy Produce Board remarked that the effort and investment represented by a work force of hundreds of agricultural workers could be totally wasted when there was no proper system to supervise the work, to measure the output or to ensure the collection, transport, storage and marketing of their produce. The provision of a computer system removed these difficulties, by providing the basis for an effective management of the operation. This is, admittedly, an extreme case, but it is typical of the sort of effect reported in interviews.

Given that computers in Zambia are not installed in order to

replace staff, their effects on staffing levels are unlikely to be serious, and the survey results in fact show a low level of effect. There have been many cases where the staffing needed for a particular operation was reduced by computerisation, but any staff displaced have generally been redeployed. The chances of actual staff reduction depends on a number of factors apart from the direct effects of computerisation, including the overall state of the organisation. Even if computerisation causes a reduction in the need for staff, it may not lead to an actual reduction in numbers if the company's business is expanding. In an economy which is expanding, staff losses are less likely than in one which is contracting. However, the total formal sector employment in Zambia has been declining during the 1980's, and this would seem to indicate that the national capacity for absorbing staff replacement without job loss is limited.

A lot of people claim that staff reductions are not likely in their organisations, even if they are possible. They point out that there was under- utilisation of staff before the computers arrived, and feel that there will be under- utilisation after computerisation. The low wages in a developing country , which appear to make it difficult to justify computerisation, also help to avoid any pressure for disemployment of staff who are no longer necessary. Another major consideration in Zambia is that there is a strong social resistance to the disemployment of workers, and a corresponding political pressure to maintain work

force levels. For these reasons, and because computer installations in a developing country like Zambia are not generally motivated by the desire to save costs or reduce staff, the loss of employment due to computerisation should be minimised, at least at the present levels of computer application.

However, as the computerisation of the Zambian economy proceeds, it may become more difficult to avoid actual job losses. The ability to redeploy staff made redundant by a computer to other parts of an organisation will be reduced progressively as computerisation extends throughout the organisation. This would be particularly serious if, as a few interviewees suggested, many workers will prove to be incapable of "converting" to computer-based systems.

However, the vast majority of computer staff and users report that staff have no serious difficulty in learning the new methods. In fact there were reports that some staff members who were not satisfactory before computerisation proved to be very satisfactory as input clerks to computerised systems. It seems that the nature of the work in clerical systems (especially manual computations and the disciplines involved) is demotivating for many people in Zambian society, but the same people find computer systems very congenial. There is scope here for an investigation of the relationship between staff aptitudes and attitudes in a developing country and the work content of

computer systems, but it is outside the scope of this study. Suffice it to say that most managers have found in practice that the Zambian work- force have taken very readily to operating computer systems. This contradicts the fear expressed by some interviewees that people in Zambia may not be able to adapt to computer systems.

The difference between the cases of failure to adapt and satisfactory adaptation may be due less to differences in innate ability than to different standards of staff training applied when computer systems were introduced. In developed countries it has often been noted that insufficient staff training was provided on conversion to computer systems. In a developing country, the degree of change and amount of training needed should be even greater. The constant shortages of computer staff and expertise in Zambia have often led to the absence or poor quality of staff training when converting to computerised systems in Zambia. Many Zambian organisations have found to their cost that a high priority should be given to staff training if they are to work well with new computer systems.

There is a widespread view that computerisation will increase the demand for higher qualifications in staff, and this is borne out by the opinions of longer-term computer users. The experience has been that computer systems allow a higher grade of work to be done, and sometimes requires a better-educated staff to cope. As the scope of computerised systems increase, this will presumably

cause increasing demand for the better - educated, and correspondingly less demand for the unskilled and semi-skilled office workers.

Many organisations have had serious difficulties in the quality of computer maintenance, and there is a general feeling that it has deteriorated in Zambia in recent years. The numbers and quality of engineering staff, range of spares and so on which a supplier maintains must depend on the size of his market, and the more suppliers are competing the smaller the market of each. The Computer Utilisation Committee mentioned earlier pursued a deliberate policy of restricting the number of suppliers on the Zambian market, in order to ensure that the suppliers which were active in Zambia did provide a good support service, and apparently achieved good standards of maintenance as a result. With the relaxation of this control, the number of suppliers in Zambia has proliferated in recent years and the standards of maintenance have dropped. This is an important consideration in the question of the value derived from computerisation in Zambia, and also in the question of selecting appropriate equipment for Zambian conditions.

The absence of computer plans for the future does not imply that the organisations involved foresee no expansion of their computer facilities. In fact all organisations intend to expand their use of computers, but the form of this expansion is unknown

in the 11 cases which have no plans.

The main significances of the analysis of computer plans, borne out by discussions with the staff involved, are that :

(a) Every organisation surveyed intends to expand its use of computers. Not a single organisation has found computers to be unsuitable or irrelevant to its future needs,

(b) Many of the organisations have ambitious plans which will involve more advanced technology as well as increases in the scale of computer usage. This has important implications for future needs of computer expertise in Zambia,

(c) The trends in computer application already noted in this survey seem set to continue - the government sector will expand at a modest rate, and the education sector more rapidly. But the major expansion will be in the remaining sectors, with the parastatal continuing to lead the way.

In the responses to questions about obstacles to expansion of computerisation, we see a very clear distinction between the factors which restrain further computer development in different sectors. In the case of the government and education sectors, the most common obstacle is shortage of expertise. This is despite the fact that government was one of the earliest users of computers in Zambia, and has invested considerable effort and resources in training of computer staff over the years. But there is a steady exodus of trained computer staff to the other sectors. Many of the senior computer staff in the parastatal and

private sectors received their initial training in the government computer centres. The problem is caused by the differential between rates of pay in government and the other sectors. In the public sector, pay rates for computer staff are linked to the pay rates of other civil service grades. As a result, a computer expert can often double or triple his salary by leaving for the private sector, and many do. It seems that this problem is not open to any easy solution, and that the shortage of expertise in government and education sectors will continue.

In contrast, the most frequent problem mentioned by the parastatal sector was that of management awareness. It is a feature of this sector that the individual companies in this sector are grouped into large conglomerates, and that senior management are frequently transferred within and between companies in the group. The understanding of the importance and potential of computerisation which takes some years to develop can be lost over-night when a new senior management team is installed, and many parastatals find that this prevents the proper development of their computerisation.

Turning to the "Private - Zambian" sector, the most common problem is lack of foreign exchange. (It should be explained that, in common with many developing countries, Zambia suffers from a shortage of foreign exchange. Different controls have been imposed over the years. At present, since the end of the currency auction system in early 1987, all foreign exchange is allocated

by the Government- appointed Foreign Exchange Management Committee or FEMAC, to which applications for every allocation of foreign exchange have to be submitted). While government and education sectors receive substantial support from aid agencies, and private foreign companies from their parent companies, parastatals and private Zambian companies are largely reliant on their own resources. Some parastatals are able to retain 50% of their foreign- currency earnings, and others no doubt have sufficient influence to secure allocations from FEMAC. For the Zambian private companies, lack of access to foreign exchange presents a more serious problem than for the others.

It should be noted at the same time that over a quarter of the individuals covered by the survey said that they see no major obstacle to expanded computer usage in their organisations.

While expecting an expansion of computer usage over the foreseeable future, many respondents pointed out that the rate of expansion will depend very much on economic and political developments. Any easing of controls on foreign exchange would accelerate the rate of computerisation. On the other hand, any decline in the economy would result in shortage of capital for investment in any form, including computerisation. Zambia has had a difficult period economically in the recent past, and the uncertainty of economic prospects will affect the rate of computer usage in the future.

The sectors most likely to be immune from any such restrictions are those in which computer resources are most frequently provided by aid agencies- the government and education sectors. In the past, aid agencies have often had reservations about the advisability of providing computers to developing countries - apparently on grounds of worry about appropriateness and creation of dependency - and some have even had an express policy of not providing computers. These restrictions have now been removed in all cases, and the aid agencies appear to be satisfied as to the appropriateness and potential of computers in developing countries. It is probable that the future will see an expansion of aid agency activity in this connection. Whereas these agencies used to :-

treat IT only as a tool that supports projects in other traditional sectors such as agriculture, energy and health. A few of these organisations are beginning to recognize IT as an important sector in itself, and to subject it to integrated rather than piecemeal analysis and planning (Schware, 1988:146).

A noticeable feature of the plans described is the relatively low level of technology involved. There are isolated mentions of the intention to introduce specialised technology like point - of- sale (POS) equipment or computer- aided design (CAD) systems, but for the most part the plans are simply for further computerisation along existing lines. With the exception of word processing on microcomputers, there are no widespread plans to

expand into office automation or Information Technology systems.

### Conclusions

On the face of it, the evidence in this chapter is that the experience of computer usage in Zambia has been generally favourable. The incidence of problems experienced has not been excessive, the benefits achieved seem to have exceeded the scale of problems encountered, and the enthusiasm for computers in Zambia is high as a result. Many of the problems reported (such as lack of expertise, lack of systems, over-reliance on computers) are symptomatic of the early stages of computer usage, and might be expected to diminish as experience of computerisation grows.

As against that, there is evidence that the low level of problems experienced to date in Zambia may be due to the low penetration of computer systems in most organisations, and that problems will become more acute as the use of computers increases. The standards of computer support and maintenance appear to have actually worsened in Zambia in recent years, because of the proliferation of computer models and suppliers on the market. The Zambian market for computers is too small to make it worthwhile for many suppliers to maintain a large support operation in the country. Many Zambian managers would welcome the return of controls to limit the number of suppliers in the country.

This dichotomy applies also to the question of the impact of computers on staffing. The actual experience to date in Zambia has been that computers do not lead to serious staff losses. This is supported by the facts that computers are not generally introduced in Zambia with a view to staff or cost reduction, that there is social and political resistance to staff disemployment and that the low wage levels in a developing country minimise the financial pressure to disemploy people who are not strictly needed.

However, the longer-term experience may prove to be different. As the use of computers spreads in each organisation, it will become more and more difficult to redeploy un-needed or unsuitable staff to unaffected areas. While excess staffing may not cause direct redundancies, it may depress or eliminate recruitment of new staff, which could have a serious effect on the national employment levels. It will also result in a change in the patterns of demand for staff, increasing the need for the higher-skilled, better educated and reducing the demand for semi-skilled and unskilled. However, it seems that most Zambian staff are able to convert to computer systems without major difficulties.

The main benefit secured by computerisation has consisted of the improvement in efficiency of systems. Computers have been introduced not in order to save money, but in order to enable

organisations to operate at new levels of efficiency. In effect, computers are being used to remedy the shortages of skills, expertise and disciplines which prevent the efficient management of organisations in a developing country. This is not a matter of providing sophisticated management information or decision-support systems. The computer systems operate at the most basic operational level. What they do is to provide the speed, accuracy, consistency and discipline which is practically impossible in a purely clerical system. This means that an organisation is in a position to introduce accountability for use of resources and results achieved, and to identify successes and problem areas. The computer supplies the basis for the efficient use of the resources of the organisation - staff, money, equipment. The impact of the computer is therefore much wider and more important than the simple saving of costs or increase in speed of outputs.

It has been noted before that computer systems can serve to improve efficiency and management at national level in developing countries. For example :

the use of Information Technology (IT) can help governments with scarce resources to deploy them more effectively and thereby contribute to the national economy (Schware,1988: 146).

However, the possibility that computers might have the same effect at the level of the individual organisation or company seems to have been overlooked. Without computers, resources at

both national and company level are generally mis- applied and wasted because of inefficient systems of control and management. With computers, this waste can be greatly reduced or eliminated. The effect of raising standards of efficiency and productivity in individual companies may be less visible and less dramatic than changes at national level, but it is no less important for national development. In fact, these standards are obviously of central importance in determining national development and prosperity.

Looking to the future, there is little doubt that computerisation will continue to expand in Zambia for the foreseeable future, although the rate at which it expands will be linked to economic and monetary developments. The majority of those interviewed expressed the view that "every company in Zambia" will have computers within the next decade. There is a wide-spread perception that the computer has become an essential item of office equipment, like a telephone or a typewriter.

On the other hand, computers do involve a substantial investment, and it is difficult to see how Zambia will be able to support this demand, along with all other pressing demands, if the economy continues to decline. It is certainly the intention of most organisations to expand their computer resources substantially, but that may run into practical difficulties.

Since the acquisition of computers requires large amounts of

foreign exchange, the availability and allocation of forex will be crucial. Under current arrangements, foreign exchange is allocated by the FEMAC. Many interviewees recommended strongly that, in view of the importance of computers to national development, FEMAC should give some preference to applications involving computers. In practice, FEMAC does frequently approve computer-related applications, but it is doubtful if it could automatically favour computer-based cases, in view of the pressing demands on available foreign exchange. Any change in the future which made foreign exchange more freely available than at present would clearly favour the more rapid expansion of computer usage in Zambia.

The importance of foreign exchange availability varies from sector to sector. While the expansion of computerisation in the government and education sectors may not be constrained by lack of forex, it will continue to be hampered by the shortage of expert staff. In the parastatal sector, the lack of management awareness and appreciation of the potential of computers seems likely to be the restraining factor.

Assuming that the prediction of constant expansion in the future is correct, Zambia at the end of the century will have a considerable computer industry in operation. Many of the users in this industry will be new to the field, and will presumably be experiencing the kinds of advantages and problems identified here. But many of to-day's users will be making greater use of

computers, and may be experiencing a different range of effects.

As the use of computers in the larger organisations expands, many organisations will need to upgrade from micros to minicomputers, or some form of networked processing. This will increase the demand for highly qualified computer staff, who are already in great demand from the existing large-scale users. The national shortages of qualified and experienced computer staff will continue for the foreseeable future.

While Zambian computer users have plans to extend the range and level of their computer usage, there is very little evidence of any intention to introduce the latest technology in Zambia. In the developed countries, the "first-generation" computer applications related largely to the automation of routine clerical procedures. These have now been joined by a "second-generation" of systems which are involved in the provision of integrated office facilities, such as electronic mail, digital voice systems and so on. There is no evidence in the present material of any intention to introduce such systems in Zambia. This represents one of the most important questions in relation to the medium- to long-term future of computerisation in countries like Zambia. Is this omission due to a failure of the Zambian computer practitioners to perceive the approach of these new developments, or is it because sophisticated Information Technology systems have no place in, or are too expensive for, a

developing country?

The staff participating in this survey have shown in other respects that they are well-informed on current issues and technological developments. If they have no plans to introduce the "second-generation" systems, it is presumably because they see no need for them, at least while so much scope exists for improvements based on the existing type of technology. A few people did comment on this question, and they were all convinced that the "high-technology" Information Technology systems are not needed in Zambia, at least for the foreseeable future. This conclusion was based on the feeling that it was not "appropriate" to Zambia's needs. It was pointed out that Zambian society will not, for the foreseeable future, support some parts of the technology, such as a national Videotex service, and that the infrastructure needed is generally absent at the moment. The general consensus was that computerisation of "first-generation" systems offers ample scope and challenge for Zambia at least for the next decade. The only exception to this conclusion was in the banking sector in Zambia, where the proliferation of banks in recent years has caused fierce competition between banks to win or retain customers. As a result, many of the banks plan to introduce sophisticated computer systems as a way to provide better services to their customers, in the hope of increasing their market share. (The banks have spent a lot of effort and money on computerisation already, but this has mainly affected

the work behind the counter, and has not so far affected the service to the customer. The work of computerising the basic accounts data which has taken place to date has laid the necessary foundation for the newer customer service systems, which are expected to be introduced shortly).

While, for the most part, Zambian computer users plan to continue their programme of basic computerisation, the demands for staff and high skill levels will continue to increase. Not only will the total numbers increase, but it seems that the levels and ranges of skills needed will also increase steadily. The movement towards distributed processing, with the introduction of telecommunications and varieties of local and central machines, will raise the levels of expertise needed. So will a drift from smaller to larger machines which seems likely to take place in future years, confirming the view that :

The demand for PC's in the long run for for most organisations is most likely to lead to a demand for more computing power resulting in a shift towards larger equipment. The author of this paper is in this regard of the persuasion that the PC is in many ways a Trojan horse (Shitima,1986: 167).

If many Zambian computer users do develop to the level of requiring larger computers than the microcomputer, then that will have important consequences for the impact which computerisation will have nationally, as well as demanding higher levels of computer training and expertise.

The general impression which emerges from the material in this

chapter is that there is almost boundless scope for the beneficial application of computers in Zambia, great enthusiasm resulting from the experience of results to date, and ambitious plans for expanded computer usage in the future. At the same time, the problems and constraints of staffing, expertise and financing seem set to increase rather than diminish as the penetration of computers in the existing users increases, and new users continue to join them. There is little scope for doubt that computerisation has great potential for beneficial application in Zambia, but there is also mounting evidence of future problems in managing, staffing and financing the constant expansion of computers.

## CHAPTER 4

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### COMPUTERS AND DEVELOPMENT

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#### Introduction

Having examined the details of computer acquisition, computer application and planning of computer usage in the future, we now turn our attention to the broader question of what this material means in terms of the effect of computerisation on national development. It is clear that computerisation has brought many advantages to the organisations using them in Zambia. It is also clear that there are existing and potential problems. The important question in this chapter will be the balance between advantages and disadvantages. The issue will also have to be considered at a broad national level, rather than just the level of advantage to the individual organisation. Computers have been suspected in the past of being basically inappropriate to the needs of developing countries. The main interest here will be to establish whether or not computerisation in Zambia has made or is making a net contribution to the development of the country. This examination will start by considering the opinions of the people interviewed on this issue, and will continue to a general analysis of the evidence from this survey.

#### Appropriateness of computers

Interviewees were asked whether they considered computers to be appropriate or inappropriate for a developing country such as

Zambia. The great majority (85 of 88 - 97%) replied that they considered computers appropriate. The majority was consistent across all categorisations except that the three who regarded computers as inappropriate were all expatriates and experts. The reasons for this view are considered later.

Among those regarding computers as appropriate there were some whose reply was unqualified, and others who said that computers were appropriate subject to certain conditions :

Table 27

Appropriateness of computers for Zambia

<u>Computers are:-</u>	<u>Expert</u>	<u>User</u>	<u>Total</u>
Inappropriate	3	0	3 (3%)
Appropriate <u>if used</u> properly	8	6	14 (16%)
Very appropriate	<u>42</u>	<u>29</u>	<u>71 (81%)</u>
Totals	53 (60%)	35 (40%)	88 (100%)

When respondents were asked if their computerisation programme has had, or was likely to have, any impact on Zambia at national level, the replies were :

Table 28

National impact of computerisation to date

<u>National Impact</u>	<u>-Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	<u>Total</u>
Better national administration	8	0	3	0	0	0	11(12%)
Greater product- ivity/efficiency	7	2	3	0	1	0	13(15%)
Potential for future	1	7	3	1	2	0	14(16%)
None	<u>2</u>	<u>0</u>	<u>17</u>	<u>13</u>	<u>15</u>	<u>3</u>	<u>50(57%)</u>
Totals	18	9	26	14	18	3	88(100%)

Most of the commercial sector users felt that their computer systems would have no impact at national level, although some parastatals are so central to national life that their operations must have a significant national effect. It must be remembered that many of these organisations are in the very early stages of computer usage, and would not have made sufficient progress with computerisation to have much impact. Furthermore, while individual companies might not perceive that their systems were having any effect, the cumulative effect of numerous systems in different companies could be substantial. However, the direct evidence available to us is that national impact of computerisation in the commercial sector is very limited to date.

Most of the Government users, on the other hand, saw their systems as having had a significant national effect already, and the educational sector, reasonably enough, saw its impact in the form of the potential for the future. While these results might be regarded as predictable, they also seem to show a high level of responsibility and thought in the responses.

As would be expected, the larger users were the only ones showing impact at national level: smaller user universally denied any such effect, although two did feel their systems had potential for national effect, because of the results achieved and the example this could provide for other Zambian users.

The final series of questions asked about the benefits and dangers of computerisation for Zambian society. The answers in this area can be cross-checked for consistency with earlier answers about actual experiences and plans for the future.

Interviewees were asked in the first place about the expected advantages for Zambian society of computerisation in the future.

Table 29

Expected advantages for Zambian Society of future computerisation analysed by sector

<u>Advantage</u>	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	<u>Total</u>
Greater national efficiency/ productivity	11	5	20	11	11	2	60(35%)
Essential to national development	7	4	10	8	5	1	35(20%)
Better management/ administration	5	2	9	5	8	2	31(18%)
Necessary to maintain competitive position	2	5	5	5	7	0	24(14%)
Better service	3	0	3	0	3	0	9(5%)
Provide skills needed	1	2	2	2	0	0	7(4%)
Save costs	0	1	2	2	1	0	6(3%)
Don't know	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1(1%)</u>
Totals	29	19	52	33	3	5	173(100%)
Number of interviews -	18	9	26	14	18	3	88

When these responses are compared with those relating to the actual experience of computers (Tables 19 and 20), a very interesting fact emerges. Whereas there was some uncertainty as

to central effect of computers in Zambia in the earlier tables, there is none here. Over two-thirds of interviewees identified greater national efficiency and productivity as the main benefit, and a further third mentioned "better management/administration" as a key benefit. This provides support for the interpretation in Chapter 3 that the central effect of computerisation in Zambia is to improve the general levels of efficiency and productivity at both national and company levels.

This question was matched with another which asked about the main disadvantages or dangers for Zambian society of computerisation.

Table 30

Expected dangers to Zambian Society of future computerisation analysed by sector.

<u>Disadvantage/ Dangers.</u>	<u>Number of mentions by -</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	
Mistakes in computer purchase	6	4	12	6	3	1	32(25%)
Creation of unemployment	8	2	7	4	4	0	25(20%)
Inability to adapt	3	1	3	4	2	0	13(10%)
Waste of computer resources	1	1	1	1	4	1	9(7%)
Computer fraud	1	0	6	1	1	0	9(7%)
Over-reliance on computers	3	2	1	1	2	0	9(7%)
Poor support	0	0	1	2	2	0	5(4%)
Collapse if aid pulled out	1	0	0	0	1	1	3(2%)
Other dangers	1	0	2	1	0	0	3(2%)
No dangers/ disadvantages	<u>3</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>1</u>	<u>20(16%)</u>
Totals	27	12	38	23	25	3	128(100%)
Number of interviews -	18	9	26	14	18	3	88

Comparing this with the list of national advantages in the previous table, it is notable that :

(a) The numbers of advantages mentioned far exceeds the number of disadvantages,

(b) No single interviewee said that computerisation was without advantage, whereas 18 people - 20% of the total - saw no national disadvantage, and

(c) Many of the stated disadvantages are not in themselves arguments against using computers ( for example, mistakes in computer purchase, or waste of computer resources), but rather issues involved in ensuring the effective application of computers in Zambian conditions.

It is interesting to compare the perceptions of Zambians and expatriates in relation to the dangers to Zambia society :

Table 31

Expected dangers to Zambian Society from future computerisation  
analysed by Zambian/expatriate

<u>Disadvantage/ Danger.</u>	<u>Number of mentions by - Zambians</u>	<u>Expatriates</u>	<u>Total</u>
Mistakes in computer purchase	25	7	32 (25%)
Creation of unemployment	23	2	25 (20%)
Inability to adapt	13	0	13 (10%)
Waste of computer resources	7	2	9 (7%)
Computer fraud	7	2	9 (7%)
Over-reliance on computers	6	3	9 (7%)
Poor support	3	2	5 (4%)
Collapse if aid pulled out	0	3	3 (2%)
Other dangers	2	1	3 (2%)
No dangers/disadvantages	<u>14</u>	<u>6</u>	<u>20 (16%)</u>
Totals	100	2	128 (100%)
Number of interviewees -	67	21	88

It seems that Zambian and expatriates tend to agree on many of the possible disadvantages except that Zambians are far more pessimistic than expatriates on the issues of creation of unemployment and inability to adapt, and expatriates were alone in worrying about the danger of collapse if aid were withdrawn. There is no significant difference between the views of experts and users on this question.

Finally, interviewees were asked for opinions on what Government action, if any, should be taken in relation to the use of computers in Zambia. The results were as follows :

Table 32

Steps which should be taken by government in relation to  
computers in Zambia

<u>Steps which should be taken.</u>	<u>Number of mentions by-</u>						<u>Total</u>
	<u>Govt.</u>	<u>Educ.</u>	<u>Parastl.</u>	<u>Pvt-Z</u>	<u>Pvt-F</u>	<u>Other</u>	
Control all computer purchases.	5	3	11	3	7	0	29(27%)
Control <u>Govt.</u> purchases only.	0	0	0	1	1	1	3(3%)
Support national training programme	3	3	5	4	5	0	20(19%)
Coordinate national computer policy	0	2	5	5	2	1	15(14%)
Develop <u>Zambian</u> computer industry	2	0	3	2	2	0	9(8%)
Introduce privacy legislation	1	1	2	0	0	0	4(4%)
No action	<u>8</u>	<u>2</u>	<u>5</u>	<u>4</u>	<u>5</u>	<u>2</u>	<u>26(25%)</u>
Totals	19	11	31	19	22	4	106(100%)
Number of interviewees	18	9	26	14	18	3	88

Almost 30% of the interviewees (26 of 88) saw no need for any action on the part of the Government - indeed many were strongly opposed to any interference by Government in the issue. But most people saw a need for some Government involvement, in ensuring that proper training provision exists in the country, in controlling computer purchases to avoid mistakes and waste, in taking steps to develop a native computer industry and in producing a national policy for computer development. The four mentions of a need for privacy legislation are surprising in view of the lack of mention of invasion of privacy as a potential

disadvantage/danger in the previous section. This may be an indication that the people involved were aware of developments in this direction in many developed countries, rather than believing it to be a pressing problem in Zambia.

#### Discussion.

The small number of people who regarded computers as inappropriate for Zambian conditions did so on the grounds of lack of infrastructure in Zambia to support computer users, and possible lack of resources to undertake computerisation effectively. Expatriates are presumably especially conscious of the large range of computer support services which now exist in developed countries, and are largely lacking in Zambia as yet. There was no suggestion that computers were useless in Zambian conditions. "Appropriateness" is, of course, a wide concept and is open to a number of different interpretations. Most of the people responding to the question put here used appropriate in the sense of "needed" or "useful". There is no question of the utility of a computer in Zambia - everybody agreed that a computer would bring benefits. A more rigorous interpretation of the term would include the question of balance between cost and benefit. This was a balance which concerned a small number of the interviewees. Acquiring a computer and producing some results from it are relatively easy steps. But exploiting computer technology fully requires a great deal of effort, commitment and expertise, without which a computer could

prove to be a very expensive way of producing minor results. It is important to bear in mind, when considering the question of "appropriateness", that it should include some reference to the capabilities of the users to handle it. The experience in Zambia has been encouraging in this respect, but the capability of Zambian organisations to handle the technology will be tested more severely as the usage of computers grows.

The misgivings of those who regarded computer as appropriate provided that certain conditions were met are effectively explained by the responses to the later questions about national disadvantages or dangers and about steps which Government should take. The most common misgivings are concerned with the dangers of mistakes in computer purchase, and the resulting waste of resources. A lot of Zambian managers are very conscious of the mistakes which have been made in the past, and are anxious to avoid similar mistakes in the future.

A second common ground for concern, closely connected with the first, derives from the difficulties which many Zambian organisations are experiencing with machine maintenance. The situation has deteriorated significantly over the years. In part this may be due to economic and political developments (for example, developments in relations with South Africa over recent years have cut off access to maintenance expertise and spares from that country, and introduced longer delays and greater costs

in getting these facilities from the US or Europe). But for the most part, computer users blame the proliferation which has taken place in the last few years in the numbers of computer suppliers and models on the Zambian market. The market in Zambia is not large enough to justify the maintenance of a large support facility by every supplier, and many purchasers of computers in Zambia have found to their cost that virtually no after-sales service is available from some suppliers.

This is behind the common recommendation that government should control computer purchases - a recommendation which would surprise an observer from the developed world. This is based on practical experience in the Zambian conditions. Many people feel that the Computer Utilisation Committee prevented many serious mistakes and did something to ensure that the computers acquired were reasonably suitable for the requirements. The Committee also had a deliberate policy of restricting the suppliers in Zambia to a small number, who could and would maintain a proper support service here. The Committee lost its control over non-government purchases, and its power to limit the number of suppliers in Zambia, as a result of changes in currency regulations in 1985 which eased restrictions on computer expenditures. It is still in existence, but is effectively limited to the review of government acquisitions, and has no power over the number of suppliers in Zambia. In view of the dramatic increase in the numbers of computers being installed in Zambia in recent years, one wonders

whether the committee could, in any event, cope with the task of scrutinising all proposals for computer acquisition.

Some of the power has passed from the Computer Utilisation Committee to the Foreign Exchange Management Committee (FEMAC) which now controls allocation of foreign exchange. The FEMAC has no special interest in or knowledge of computers, and has no mandate to treat applications for foreign exchange for computer purchases differently from any others. Many of the people who recommended that the Government should develop the Zambian computer industry had in mind that it should be national policy to accord a high priority to computer expenditures, in view of their potential for national development, and to give some form of preferential treatment to applications for computers. In view of the demands on the funds available to this Committee, it would be necessary to have some very convincing evidence of the merits of computers before such a move were likely.

The high number of responses saying that there has been no national impact is due largely to the early stage of computerisation present in most cases. As pointed out earlier, some three-quarters of these organisation have installed their first computer in the last 10 years, and the penetration of computerisation is still very slight. Where an impact was claimed, it generally took the form of better national administration, that is, a marked improvement in the administration, planning and management of the nation, or greater

productivity on the part of the work- force.

Both effects were prevalent in the government and parastatal sectors and largely absent elsewhere. As pointed out earlier, these are the two sectors with a substantial and long-established computerisation programme, as well as being the ones most likely to have a national influence.

Where a national impact was claimed, interviewees were asked to give some practical examples of how it was achieved. In every case, they were able to point to systems which obviously did have the potential for major national benefit. For example, there were systems which for the first time provided comprehensive, accurate and up-to-date information on national agricultural production, which now permit effective policy-making for pricing, transport and storage. Other systems guide decisions on banking and foreign exchange policy. Demographic data provides a basis for social and physical planning. There is no doubt, that in each of these cases, there was a serious waste of national resources before computerisation, as a result of the inability to plan or manage operations under the conditions then prevailing. It was equally certain that the introduction of computers brought substantial improvement.

The other main impact - increased productivity - was again investigated in some detail. As would be expected from the

earlier material, this generally took the form of increased or improved output, rather than any reduction in the staffing. It is usually a feature of the larger systems which are common in government and parastatal sectors. Before computerisation, these systems suffered seriously from a lack of management and organisation. While these types of system occur in all sectors, they are particularly characteristic of the government sector, and were best described by two senior managers in a government Ministry in the following terms. In this Ministry there were huge paper filing systems in which cases were frequently lost, long delays in producing outputs (sometimes weeks or months) and very high error rates. In some cases, the systems were on the brink of collapse before computerisation. In these cases there were also typically large numbers of clerks, whose presence did nothing to solve the problems. The common experience was that the introduction of computers solved the problems, and this underlies the enthusiasm for further computerisation.

The national benefits expected from computerisation again reflect these experiences, in the high incidence of claims for "Greater national efficiency/productivity" and "better managed companies/better administration". These are directly grounded in the knowledge of the difficulties and inefficiencies which have beset all enterprises in Zambia in recent years, and in the belief that computers will help to avoid waste and increase national levels of production. Many interviewees saw computers as

being "essential to national development", in a wider sense than that of increasing economic production - namely, that of being central to all efforts in the future to develop the country. Others saw the issue in relation to Zambia's position in the international market and believed that Zambia cannot hope to compete on this market unless it uses methods and procedures which are as good as those of its competitors, including widespread computerisation. A small number expressed the view that computerisation was important to Zambia because it would in effect provide the skills needed in manufacturing. While this view was not numerically significant in the survey, it represents a point which seems to deserve further consideration because of its potential importance for Zambian development.

This view is based on the fact that many production processes in industry to-day require very high levels of precision in process control and quality control. Interviewees were able to cite cases where products had ceased to be produced locally, and were now imported, because the levels of skill and expertise needed to operate sophisticated equipment could not be maintained. In one example cited, a pharmaceutical manufacturing industry in Zambia in the 1960's used to make high-quality toiletries which supplied the home market and were exported to all countries in the region. The highly-skilled staff needed to operate this process left Zambia in the 1970's, as a result of which the goods can no longer be made here and are imported. The

same products could now be produced by a totally automated, computer-controlled production line.

As these interviewees point out, these skills can and will increasingly be incorporated into automatic plant using computer technology in the future. They feel that the natural advantages of developing countries - plentiful and cheap labour, abundant natural resources, low energy costs - can effectively be brought to bear in partnership with this new technology to produce high-quality products in Zambia and other developing countries in the future.

The same effect has been noted before.

microelectronic systems . . . require relatively low skills and decentralised operations are possible. The fact that micro-electronics replaces many intricate shop-floor skills could be an advantage to developing countries which have not yet built up such skills (UNIDO Secretariat, 1985:3).

It was interesting to find practical examples of this effect in the actual experience of Zambia.

The discussion of the potential advantages of computers to the development of developing countries produced some interesting examples of other effects which are peculiar to those countries. Many people expressed the view that computers are potentially more beneficial to developing than to developed countries, because of their capacity to solve some of the particular problems which constantly obstruct attempts at improvement in these countries. One example, mentioned repeatedly, was that of

the detection of fraud, corruption, pilferage and general negligence among the work-force. The clerical systems which precede computerisation are open to abuse and are too limited and unreliable to assist in preventing malpractice. But computer systems which can supply detailed, up- to- date information could serve to detect and prevent these practices, and this could make a major contribution to national development. (See "Fraud detected by Computer", Computers in Africa, September/October 1987, p. 9). It is true that computer systems introduce new threats, such as computer fraud and computer virus attack, but these are high-technology crimes, requiring levels of knowledge and skill which very few people possess, even in the developed countries. It would be dangerous to ignore these threats, but it is possible to take precautions against them. The search for security in systems requires constant vigilance, whatever technology is used. It is a matter of constantly searching for better methods.

Another interesting example of computers' special advantages, mentioned in relation to some Government systems, was that of solving some problems arising from regional or tribal suspicions. Despite Zambia's success in avoiding inter-tribal disputes, some suspicion of tribal bias in administration remains. When systems were administered entirely by clerical staff, official decisions were sometimes suspected in practice of being guided by tribal bias or favouritism, and the subjects of these administrative

decisions often complained and appealed against the decisions. When the same processes were transferred to computer, the suspicions and the complaints effectively ceased. It seems that the people involved, and these were in many cases people living in remote and traditional centres, were happy to accept that a system administered by a computer was free of any human bias. The faith in computers which this indicates is, perhaps, an example of the "over-reliance" which has been noted elsewhere in this study, but it is interesting to note that computers, far from encountering any cultural resistance from the population, are in some ways more acceptable than the traditional, human administration.

The list of expected dangers or disadvantages of widespread computerisation in Zambia again shows the importance attached to avoiding mistakes in computer acquisition. These need no further comment here. The next most common fear expressed was in relation to the danger of unemployment resulting from computerisation. While the practical experience to date has not involved any large scale unemployment, there is a widespread knowledge of the fears and problems of the developed world in this connection, and a corresponding fear of what the future may hold. In a minority of cases, this view was based on the specific fact that computerisation in Zambia is still at a low level, and that the experience to date may be no guide to the results of extensive computerisation.

A number of interviewees expressed the fear that the local work- force might prove unable to adapt to the complexity and rapid change of computer technology. In some ways, this is contradicted by the practical experience of many computer users in Zambia, who have found that workers adapt very readily and effectively to computer work. But it is also an expression of the fact, remarked on earlier, that computerisation tends to demand higher levels of ability and knowledge on the part of the work force, and may well reduce the scope and demand for unskilled and semi- skilled workers. In these cases, unless a significant adaptation can be made, there is a real danger of redundancy or under- employment resulting from computerisation.

Computer fraud was mentioned as another possible danger of computerisation. This was based on the knowledge that it is a major issue in the developed world, and is receiving considerable publicity there. As far as is known, no case of computer fraud has yet occurred in Zambia, but the feeling is that it is inevitable in the future as the use of computers in financial systems increases. There is also some concern that the Zambian legal system has apparently made no attempt to prepare for this eventuality, and that there may be serious problems when it does come.

Over- reliance on computers was another potential problem

mentioned. This derives from the common experience that people using computer systems, impressed by the power and accuracy of the machines, come to regard them as infallible. This attitude can lead to acceptance of wrong information (since computers can only deal with the information they have been given), and/or the expectation that no human effort is needed once the computer is installed. While this is, in a way, a compliment to the facilities which computers have provided, it is a danger in the early stages of computerisation, but can be minimised by training and increased experience.

Finally, a small number of people, all expatriates, are concerned about the danger of computer systems collapsing if and when the support of aid agencies is withdrawn. These agencies do not welcome a long-standing commitment to any particular project - they operate on the basis of limited-term support for selected operations. At the end of that term, the operation is expected to be self-sustaining. In these circumstances, some aid workers are concerned about the danger of creating a degree of dependence on computer facilities which may not be supportable once the aid project finishes, and might cause serious problems in the systems established. One can only hope that the authorities involved, mainly in the government and education sectors, are alive to this problem and will be able to take steps to maintain their computer systems into the future.

In fact, some of the people working in offices which are the

recipients of aid-sponsored computers were critical of the practice of these agencies of installing computers but not providing the necessary training and educational facilities. The aid agencies often appear to believe that this need is provided for as long as one or two expatriates are available. But even where expatriate staff were provided along with the computers, they generally had their own work to do and deadlines to meet, were usually not trained in teaching computer skills, and sometimes had no counterparts to teach in any event. These types of arrangement seem to invite the danger of collapse when an aid agency retires from a project, whether or not the office involved could keep the equipment in operation from its own resources.

The list of perceived dangers or disadvantages is as interesting for those factors which it omits as for the ones it contains. There is, for example, no mention of any danger to Zambian culture arising from the rapid introduction of computerisation. Admittedly, this study was conducted in a business framework, and the issues of cultural impact would not be of prime concern to this group. It could also be argued that the subjects of this survey were, by definition, members of the modern sector of society, and therefore of an elite which might be pre-disposed to a favourable attitude to computers. However, if the large numbers of lower-level clerical staff who have been required to work with computer systems, or the many Zambians

across society who have been exposed to their output, found any cultural resistance to the concept, one would have expected some mention of that to emerge in the study. The responses to this survey show a well-informed and thoughtful attitude, and it seems that the issue of socio-cultural impact would have emerged if it were seen as a potential problem. In fact, the evidence suggests that computers are readily accepted in Zambian society as a whole.

Similarly, there was no reference to any danger to society arising from the potential of computer systems for population surveillance and control. Many of the interviewees must have encountered some references to this possibility in the international press, and the fact that it does not appear as a threat in Zambia may be as much a compliment to the country's political stability as to anything else. At the same time, it may be a reflection of the relatively early stage of computer application in Zambia, and the dangers of threats to privacy and freedom may again be one of those issues which will arise only later in the continued expansion of computerisation.

While computer fraud was identified as a future threat, there was no mention of the other current issue which is capturing much attention in the computer press - the "computer virus". This is despite the fact that :

In the Third World, individual computer's lack of security, the pirating of expensive programs and the tendency of users to share machinery all leave computers open to attack

(Arthur, 1989:81).

On the question of what steps, if any, the Zambian Government should take in relation to computers, the most common response - control purchases of computers and/or limit the number of suppliers in Zambia - has already been noted and discussed. Almost as frequent was the recommendation that the Government should support a national campaign of computer training. In the first place this meant a programme of third-level courses sufficient to provide the qualified computer staff at all levels which are necessary to man the computer systems. At present, the national provision for this purpose is totally inadequate.

But the recommendation also had a wider sense, in that many people consider it important that all school students, or as many as possible, become computer literate in school, because they will need this knowledge in their future lives. Many people in Zambia are anxious to see the introduction of computer studies on school curricula as soon as possible, backed up with the necessary trained teachers and equipment. As well as the future additions to the labour force, there are hundreds of thousands of Zambians already working in the formal sector who should also be trained to cope with an increasingly computerised society. The scale of the training requirement is massive, and the manner in which it is addressed may have major implications for the structure of Zambian society in the future. Writing about a developed society, one authority said :

the need for 'computer literacy' in society is a priority . . . because the young, the confident, the skilled and the more intelligent populace may be better equipped to 'survive' or exploit microcomputing, a dangerous generation gap . . . could result (Earl,1978:365).

Another recommendation was for the Government to establish a co-ordinated computer policy. Among the advantages expected from this step would be that of avoiding waste of resources through duplication of systems or equipment, providing a basis for efficient planning of computer development by computer managers (including knowledge of the future development of the Zambian telecommunications system, on which computer telecommunication will depend), and laying the ground for the future integration of computer systems and files. As the scale of computer application increases in any administrative system, it becomes increasingly necessary to integrate systems and files. To achieve the full benefits of computerisation in government, it should be possible for ministries using the same data to share or exchange it. To take just one example, details of national imports and exports would be of interest to the Ministries of Finance and Commerce, Industry and Foreign Trade, the National Council for Development Planning, the Customs and Excise, the Central Statistics Office and the Bank of Zambia. Sharing this information between these authorities would in the first instance save considerable expense, and help to streamline procedures and reduce paperwork for importers and exporters. Sharing the same data files would also avoid confusion arising from the use of different data,

would mean that each user organisation had immediate access to any changes made, would avoid the problems of transporting data and files from one office to another, and would reduce or eliminate the problems of constant loss of files and data. In Zambian circumstances, such developments could make major contributions to national development.

But this shared access is possible only if the computer systems involved are compatible with each other, and this in turn requires careful planning. In this context "compatible" means that the various computers and peripherals in a system can all share and exchange data. It may mean that data is exchanged directly between computers, or that it is transported between computers on magnetic media like tapes or discs. But it does require that computers accept the data or programs generated on other computers.

This facility is not one that happens automatically in computer systems, nor even one which is easy to plan or achieve. Different computers operate to a multitude of different standards, sometimes deliberately so in order to gain commercial advantage. There are some trends in the international computer market towards the emergence of international standards, but there is a long way to go before compatibility between different computers could be assumed. In the meantime, careful planning and control in computer acquisition is essential if the possibility of integrating systems is not to be totally lost.

The aid agencies came in for some criticism in this connection, because they often provide computers (on the basis of external decisions and selection, as we saw earlier), without any regard to the broader future of computerisation in the Ministry or other organisation involved. This practice could have the effect of making future attempts at integrated computing more difficult, more expensive or impossible.

Finally, a number of people recommended that the Zambian Government should take positive steps to establish an indigenous computer industry in Zambia. Cases were cited of neighbouring countries which had successfully established a local computer industry (See, for example, "Zimbabwe to repair its own (computer) equipment", Computers in Africa Vol. 3 No. 1 p. 10, or "Local (computer) assembly in Kenya", Computers in Africa, September/October 1987, p. 9).

In many developing countries there are now companies producing local computer packages (and in some cases selling them to Zambia). The importance of this was seen as being far greater than that of simply acquiring another industry for Zambia. It was regarded as central to the whole question of Zambia's dependence on outside resources to supply its computer needs, and of the amount and rate of progress which Zambia will be able to make in national computerisation.

A local software industry, in particular, would require little

investment, should provide systems which are designed for local requirements, would reduce the need for foreign exchange which is a serious problem for many users and would mean that advice and assistance would be available locally. This could have a major beneficial effect on the development of the Zambian computer industry. The question of establishing native computer software industries in developing countries was considered by one expert who came to the conclusion that countries :

that must rely on outside expertise for their technicians and formal education and training (e.g. Syria, Zambia, Tanzania) . . . are not yet ready to produce software for export since there is not at present substantial software development and accumulated technical software know-how even for domestic markets. However, appropriate government policy may help build this up over time (Schware, 1987:1254).

As we saw earlier, Zambia is no longer in a position of reliance on outside sources for its computer expertise. The level of application of technology in the country is not very advanced, but that should not be a major drawback in catering for domestic or regional requirements, for reasons considered earlier. In fact, a number of centres in Zambia are preparing to enter the software production business both domestically and regionally.

Another desirable development, mentioned by several people, was that of establishing a proper professional body for the computer profession in Zambia, to ensure the maintenance of standards in the profession, advise Government and other bodies on policy issues, to press for national policies and legislation which would assist the computer industry, and to assist with

continuing education for its members. The Computer Society of Zambia is already in existence for some time, but it has not yet begun to assume a major role in the development of the Zambian computer industry. The model of the British Computer Society, or of other national computer societies, is available to show what contribution this could make to the development of the Zambian computer industry. It is understood that the Society is in fact engaged in planning a new and more dynamic role in the future.

### Conclusions

The favourable attitude to computers and their contribution to national development which marked the earlier sections has continued into the present one. There is an overwhelming conviction that computers are very important, if not absolutely essential, to the development of the country.

At the same time, there is an appreciation that extensive computerisation in the future will pose certain dangers, and there is a thoughtful concern about these dangers. Some of these concerns come directly from experience in Zambia, for example, that of the dangers of wrong decisions in computer acquisition. Others relate to effects which have not yet been seen in Zambia, such as computer fraud or wide-scale unemployment. The interviewees who mentioned these latter effects are aware that they have taken place in the developed countries, and are assuming that they will follow here. It is difficult to know how

well-founded these assumptions are, or whether computerisation will have different effects in the different societies of developing countries (as, indeed, they have been seen to have in Zambia to date).

The issues involved in considering the role of computers in development have been put in the following way :

In utilising the computer, is Africa enhancing its capacity for development? Is it facilitating the modernisation of management, planning , analysis and administration? Or is Africa adopting instead a technology which is inappropriate to its current needs, expensive in relation to other priorities, detrimental to job creation, and vulnerable to external exploitation? (Mazrui,1977:279).

Based on the findings here, the answer would have to be that Africa (or, at least, Zambia) is enhancing its capacity for development and is very much facilitating the modernisation of management and administration. If the direct evidence of this was not available when Mazrui was writing (1977), it is available to-day in abundance. On the question of whether or not the technology is appropriate there again seems to be ample evidence that it is appropriate - far more appropriate than it was when Mazrui was writing, because of technological developments in the past 10 years which have already been described. The dangers of unemployment and of increasing the differential between rich and poor remain, and because of their importance they are examined in a separate section in Chapter 5.

It is not entirely clear what Mazrui means by "exploitation"

in this connection. If it is intended to be synonymous with "dependence", then the issues involved will be discussed in detail in Chapter 5. If exploitation is taken to represent the danger that unscrupulous suppliers might try to "dump" unsuitable or obsolete computers in developing countries like Zambia, then this again stresses the importance of Zambia's taking steps to develop its expertise and protect its own interests.

But if "exploitation" was meant to refer to the specific and deliberate exploitation of a developing country by computer suppliers for economic, political or other ends, then it must be remarked that trends in the international computer market are reducing this risk. It was pointed out by a number of people during the survey that the world supply of computers has also changed radically in the past 10 to 15 years. The sources of computer equipment and systems have proliferated in this period. In particular, a number of countries in the Far East are competing very effectively in the computer industry with the original source countries in Europe and North America, and they are being joined by increasing numbers of developing countries who are supplying components, software and complete systems.

It is becoming progressively less feasible for any country or power bloc to use the supply of computers as a weapon to exploit other countries in its economic or political interests. This discussion is taken to refer to the administrative applications of computers - the access to "leading-edge" technologies of the type used in weapon systems is a different issue. It is important

to remember that the types of computer technology needed by developing countries are relatively common and "low-technology" at this stage, and are freely available from a wide variety of sources on the international market. Some interviewees suggested that it might be advisable to deliberately diversify Zambia's computer sourcing at this stage, to ensure access to the best available value and avoid over-reliance on any one source. To do this successfully would, however, require expert guidance in computer policy and selection, and this again emphasises the importance of developing local computer expertise and experience. The fact is inescapable that the degree of dependence caused by computer usage is linked directly to the degree of effort made to develop local expertise.

However, the nub of the question posed by Mazrui lies in the balance between the positive effects of computerisation and the negative effects. It is very clear that computers can bring some benefits to a country like Zambia, and it is equally clear that there are some inevitable disadvantages and dangers. In effect, the question is whether the beneficial effects of modernisation brought by computerisation are being bought at too high a price in terms of dependence, employment effects and so on.

The practical experience of Zambia to date would weigh heavily in favour of the conclusion that the modernisation effects are real and substantial, while there is no evidence (at least to date) of the adverse effects hypothesised. It could of course be

argued that the adverse effects, such as increasing intellectual dependence on alien cultures, may be too subtle to be seen by the practitioners in the field. It might also be that these dangers exist only in the minds of theoreticians. But if we are content to base our findings on the empirical evidence collected in this survey, then we would have to answer "yes" to the first part of Mazrui's question in relation to the experience of Zambia, and "no" to the second part. At the same time, we would have to accept that there are grounds for believing that future developments may hold more danger of adverse effects than the country has seen to date.

Whereas some of Zambia's neighbours (especially Tanzania) have adopted a cautious approach to computerisation, Zambia has adopted the technology early and without any visible restraint. Various explanations were offered for this situation. The importance of the mining industry in the Zambian economy, and the fact that the mining companies, with their early multi-national connections, provided early and successful models for computer utilisation, was perhaps one influence in this direction. The fact that "Zambia has one of the highest levels of urbanisation in the (African) continent " (Woods,1985:186) was also suggested as a reason for the ready adoption of computers in Zambia. Whatever the reasons, Zambia as a country has never attempted to resist the advent of computers. On the contrary, the country has adopted them enthusiastically at every opportunity which

presented itself. The country has already invested very substantial resources in installing the technology and developing the associated expertise. This investment is generally seen as a national asset which should help to ensure that Zambia will adopt and exploit the technology. At the same time, there is almost universal acceptance that Zambia must adopt and exploit the technology in order to achieve desirable national development.

CHAPTER 5  
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CONCLUSIONS  
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Introduction

The central research question posed in this study was :

"What has been the practical experience in Zambia of computerisation, and in what ways has computerisation contributed to or detracted from the development of the country?".

This chapter will attempt to answer this question, based on the evidence collected in the survey.

At the beginning of this paper it was suggested that the patterns of computer acquisition and usage in Zambia might be different from those established in developing countries. This has proven to be the case. In the sources of decisions to computerise, in the methods of computer selection, in the types of systems computerised and in the results achieved by applying computers, the practice in Zambia differs significantly from that in the West. Zambia is not following, at a distance, the example of the developed countries in the application of computers. It is using computers in a way which relates to the particular circumstances obtaining in the country.

In these circumstances, the criteria and standards applied in the developed countries to computer application are unsuitable to a country such as Zambia, and perhaps even misleading. We have seen that some commentators, applying the criteria developed in

the West, have assumed that computer systems in Africa must be "clerical-replacement" systems, and have concluded that the systems were failing because they were not replacing clerical staff. In fact, computers are not generally intended or used for clerical staff replacement in Zambia, and a conclusion based on that assumption would be wrong. We must be careful to base our conclusions on the particular and actual situation with which we are concerned.

#### Experience of computerisation to date

The first and most striking finding from the study must be that the Zambian experience has been, for the most part, very satisfactory and very positive. There is frank admission that there have been problems and mistakes, but on balance the results have been very encouraging. The degree of enthusiasm for computers is extremely high, and the expectations of the potential contribution of computers in the future extremely optimistic. Unless we are prepared to believe that the people taking part in this survey were deliberately or unintentionally falsifying the position, they have gained substantial benefit from applying computers in Zambia, and see scope for further development. The material collected in this survey testifies strongly to the fact that computer systems in Zambia have solved serious organisational problems, have enabled large systems to function which might otherwise have collapsed, have provided

managers for the first time with the information which is essential to run any organisation and have permitted all sorts of improvements in services and systems. The introduction of computer systems has facilitated, or permitted for the first time, the application of modern management methods to Zambian enterprises. The resultant rationalisation and improvement of administrative and productive systems promises to produce a substantial improvement in national levels of productivity and efficiency. The results achieved to date have been sufficiently impressive to convince almost all of the people involved that computers are essential to Zambian development in the future.

These effects can best be summarised by saying that computer systems in Zambia have generally functioned as a catalytic agent, helping to transform the general standards of efficiency and productivity in their organisations. This finding is extremely significant in any attempt to assess the contribution of computers to development. In attempting to follow the modernisation path to development, developing countries have generally been frustrated by the organisational and infrastructural requirements which are demanded by modern technology and management systems. The consequences of underdevelopment include low levels of education and skills, low levels of productivity, lack of management skills and experience and lack of infrastructure. Any attempt to secure development by introducing modern technology or systems has tended to be

obstructed by this environment. If the application of computers can act to remedy the deficiencies of skills, disciplines and control, then computers have a great potential to facilitate and accelerate the whole process of modernisation in developing countries. For this reason, the results from this survey would support the view that :

We are now in a vicious circle of cheap labour, poor purchasing power, reduced production, unemployment, cheap labour and so on. The microprocessor will have a star role to play in a "new cycle" of consumption, more production, more employment, increasing productivity generating information, streamlining operations (Pisharody, quoted in Natarajan, 1984:42).

Apart from the results from the survey, we should realise that the question of computers' potential for development has also been addressed in a very practical way on many occasions in Zambia, when the various supervisory committees have considered applications for approval for proposed computer acquisition. These committees, especially the FEMAC, have no reason to favour computers. They are concerned with satisfying themselves of the case for investment in one form or another, and their approval should signal their satisfaction that the proposed investment is justified, and is justified in comparison with alternative investments. The scale of investment in computers in Zambia to date must represent solid proof of the advantages to be gained, at least at the level of individual organisations.

But the perspective of the individual organisation and the broad national interest are not necessarily the same thing. If a

lot of individual organisations in a given country benefit from installing computers, then some general kind of gain is presumably being made. But even if computers bring substantial benefit at the level of the individual concern, there is still the possibility of serious disadvantages at the national level. The situation is summarised in the following quotation :

There is an increasing recognition that microelectronics and Information Technology could have both adverse implications and potentials for development. Possible adverse implications extend to employment, comparative advantage and social effects; the potentials lie in new industrial opportunities and employment, increase in productivity over a wide range of economic activities, and innovations which can improve the quality of life (UNIDO Secretariat, 1985:1).

#### Employment effects

The direct experience in Zambia to date has been that computers have caused little or no unemployment. The main reasons proposed for this state of affairs are that computers are not installed in Zambia with the intention of reducing costs or staff numbers, that the practical circumstances in Zambia, especially the low wage levels, minimise the need for staff reductions, even where staff numbers could be reduced, and that the political climate discourages staff reduction.

On the other hand, it has been emphasised many times that computer application is generally in the very early stages in Zambia. As the penetration of computers increases in future years, it seems unlikely that job losses, direct or indirect, can

be avoided. The numbers of new staff needed to operate the computer systems are very unlikely to offset the losses. Furthermore, the Zambian economy is not in good shape to absorb displaced staff at the present, because of the tendency for formal sector employment to diminish.

### Competitive Position

The question of impact on employment is inextricably linked with that of each country's competitive position in world markets. The very existence of a modern sector may mean that very little real choice exists. In order to maintain a modern sector, some imperatives have to be observed - the modern sector in every country exists in a competitive relationship with the modern sector in other countries. As one writer put it in relation to developed countries :

European industries face a stark choice - adopt new technologies and lose some jobs, or fail to remain competitive and lose most or all of your jobs (Sadler,1980:295).

This same choice faces all countries in the world, since all countries in the modern economy are in some degree in competition for international markets. The available data in relation to the Zambian experience supports the position that to banish the computer from Zambia would do nothing to help the country, and would deny it the possibility of major benefits and development. Effective computerisation could improve a country's competitive position and productivity, and increase national prosperity,

which would help to offset any direct job losses caused by computerisation in the first place.

The situation is further complicated by the issue of what global effects computer technology will have on industry location. Some people interviewed were optimistic that computer technology will allow new sophisticated industries to be established in countries like Zambia, and will improve the Zambia balance of payments situation. Some international experts have expressed the contrary view, that computer technology will have the effect of repatriating some industries back to the metropolitan countries. The former view is based on the fact that computer systems can substitute for advanced skills in manufacturing, and overcome the developing country's lack of these skills. The latter view is based on the fact that computer-based manufacturing systems require very little labour, and this will help to overcome the developed country's high labour costs.

The range of this argument is beyond the scope of this enquiry: we must confine ourselves to the experience of Zambia. This country has had the experience of losing industries through the lack of special skills - a lack which can now be remedied by computers. Zambia has not benefited from the transfer of any high-labour-content industries from the developed world, as some of the Newly Industrialised Countries (NIC's) have, for example, in the case of electronic assembly operations. Zambia has no

large manufacturing plants, such as car plants, which might suffer serious job losses through the introduction of automatic process control or robotics.

The Zambian experience can be summarised, then, by saying that little or no job losses have occurred to date; that the incidence of future job loss may be higher, but the effects should be limited by the special economic and social circumstances in Zambia; and that the Zambian experience and situation would suggest that the country will stand to gain on balance from the impact of computers on industrial production methods and location. This of course assumes that Zambia is successful in exploiting the advantages of the technology - a point to which we will return later.

#### Effects on social stratification

There is no doubt that the introduction of computers will, increasingly, call for higher education and skill levels on the part of the labour force. This is not simply a question of needing large numbers of trained computer managers, systems analysts, programmers, operators, data entry staff, and the specialised support jobs such as maintenance engineer and systems programmer. The need for higher qualifications extends to all staff in an organisation who have any contact with the computer systems, as managers, users of the data or providers of the data.

It even extends, in the view of some contributors to this

survey, to the need to include "computer literacy" in the national schools curricula, down to primary school level if possible. If it is accepted that computers will increasingly become a basic tool of commerce industry and administration, then it follows that an appreciation of computers becomes a basic requirement of full participation in society, on a par with basic literacy and numeracy.

These demands will be added to existing demands for qualified staff, and will serve to increase the demand for already scarce resources. At the same time, the widespread application of computers will tend to reduce the demand for the unskilled and semi-skilled workers, particularly at the lower levels of clerical staff. The effect may be to increase the comparative advantage of the better-educated members of society, and increase the differential between the already privileged and the under-privileged. In fact, the combined effects of reduced total employment, and the shift in employment opportunities to the higher educated, will be to throw the entire burden onto the lower levels of the labour market. It has been stressed that :

transitional adjustments, which cut down on the labour needed in industry, are being made at the expense of the least well-educated members of the community (Mead,1980:347).

The differentials in society are already a problem in developing countries, and to exacerbate it could contribute to social tensions. It is already a concern of sociologists and

planners that "Isolated and peripheral groups, communities and regions cannot participate or share in the benefits of development" and that "attention must be paid to reducing disparities and inequalities between social groups and communities." (Osei-Hwedie,1985:7).

In the definition selected for this survey, true development by requires that it brings "good growth and desirable modernisation". If large- scale computerisation in any developing country were to result in greater social inequality, then to that extent it would not be contributing to development. There is no doubt that this is a real danger. It can be minimised by careful planning in the provision of access to computer education and training, in order to distribute the opportunities fairly. This will be an issue for the educational authorities in Zambia in the future.

#### Adverse social effects

The most immediate social effect would be that of reduced employment opportunities which, as has been said above, will hopefully be of limited importance in Zambia. As against that, some authorities have pointed out that technology- driven job losses tend to be transitional, and to be made up in time, after the necessary adjustments have been made in society. One author criticises :

The static theory, according to which there is only a certain amount of work to be done, and any labour-saving device is therefore bound to reduce the number of workers who can be employed for the execution of that work (Einzig,1973:337).

He goes on to explain that society re-adjusts over time to a new set of circumstances, and that new job opportunities arise to replace the old :

Taking a long view, automation is likely to be accompanied by a progressive reduction of working hours. This should go a very long way towards offsetting unemployment (Einzig,1973:339).

Many of the interviewees with views in this connection would agree with Einzig that, while some jobs might be lost in Zambia in the short term as a result of using computers, the losses would be compensated by other adjustments in the economy and society. In fact, the General Manager of a private Zambian company made the interesting point that adjustment should be easier in a developing country like Zambia, where complex and rigid working structures have not had time to develop, and the whole social fabric is not so bound up with the work ethic and the prestige of job-holding as it is in some developed countries. In many developed countries, especially in Europe, the changes needed in society to respond to the effects of computerisation have sometimes been hampered by confrontations between entrenched and powerful interests. There seems to be no reason to expect that this will happen in Zambia.

Extensive computerisation will cause radical change in social systems and procedures, and will give rise to some new dangers.

Computer fraud has been identified as one such danger, and so has the threat of invasion of privacy from large computer systems. The dangers of these developments arise mainly from the possibility of failure to prepare for them. Once the danger has been identified, societies can and do adapt to the new situation. But a dangerous transition period can lead to all sorts of problems if the adjustment is not made early enough. The response of the society to the new situation is crucial in determining the effects of the technology :

The greatest threat to the employment opportunities of our young people lies not so much in the technology as in the slowness of our political and social institutions to recognise and adjust to changed circumstances (Sadler,1980:296).

#### Benefits of computerisation

It has been widely accepted for some years that the scope of possible application of computers for development purposes is almost endless :

One is hard pressed to name an area of national development that could not potentially benefit from the introduction of IT (Information Technology). Application areas, both potential and actual, include such diverse fields as financial planning and management, agriculture, transportation planning, water resource management, utilities, primary health care management, banking, geophysical computing, and the design and control of machinery ( Schware, 1988:146).

However, before this potential can be assessed in terms of actual contribution to development, it is necessary to be clear as to how computers are used in developing countries, and what the exact balance between cost and benefit is. It was pointed out

at the start of this paper that computers are expensive to acquire, even after the technological advances and cost reductions of recent years, by the standards of the cost and wage structures of a developing country. This presents serious problems to any attempt to justify computerisation on the basis that it substitutes for and reduces existing costs.

According to the material assembled in this survey, the important impact of computers in Zambia is in effect they have on the general operations of an organisation. Computers can be viewed as a catalyst which helps to transform the effectiveness of the organisation totally, by reducing or eliminating the gross waste of effort which marked the pre-computer period.

When the problems of under-development are considered, the shortage or lack of resources is always identified as one of the major problems. An equally important effect, which receives far less attention, is the waste or mis-application of the resources which are available. The low productivity which is associated with developing economies is not always the result of low education and skill levels, poor technology or lack of capital and infrastructure. It is also frequently the direct result of mis-guided effort, of the absence of effective supervision and control, of lack of coordination and planning, of delayed decisions and incorrect policies. It is in this connection that computers can make their greatest contribution.

In reconsidering at this stage the various point of view reported in the literature review, the findings of this survey most closely support the assessments of those authors who predict that computers in developing countries would convey the advantages of high productivity and effective management which have long been enjoyed in the developed countries (Okogbaa, 1987:127). It may be that the continuous advances in the technology will do something to maintain the relative advantage of developed countries, as some of the more pessimistic assessments would suggest, but at least computer application in a country like Zambia can help to raise the effectiveness of Zambian enterprises to the present levels of their counterparts in developed societies. Furthermore, it is relevant to note that there was no suggestion in the course of the survey as to how this might be achieved without the use of computers.

The basic mechanisms by which computers affect the operation of organisations in developing countries have been mis-understood in the past. As we have seen, they are not "clerical-replacement" systems, nor are they cost-reduction systems. Based on the findings in this survey, computers in a developing country like Zambia are best assessed by regarding them as skill-replacement systems. (In this connection, "skill" is not confined to formal technical or professional skills, but includes organisational, supervisory and clerical skills). In the West,

computers were used to replace low-level skills which were relatively expensive. In the present case, the main benefit of computers is that they replace higher-level skills which are not available. They help to overcome the shortage of management skills, of technical knowledge, of supervisory ability and of organisational disciplines. In Zambia, a lot of experienced and skilled people are not applying their skills and education - they are spending their time struggling with clerical work due to the absence of any support. If these resources and skills can be made effective by the provision of efficient organisation and management, there will be a multiplier effect on the impact for national development. The potential for improvement which the computer represents goes far beyond the direct effects of increasing speed or improving accuracy. It offers the prospect of breaking the vicious circle of low productivity/ lack of resources/low pay/low levels of efficiency which bedevils organisations in developing countries.

The enthusiasm for computerisation in Zambia which has been remarked in this paper is a result of the fact that the people who have been associated with computer application in this country have seen the potential for improvement. The specific problems which computerisation might cause within the country have already been discussed. It now remains to consider the possibility that computers could increase dependence in a developing country, and lead to broader economic and political

problems.

### Computers and Dependence

In the literature review, the two main schools of thought on development as affected by the computer were reviewed, and it was suggested that this survey should cast some light on the applicability of both to the situation in Zambia. We have already seen strong evidence of computers having led to modernisation and development: we should now consider the case for the other view.

There is some evidence in the material gathered here for the dependency school of thought. In relation to the acquisition and selection of computer equipment, Zambian organisations have on average far less autonomy than organisations in the developed countries would have. They are frequently subject to outside decisions and funding, and considerations other than Zambia's best interests seem to enter into the decisions on some occasions.

But dependence arising from the adoption of computers is much more fundamental than that. It is a fact that a developing country like Zambia is heavily dependent on outside sources for its computer hardware and software, and that this dependence is inevitable. There is no prospect that Zambia will become self-sufficient in the manufacture of computers :

The electronic equipment sector is advanced, rapidly changing and fiercely competitive. Most developing countries will not

succeed in creating an internationally competitive industry of any substantial proportions in this sector (Lalor, 1984:46)

If computers are to be used, they will have to be purchased from abroad. This is a situation which Zambia shares with every other developing nation. It is also a situation which applies to other key sectors of the Zambian economy, such as transport, manufacturing and commercial farming. The use of any modern technology involves dependence on outside supplies.

If politico-economic circumstances could arise in which essential computer supplies from the outside world would be cut off, then great disruption could be caused in Zambian administration and commercial life. The degree of such disruption would be related to the amount of progress made in computerisation and the degree of reliance on computer systems which had been created. The same is true, however, of almost all of the technology used in the modern sector of a developing country (or, for that matter, of most developed countries). In the type of circumstances which would deprive Zambia of essential computer supplies, similar problems could arise in relation to all motorised transport, to most of manufacturing industry and to the commercial farming sector. All of these are similarly dependent on a constant supply of inputs from abroad.

The fact is that computers are an intrinsic part of the modern sector of the economy in a developing country, and form one part of the general debate on the relative merits and demands of the

modern versus traditional sectors of these countries. This broad debate is outside the scope of this paper. Given that a modern sector exists, and assuming only that it is desirable that the sector is as efficient and effective as possible, then computers can claim an important place in the society. To put the same point differently, if a modern sector is to exist in a developing country, there is nothing to be gained from ensuring that it is denied the means of becoming efficient.

So we can state that, in principle, the computer is an intrinsic part of the modern sector, and subject to the same general characteristics of benefit and dependence as the rest of that sector. We should, however, proceed from that statement of general principle to an examination of the particular features of computers as they relate to dependence.

The resources required for a computer system can be categorised as hardware ( i.e. the physical equipment) and other (software, data and other operational requirements). In the early years of computer development, hardware was very expensive, and constituted a major part of all computer costs. As the technology advances year by year, the cost of hardware is falling steadily. As a result, hardware costs are becoming a less significant part of the total costs. The fact that a country like Zambia has no prospect of becoming self- sufficient in computer manufacture is therefore less significant than it appears.

The other costs, which form an increasing proportion of the total computer costs, are essentially "people" costs. They include the costs of developing or buying the specialised software or programs needed, and the costs of maintaining and operating the computer systems. If a country lacks the specialised skills needed these skills are very expensive to import from abroad, and a country would be highly dependent on external resources. But if a country develops its own capabilities then these costs can be converted into domestic costs, and external dependence can be reduced or eliminated.

Compared with other modern technologies, computers enjoy the advantage that the inputs required to keep a computer system operating are usually very modest. Very few parts of a computer are subject to wear, and the cost of maintenance would be very small compared to maintenance in the transport or manufacturing industries. The only "consumables" involved are some supplies like paper, magnetic filing media etc., and the small amounts of electricity needed. It can still be expensive to acquire computer equipment in any quantities at the outset, but the running costs should be quite low. The overall effect of technological development in recent decades has been to reduce the actual and relative costs of the computer equipment itself, and to increase the relative importance of other costs, which are mainly costs

associated with staff.

The supply and cost of skilled manpower is therefore extremely important. It would be very expensive to man a large computer industry with expatriates, as was done in Zambia in the earlier days of computing. However, once sufficient training has been given, there is no reason why almost all computer posts should not be "localised", and this has happened to a very large extent in Zambia. The vast majority of Computer managers, systems analysts, programmers and so on in Zambia are now Zambian citizens.

There are also some specialised functions required to maintain a computer industry which should be developed locally. The maintenance of computers requires small numbers of highly skilled electronics engineers and systems programmers. These are extremely expensive skills to buy from abroad, and it is very important that they be developed and retained in Zambia, both to reduce costs and demands for foreign exchange, and to reduce dependency on outside suppliers. If they are present in sufficient numbers in the future, Zambia could become largely self-sufficient at least in the maintenance of its computers.

Another important requirement of computer systems that for computer software, especially packages. Again this involves high costs if, as at present, it is purchased from abroad, and again it requires highly skilled people to design and develop the

software. A software industry requires very little infrastructure or investment and is very suitable for a developing country. Having dismissed the prospect of developing a computer hardware-producing industry in most developing countries, Lalor goes on to say that :

The question of the application of this equipment and technology in the local environment is, however, a different issue. Because of the specificity of local needs and the local control over how this need is addressed, the balance of advantage lies with indigenous effort rather than foreign competition in this area (Lalor, 1984:46).

Many developing countries have established successful software industries. In Zambia, there is a clear demand for locally-produced and maintained packages. It is encouraging to note that a few companies in Zambia do have plans to produce computer software locally.

The degree of dependency caused by computerisation will depend in large measure on the extent to which Zambia gears itself to the computer industry. It can be minimised if Zambia develops a native expertise in all the important aspects of systems development and maintenance. In this connection, the role of education is clearly crucial.

On the question of computers and dependence, the overall conclusion from this survey would be that computerisation causes dependence in a very general sense, in that a country using computers is dependent on inputs from other countries. However, it is less true of computers than of much of the modern

technology used in the modern sector of every country in the world, because of the modest inputs needed to keep this technology operational. The real degree of dependency caused by computerisation in any country is to some extent within the control of the country itself - it depends on the steps taken by each country to develop its indigenous computer industry, and in particular to develop the local expertise.

### Developments in computer technology

The relatively low levels of dependence-creation which are inherent in computer technology today are a recent phenomenon. Twenty years ago, computers were much closer to other modern technologies, in requiring very large investment, very expensive infrastructure and highly specialised staff. But there are long-term trends within the technology towards ease of use and reduction in costs which are very helpful in making computers appropriate for developing countries. Computer technology is apparently the only technology ever to become more "appropriate" for developing conditions under the impetus of its own natural development. There is a tendency in most technologies to become more sophisticated, more expensive and more demanding of support and expertise as they develop. Computer technology alone seems to have moved, for many practical purposes, in the opposite direction. This is because :

(a) rapid scientific advances in electronics are making the components much cheaper, more powerful and more rugged; and

(b) the technology contains within itself the capability to absorb more and more of the complexity of its own operations, and to become more "user- friendly", in the sense that the skills required to operate it are becoming simpler all the time.

In the past 10 years especially, the technology has changed totally in character. The microcomputer has arrived, and with it the technology suddenly has all the characteristics of a technology appropriate to a developing country. However, this is not the result of deliberate attempts to adapt a technology to Third-World conditions, or of a "sub- technology" created for special conditions. The whole trend of computer technology world-wide, driven by technological development and market considerations, has been towards cheaper, more rugged and more "user-friendly" computers.

The future holds further development along these lines for as far as can be foreseen. The costs of the technology continue to fall. New "super-micros" are appearing which have the power of very large computers and the desirable features of very small ones. The potential for assisting development is almost without limit :

The (recent) advances in microelectronics have certain characteristics which make them appropriate for use in developing countries. Microelectronics has opened the door to a vast array of needed applications which can, besides improving productivity over a wide front, help obviate the shortage of middle- level technicians and skilled workers (UNIDO,1985:2).

## The role of education

Education has emerged time and time again in this study as being of conclusive importance in determining the balance between cost and benefit of computerisation for a country like Zambia. The extent of Zambia's self-sufficiency in trained staff will do a lot to decide the on-going costs of using computers. The availability of expertise will decide the degree of waste and mis-use which Zambia will experience in its computerisation. The form of and arrangements for computer - related training in the future will do a lot to decide which sectors of the Zambian society benefit most from computerisation and the job opportunities which it brings. The numbers and quality of Zambia's computer staff will determine the degree of ultimate dependence on outside resources caused by computerisation. If Zambia is ever to develop a native computer industry, it can be built only on a reservoir of expertise and experience.

If the role of education will be of central importance, the experience of the past is not encouraging. Zambia has been much slower than some of its neighbours in establishing a computer training programme, despite an early start in the application of computers. At primary and secondary school levels there is no computer teaching except in a few, especially privileged schools. As recently as 1986, there was no third-level institution in Zambia offering professional computer qualifications. The main

source of computer staff was the few computer centres in the country which provided practical "on- the- job" training, supplemented by the practice of sending staff abroad for professional third- level courses. In the past 5 years, this latter practice has become prohibitively expensive, because of movements in exchange rates. For the future, it seems that Zambia will have to develop its own staffing and expertise. It also seems that the success with which it does it will do a lot to determine the contribution which computerisation makes to national development.

#### Final conclusions

The definition of the concept of "development " which was chosen in Chapter 1 is very definitely a "value-laden" one. The emphasis on "good growth and desirable modernisation" implies a judgement of the overall effects, broader than the individual or the narrowly economic.

In summary it can be said that Zambia has enjoyed "good growth and desirable modernisation" as a result of its computerisation to date. There is a lot of support for the view of "desirable modernisation" already taking place in the Zambian economy as a result of increasing computer usage, and of almost endless potential for beneficial development in the future. There is no evidence of any damage to Zambian society- in fact Zambian society seems to accept computers very readily. It is less certain that this position can be expected to continue in the

future. As the scale of computer application increases, the potential for damage to Zambian society will also increase. Large-scale computerisation in a society causes significant changes in the structure and mechanisms of the society, which can involve major re-adjustment. The resultant transition in society will be more or less painful and more or less beneficial, depending on the promptness and success of the efforts made to adapt. If Zambia wishes to benefit fully from computerisation in the future it will have to take steps to safeguard its own interests. As has been pointed out :

The idea of "computers as a short cut to development" has masked the importance of the effort that has to be made with them, as success depends on national computer policies being defined, with priority on training and attention to the transfer of technology. The difference in the way various countries have implemented their policies is behind the disparity of situations in the late 1980's, with some of them effecting an impressive take-off and others in relative stagnation (Beer Gabel, 1989:56).

The study has identified a number of respects in which Zambia should be preparing for extensive computerisation, and which will present certain dangers if ignored. The need for an extensive computer education program has been pointed out. The lack of any apparent moves to prepare the country's legislation for the future is another case in point. The absence of any identified national policy in relation to the Zambian computer industry is another. As has been said of other technologies, computers will make a good servant or a hard master. If the country does not take the necessary steps to control the technology in its own

interests, it should not be surprised if it suffers as a result. The necessary preparations for the future can only be undertaken by government :

The potential impact of microcomputing - on employment, information, organisation and society - raises questions of values, equity and power. In short, it is a political matter (Earl,1978:365).

Computers have emerged in this study as representing an extremely important and powerful tool for any country seeking modernisation and development. They do pose certain dangers of societal disruption and dependence, but developing countries can take steps to protect themselves from the worst of these effects. The Zambian experience of computers and development in the future will depend very much on the steps which Zambia takes to prepare itself for that future.

APPENDIX 1

List of organisations covered by the survey

(a) Government Sector.

Large users

Ministry of Finance  
Ministry of Home Affairs  
Central Statistical Office  
Ministry of Agriculture and Water Development -  
    - Planning Division  
    - Extension Department  
Mt. Makulu Research Station  
Lusaka U.D.C.

Small users

Ministry of Agriculture and Water Development  
    - Farm Management Department

(b) Education Sector

Large users

University of Zambia (UNZA)  
Copperbelt University  
Evelyn Hone College  
National Institute of Public Administration (NIPA)  
Zimco Institute of Management (ZIM)  
International School of Lusaka

(c) Parastatal Sector

Large users

Industrial Development Company Ltd. (INDECO)  
Zambia Consolidated Copper Mines Ltd. (ZCCM)  
Zambia State Insurance Corporation Ltd. (ZSIC)  
Zambia Electricity Supply Corporation Ltd. (ZESCO)  
Zambia National Building Society (ZNBS)  
Zambia Airways Corporation  
Zambia Co-operative Federation Ltd.  
Namboard  
Posts and Telecommunications Corporation (PTC)

Bank of Zambia  
Memaco (Zambia) Ltd.  
BP (Zambia) Ltd.

Small users

Zambia Industrial and Mining Corporation Ltd. (ZIMCO)  
Dairy Produce Board

(d) Private - Zambian sector

Large Users

Capital Bank  
Computer Services Ltd.  
Data Processing Ltd.  
Finance Bank  
Galaun Holdings Ltd.  
Realtime Ltd.  
Woodgate Computers Ltd

Small users

Data-Care Ltd.  
E.W. Tarry Zambia Ltd.  
Manica Freight Services (Zambia) Ltd.  
S.C.N.R. Computers (Africa) Ltd.

(e) Private - Foreign

Large users

Barclays Bank of Zambia Ltd.  
Citibank Zambia Ltd.  
IBM (Zambia) Ltd.  
ICL (Zambia) Ltd.  
Lonrho Zambia Ltd.  
Peat Marwick Mitchell (Zambia) Ltd.  
Stanchart Bank Zambia Ltd.

Small users

Consolidated Motors Ltd.  
Coopers and Lybrand (Zambia) Ltd.  
NCR (Zambia) Ltd.  
Maranouchi Manufacturing and Distribution Ltd.  
Price Waterhouse (Zambia) Ltd.

Tata Zambia Ltd.

(f) Others

Large users

CIDA Programme Analysis Support Unit (PASU)  
United Nations Development Programme (UNDP)  
United States Information Service (USIS)

APPENDIX 2

Questionnaire for survey of the reasons for, and effects of, computer usage in Zambian society.

PART 1 - IDENTIFICATION.  
-----

1.1 Interview No. \_\_\_\_\_

1.2 Date \_\_\_\_\_

1.3 Name of Interviewee \_\_\_\_\_

1.4 Post Title \_\_\_\_\_

1.5 Expert/User \_\_\_\_\_

1.6 Zambian/expatriate \_\_\_\_\_

1.7 Company / Organisation \_\_\_\_\_  
\_\_\_\_\_

1.8 Type of Organisation      1 = Government Ministry/Office  
   2 = Educational Establishment  
   3 = Parastatal  
   4 = Private - Zambian based  
   5 = Private - Foreign subsidiary  
   6 = Other \_\_\_\_\_

1.9 Total Number of employees in Organisation \_\_\_\_\_

PART 2 - COMPUTER ENVIRONMENT

-----

2.1 Computer equipment installed \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2.2 Year of first computer installation \_\_\_\_\_

2.3 Computer staff - Computer Management \_\_\_\_\_  
Systems staff \_\_\_\_\_  
Programming Staff \_\_\_\_\_  
Operations Staff \_\_\_\_\_  
Data Preparation staff \_\_\_\_\_

2.4 Number of systems operational on computer \_\_\_\_\_

2.5 Types of system computerised \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2.6 Source of systems in use - Purchased package \_\_\_\_\_  
Own development \_\_\_\_\_  
Supplied by parent \_\_\_\_\_  
Supplied by other organisation \_\_\_\_\_  
Other \_\_\_\_\_

PART 3 - JUSTIFICATION FOR COMPUTERISATION

3.1 What was the source of the initial decision to consider computerisation? \_\_\_\_\_

3.2 Was a feasibility study/ selection exercise conducted before installation of your computer system ? \_\_\_\_\_

3.3 If so, by whom ? \_\_\_\_\_

3.4 Summary of findings \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3.5 If no study conducted, how was decision to install taken, and who was involved in this decision? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3.5 In order of importance, what were the main benefits expected from computerisation at that time?

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

PART 4 - EFFECTS OF COMPUTERISATION

4.1 In practice, what have been the main problems and benefits computerisation ?

Problems \_\_\_\_\_  
\_\_\_\_\_

Benefits \_\_\_\_\_  
\_\_\_\_\_

4.2 How would you assess the overall impact of computerisation in your organisation ? \_\_\_\_\_  
\_\_\_\_\_

4.3 Has computerisation changed in any way your organisation's recruitment patterns (numbers or qualifications demanded) or will it in the future? \_\_\_\_\_  
\_\_\_\_\_

4.4 Has your computerisation programme had any effect on Zambian society in general ? \_\_\_\_\_  
\_\_\_\_\_

4.5 Have you any serious problems in maintaining your computer systems ? \_\_\_\_\_  
\_\_\_\_\_

4.7 What would you say are the main obstacles to expanded use of computers in your organisation ? \_\_\_\_\_  
\_\_\_\_\_

-----  
PART 5 - THE FUTURE  
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5.1 Has your organisation got future plans for computerisation ?

If so, main features \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.2 Would you say that computers are appropriate or inappropriate for a developing country such as Zambia ?

\_\_\_\_\_  
\_\_\_\_\_

5.3 What are your expectations for the usage of computers in Zambia over the next 10 years? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.4 What would you expect to be the main advantages to Zambian society of these developments? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5.5 What would you expect to be the main disadvantages or dangers to Zambian society posed by these developments?  
\_\_\_\_\_

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5.6 Do you think that the Zambian Government should take any action to control the use of computers in Zambia ? \_\_\_\_\_

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5.7 Have you any other views on computers and developing countries in general? \_\_\_\_\_

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