



15th WEDC Conference
Water, Engineering
and Development in Africa
Kano, Nigeria: 1989

Microcomputers in a rural water supply project

Richard Okello, Hans van Maanen and Bob Bakker

MICROCOMPUTERS IN A RURAL WATER SUPPLY PROJECT IN AFRICA; A USEFUL TOOL OR A NIGHTMARE

by Richard Okello*, Hans van Maanen**
and Bob Bakker**

ABSTRACT

On a large scale microcomputers are used in the Rural Domestic Water Supply and Sanitation Programme in Nyanza Province, Kenya.

The microcomputer gradually gained access to most project activities not only in the technical departments, but as well in the non technical sections such as, personnel and payroll administration, budget control and accountancy, secretarial work and reporting.

Despite of several unfavorable conditions, as an irregular power supply, the initial unavailability of trained operators and programmers, and the frequent absence of a nearby maintenance, service and spare part supply, the presence of a microcomputer is considered as a tremendous advantage in the project.

However, before "computerizing" a project, one should seriously consider the consequences of it. Once microcomputers are introduced, there is hardly a way back. This puts a great responsibility on both the choice of equipment and the manpower operating it.

INTRODUCTION

In 1984 a Rural Domestic Water Supply and Sanitation Programme was initiated by the Lake Basin Development Authority (LBDA) in Nyanza Province, West Kenya. The Programme, which is financially supported by the Netherlands Government, consists of two major activities:

- * Lake Basin Development Authority,
P.O. Box 4565, Kisumu, Kenya.
- ** DHV Consultants, P.O. Box 85,
3800 AB, Amersfoort, The Netherlands

1. A systematic survey into the water resources combined with a complete inventory survey of all existing water sources in the area used for domestic purposes.
2. The implementation of community based water supplies in the rural areas.

At first microcomputers were mainly used for interpretations of ground water survey data and for elaboration of the large amounts of inventory data. Later on the microcomputer was also used in other project activities, such as: financial and payroll administration, report writing, budget control.

The microcomputer has gained such a central place in the Programme that without it many activities can not be continued anymore or not carried out under the same time schedules.

PROJECT APPLICATIONS

Data management

About 90% of the rural population in Nyanza Province use point sources for domestic water supply. More than 20,000 point sources, such as springs, wells, roof catchments, were recorded during the inventory survey. This survey included that each point source was visited by a surveyor who used a questionnaire to describe and evaluate the water point.

About 120 characteristic data were recorded of each water point.

All data indicated on the questionnaires, have been entered in a data base system. Having stored all data in the microcomputer it is possible to answer questions such as:

- How many people use good water points?
- In which areas are new water points (wells) needed?
- Which existing water points can be improved?

The main advantages of using a microcomputer, apart from its capabilities to process large quantities of data in a short period of time are the following:

- Computer storage of data is most effective if the data are stored as numeric or logical variables (objective information). When the field data have been checked and entered, one has an objective data base which can be analyzed and processed by different people and in different ways.
- Presentation of data can be standardized. Programs have been made e.g. to present all springs in a certain area together with their yield or to make a review of all water points specified to type and characteristics in a certain area. It is also possible to show spatial distributions of characteristic features.
- It is possible to statistically analyze questions as:
 - How many water points dry up regularly?
 - What is the average yield of the springs or boreholes?
 - What is the average number of consumers per water point?
- Access to detailed information. On request detailed information can be given about the position of a water point; on who's land the water point is located; who is the owner et.

Apart from survey data, construction data as the well depth, ground water level, pump test yield etc. are stored in a computerized data base.

Water quality data as well as the results of operation and maintenance activities implemented by the project, will be stored in future.

Having a common entry key to all the files, (the water point number), it is possible to start analyzing why e.g. a certain type of rising main has failed whether it was related to the water quality or to the depth of the well.

Elaboration of geophysical and hydrological data

Microcomputers are intensively used for the interpretation of geophysical survey data. Not only the information can be analyzed much faster, but also more complex data can accurately be interpreted, which is virtually impossible without the computer.

At present about 35-40 vertical electrical soundings are interpreted by a junior Kenyan geologist per day, using a specific computer program. Manually this would take at least one week from a skilled and experienced expert. The interpreted data are nicely presented through a plotter and are ready for report presentation. This makes a laborious draughting operation unnecessary.

Hydrological data, such as rainfall, runoff and evaporation are gathered, screened and presented in different graphical displays using the microcomputer.

A further application of the microcomputer is the analyses of pump test results from machine drilled boreholes. With simple programs in BASIC, aquifer characteristics can be calculated, such as transmissivity, storage factor, well losses, specific and maximum well yield, etc.

Reporting (word processing)

The aid of a microcomputer for word processing is a tremendous asset in a project, where in a high frequency reports have to be prepared (progress reports, technical notes, design manuals and divisional and district survey reports).

The simple way of correcting, the quick use of existing parts of text and no need for re-typing of an existing text saves more than 80% of the secretarial work on typing.

The transfer from draft report to final report is now a very short and simple operation.

In addition the better word processing programs have very good and fast spelling correction and thesaurus facilities, which make the time consuming use of dictionaries unnecessary.

If good printing facilities are locally not available, a full 300 page report can be stored on one floppy diskette and consequently sent to any place for printing.

Accounting

All financial transactions are recorded as vouchers, which are registered in cash and bankbooks.

All vouchers are entered from the cash and bankbooks into the microcomputer.

A custom made project administration and accounting program elaborates the voucher data and presents monthly reviews per cost code of monthly and total expenditures per cost code.

Sub-codes are used to prepare cost reviews per District and per project item.

The main advantages of using the micro computer are:

- All vouchers can be sorted in such a way that checking at management level is feasible.
- Counter checks can be embodied in the program used to enter the vouchers as well as in the program which elaborates the data and makes presentations.
- Mistakes due to wrongly summing and grouping of vouchers having the same cost code, are eliminated.
- Data stored on floppy disks are easier to handle than data stored in different box files.

Spreadsheet programs are used for the payroll administration and budget preparation.

REQUIREMENTS

Before buying a microcomputer, one first has to consider what exactly will be its purpose.

Important questions are:

- Type of computer applications wanted (only word processing, or multiple tasking as word processing, data-management, computation)
- Which people, how many and how often will use the computer?
- Nature and size of the data files to be used.
- Number and locations of data entrance or retrieval

Hardware

Hardware related aspects as memory size, storage capacity, processing speed, print quality, screen characteristics, number of peripherals (digitisers, mouse etc), possibilities for telecommunications, compatibility, and dealer/supplier support should be considered.

One of the most important aspects is the dealer/suppliers support.

The repair and maintenance services depend very much on the dealer/supplier's capabilities and efficiency and the distance between the user and dealer. Spare parts of most computer systems are often only available from the dealer/supplier.

The memory and storage capacities actually determine what can be done with a computer system. Apart from word processing packages most of the software available on the market requires a minimum working memory, and can only be used on a computer system which satisfies this condition.

The storage capacity is determined by the size and nature of data files. Word processing programs can easily be done on a computer system with floppy disk drives, whereas a database management system, requires a hard disk. It is quite an advantage to have at least one portable computer.

Software

Software can be user made or it can be purchased ready-made.

There are no software packages which are compatible at all microcomputers.

Problems associated with ready-made software are choosing the right software to fulfill your needs, copy protection and the continuous renewal of existing software.

Most copy protected software allows usage on only one micro computer at a time. Some of them have copy protection tokens on the system disk or tokens which are copied to the hard disk during installation. Unfortunately if the token is lost or corrupted then the software renders useless. Hence there is a need to educate the operators in handling such software.

Procedures

Computer systems store information on magnetic media (tapes and diskettes), which can accidentally be erased or overwritten.

Hence it is an absolute necessity to have always back ups of programs and data files. Several methods of keeping back up files exist, which in theory all work well. The reality, however is rather different. Although good systems of backing up of data are applied, it still occurs frequently that files got accidentally lost or files are overwritten by old versions without having an updated back up. It is therefore not important, which method is used, but more how strictly it is carried out. The responsibility for regularly making of back ups can be put by either one specially assigned person or by the user himself. In both cases however it should be a standard routine, which is done on a daily and weekly basis and regularly be checked.

The back ups should always be kept in a safe place, away from the computer and protected against fire and other physical damage.

Other physical precautions which should be followed to prevent data loss or damage are the following:

- covers to protect the hardware against dust
- air conditioning in environments with excess humidity
- temporary measures like sub-directories, path structures and pass words to avoid unauthorized access to programs
- avoiding of magnetic and static electrical objects in computer rooms

Power supply

Computer hardware is rather sensitive to power fluctuations. To avoid damage of the equipment it is necessary to use voltage regulators and surge suppressors.

Not only power fluctuations, but also power interruptions are common practice in the Third World. When the power goes off, during a critical situation, when a large amount of data are in the working memory, all data can be lost. Losing data this way is very frustrating, more over these sudden power failures can cause serious damage to a hard disk. In order to minimize such problems, it is recommended to use an uninterrupted power supply (UPS). The UPS provides power to the computer system when the primary power supply fails or goes below tolerance. It is permanently connected between the AC power and the computer and in case of power failure the user has ten to fifteen minutes to save his files and programs and to switch off the system.

CONSEQUENCES

- a. Design, construction and daily running of information systems requires considerable skill (presence of a specialist) in order to avoid disappointment and data loss. Unfortunately it is still very difficult to obtain skilled programmers and operators.
- b. Computers are capable to handle large flows of information in a short period of time. Collection and storage of data however are labour intensive and time consuming.

- c. The need to obtain stand by facilities in the event of breakdown of the computer system. This may include having an alternative working procedure (manually), the presence of important data or programs on different machines, or the use of a generator in case of power failure.
- d. There are physical side effects on end users. The most frequently mentioned problem is the effect of screen light on the user's eyes.
- e. There have been many discussions about microcomputers causing unemployment. Main conclusion of these discussions is that microcomputers both have a negative as well as a positive effect. Existing tasks and jobs are taken over by the computer; new jobs however are created.

CONCLUSIONS

- a. Using microcomputers tremendously widens the opportunities for water resources survey, data management and proper administration of a rural water supply project.
- b. Use of microcomputers requires circumstances in which a number of preconditions are fulfilled. Some of these preconditions are:
 - Nearby presence of a supplier/dealer capable to repair the hardware.
 - Strict procedures in daily use of microcomputers.
 - Presence of at least 1 capable computer operator/programmer. If such a person is not available somebody has to be trained.
 - Presence of facilities and procedures to deal with computer breakdowns
- c. Microcomputers not only widen the opportunities within a project, they also redefine the requirements.
- d. Once microcomputers are introduced, there is hardly a way back which put a great responsibility on both the choice of equipment and the manpower operating it.