OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as "developed", "industrialized" and "developing" are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

SIS Project

December 1988

17339

FINAL REPORT

on

Computerisation of Operations at the

**TANZANIA INDUSTRIAL STUDIES
AND CONSULTING ORGANISATION
(TISCO)**

**15 january 1989
Prepared by:**

Aladar Heppes
computer expert

**This report has not been cleared with the United Nations
Industrial Development Organization which does not therefore,
necessaruly share the views presented.**

TABLE OF CONTENTS

BACKGROUND

For some time the **TANZANIA INDUSTRIAL STUDIES AND
CONSULTING ORGANISATION (TISCO)** has been thinking
of introducing computers in the work of the company
to enhance the quality and the efficiency of its
activities.

(TISCO is a multi-disciplinary consulting
organization responsible for, among other things,
provision of consultancy and advisory services in
areas associated with industrial development and
management to the government, public institutions
and the private sector. TISCO through these
activities plays an important role as adviser to
the Government and Parastatals in the
implementation of the Government's Economic
Recovery Program.)

It become apparent to TISCO from the outset that
before introducing a computer in the organisation
it is necessary to answer a number of questions
pertaining to computerisation. Thus, in April
1988, in order to benefit most from this step,
TISCO set up a team of its own consultants to
prepare a feasibility study. The study was aimed
at identifying the fields where the introduction of
a computer would improve the quality or raise the
efficiency of work, to study what kind of computers
or methods should be applied, what cost would be
involved, what training is required, and finally,
how should the system be implemented to avoid
unnecessary disturbancies in the organisation's
daily activities.

In the six weeks of its existence the team
consisting of professional consultants, following
the Terms of Reference provided for the study
conducted a number of interviews within the company
as well as with the potential suppliers and
prepared its report (REPORT) and presented it to
the Board of Directors in June 1988.

Members of TISCO's Board of Directors were of the
opinion that there is need to computerise the
Organisation's operations. However, they felt
that, due to the limited experience of the team
with computers, the REPORT lacked some technical
details in a number of areas. It was therefore
thought necessary to have the independent opinion
of a computer expert in the form of an appraisal of
the REPORT, make amendments and give
recommendations, especialy for the training and
implementation of the new systems. Hence the
situation which led the Government to request this
project.

In the course of this UNIDO project a number of
interviews have been made with the management and
staff of TISCO and in the light of these again with
some potential suppliers (one of them has not been
asked to give quotation on the first round).

Though the findings of the REPORT have been
comfirmed by and large, in the present report some
new aspects to be considered will be mentioned and
a much more detailed description of the different
computer configurations as well as recommendations
for the introduction of each application considered
- including training - will be given.

GENERAL ASPECTS

The first question is whether there is need to
computerise at TISCO.

From the technical point of view the answer could
be no, since all of its present activities can be
carried out (at the present level) without using
computers.

On the other hand the role TISCO has been playing
so far in the promotion of industrial development
and improvement in other fields of the productive
life of TANZANIA definitely requires it to extend
its activites to this key field of any kind of
progress. But, even from the business point of
view, if TISCO goes on without introducing
up-to-date technology, and acquiring expertise
on it, there will be a constant fear that some
competition may take over.

As the role of computers spreads in general the
customers, the organisations requiring TISCO's
services, will also require evaluations concerning
computers. To do this it will not be enough to
have one or two experts to do the job. It can also
be predicted that the experts themselves will
require access to at least personal computers to
produce state of the art studies.

The introduction of computers and methods that go
with them, morover, opens a new field of
consultancy the computerisation itself. This
opportunity will be a fringe benefit in the sense
that TISCO's consultants will get familiar with
computers.

But, the computerisation of TISCO's operations is
not only a price to pay to further improve its
overall image and prepare it for future activities.
It can be done so that it is an economically
justified investment in itself.

Although computerisation is possible in most fields
of TISCO's activities the character of them is
quite different. Consequently, the areas
identified so far will be discussed separately one
by one.

There is only one preassumption; that the computer
configuration to be purchased is capable of running
programs developed for IBM PC computers of which
there are millions in operation throughout the
world and there is a broad (and therefore
inexpensive) market on which there exists programs
for many possible applications. The importance of
that last factor is underlined by the fact that
the developing of a new program is a very lengthy
procedure (even for professionals) and involves a
lot of time and effort.

As far as the size of the starting configuration is
concerned the five screens - recommended by the
REPORT - will be sufficient.

OFFICE WORK, LETTERS

The introduction of word processing (see STANDARD
SOFTWARES A)) in office work can be done fast,
since the first, limited usage of the word
processor can be learned very fast and even this
enables the user to write letters on the present
level. Further options and possibilities can be
learned step by step introducing more and more
features in wordprocessing in the daily work.

Unfortunately, occasional usage of the computer for
writing a couple of letters a day does not justify
the use of a unit. Therefore, this kind of usage is
not considered to be introduced throughout TISCO
in its first phase of computerisation. It can only
be recommended at offices where the rest of the
computer time is used for something else.

One application of word processing in an office,
however, is worth mentioning. That is writing
ciculars. The option called MAIL MERGER enables the
user to write a letter without address on it and
prepare a list of addresses separately, then let
the program combine the two and get a letter typed
for all on the list. (The list - of course - can be
reused.)

WRITING OF REPORTS AND STUDIES

A considerable typing work is required today to prepare the reports and studies written by the consultants. In addition most of the time the first version can not be used as final and has to be retyped. Retyping is not free of mistyping either.

The introduction of word processing may have an essential impact in this field.

The retyping work can be avoided, only modifications have to be made on the original text. Retyping does not result into new mistakes. The corrections can be done either on a draft printout - as today - or on the computer at the time of the proof-reading by the consultant. (The whole typing of the draft can be saved.)

Experience of other companies shows that if there is a computer available consultants tend to prefer to write their documets into a computer. That effect largely reduces the need for supporting staff and increases the speed of preperation of a document.

Parts of other documents can be reused - with minor modifications.

The quality of the documents can be enhanced by using different types of characters, underlining etc. Tables of content and indexing can be made automatic.

Textsearch can be used to find relevant parts of a document. This can be important when analyzing old documents.

FINANCIAL MANAGEMENT AND ACCOUNTING

i) ACCOUNTING packages are also available on the
market or from the potential suppliers. As the
number of transactions at TISCO is not very high
the use of a computer is certainly not justified in
the sense of the saved manpower in keeping the
books. It is a much more important factor that
many tables and statements that could only be
derived from the accounts through a lengthy and
tiresome procedure will now be available at once
whenever they are needed. This will give the
management a much tighter control over financial
matters, cash flow etc.

Most suppliers offer an integrated accounting
system containing separate modules for general
ledger, accounts payable, accounts receivable,
sales order, purchase order, invoicing, job
costing, payroll etc. and there is an extra charge
for each. It is not worth buying all parts except
if the organisation intends to use all of them.
The introduction of further parts of a system can
also be delayed. Consequently, before making final
decision about it this question has to be discussed
with the supplier. It is recommended that at least
the modul containing the General Legder and Payroll
should be implemented.

ii) PAYROLL calculations will be very easy, only
the changes have to be typed in and the rest is
automatic. (The suppliers claim that the program
complies with the legal requirements of Tanzania.)

Those who will use the accounting and the payroll
system have to learn how to use it but they need
not learn how to install it. Therefore it is
recommended to require from the supplier to install
the accounting and the payroll system on the TISCO
computer and - as the final part of the training
connected with it - supervise the first steps using
real data.

Considering the training period and the need for a
period of field tests the final introduction of
the system could begin in the middle of 1989.
(Since during the field tests the manual system has
to be maintained, in this period of time this would
mean an extra load on the staff concerned.)

iii) A PERSONNEL RECORDS system would also be
useful. If it is missing from the offer it has to
be developed.

A simple register could be developed fast by a
professional programmer.

Another possibility is to get it devolped in
dBASE III language as a test program for those in
TISCO who will learn how to program in dBASE III.

Daily usage of the system must be simple, however,
concerning the timing it has to be remembered
that initially all data of the manual system that
will be kept on the computer must be keyed in.

ENGINEERING APPLICATIONS

Within this area three likely fields of usage can
be identified.

i) STRUCTURAL ANALYSIS calculations.

Civil engineers could make use of a program in
their calculations of structural analysis, stress
calculations etc. Unfortunately, programs of this
category (like Finite Elements Method) are rare on
the micro computer software market and rather
expensive if found at all. The few offers need
careful studying to find out the program which is
really required. As a start a widely used CAD
program (AUTOCAD) could be installed that would
enable the engineers to prepare technical drawings
on the computer thereby raise the image of their
reports.

ii) MATERIAL BALANCING calculations.

Material balancing calculations for large
chemical processes is a field in which Chemical
engineers could be helped by the computer. This
requires software to solve and optimize linear
inequality systems. This software is not offered by
the suppliers thus it has to be imported.

Both fields require a very large number of
mathematical calculations that may slow down the
work of these business oriented machines. An
additional piece of hardware, called Math
Coprocessor, to be installed in the unit used in
the Engineering Department would speed up these
calculations substantially.

The engineers of the department, - especially after
a short course in programming of any language -
will learn fast how to start using the above
programs. To exploit the capabilities of them,
however, may take a lot of practice, even years.

iii) PROGRAMMING

It is expected - and highly recommended - that in
this department at least a group of a few
consultants should learn how to write simple
programs and acquire an overall knowledge of the
computer system and the technical part of all
applications running at TISCO.

The calculations required by their everyday work
will not be covered by the packages mentioned above
and it is very important that they should be able
to make use of the computer ina much wider scale.

This group could provide technical supervision of
the installation and give help when necessary
(recover data, help to understand user manuals,
etc.)

It is recommended that some people of the
department be sent for long courses or study trips.

FINACIAL/ECONOMIC PROJECTIONS AND ANALYSIS

Feasibility and most viability studies involve
doing financial and economic projection and
analysis. These include projections of sales,
expenses and profits; calculation of financial and
economic ratios; market trends/forecasting etc.

To cover this field it is recommended to use three
different sources.

i) Use UNIDO's Econiomic Cost Benefit Analysis
COMPAR program package that is not only a tool to
do the calculations but reflects a method as well
that is well tested and that can be considered as
standard in this field. (Some of the customers of
TISCO may even require the evaluations based on
COMPAR). With the help of the package the relevant
reports can also be prepared and enclosed to the
study.

ii) For further statistical calculations that are
not covered by COMPAR - especially to calculate
trends and forecasting - a general statistical
package (like SPSS) should be made available.

iii) For 'what if' analysis the spreadsheet
calculations (see STANDARD SOFTWARES B))
prowide an excellent tool.

The use of the spreadsheet calculator program and
the statistical package courses are offered by the
suppliers therefore it is a matter of weeks to
begin the initial steps. The COMPAR method will
take more time to master and no course is offered
for this. Fortunately, the introduction of these
methods need not be tied to a certain time, in case
of any problem less efficient manual methods can
take over.

INFORMATION CENTER

Alone in the Information Center at least five
applications of computers could be identified.

i) REPORT DEPOSITORY

Presently some 1500 Reports are stored at the
depository. Because of some technical reason based
on the manual system it is very difficult to
find those reports that could not be classified in
a unique way. The introduction of a computerized
register could solve this problem easily. Moreover,
the characterisation of the reports by more than
one parameter would enable more refined selection
of the material looked for.

ii) REPORT ABSTRACTS

Connected with the previous system abstracts of the
reports could also be stored in the computer. The
abstracts could be searched for information even if
it is not a predefined keyword.

To introduce the system described above first the
logical structure has to be designed.

The next step is getting the relevant software. It
would simplify this problem very much if those who
design the system could remain within the frame
provided by the UNESCO software package ISIS.
This, however, would prolong the design phase,
since the designer must get aquainted with ISIS
first.

Then time has to be given to key in the relevant
data - if abstracts are also needed they have to be
prepared, too. The best way to do this is to do
all fresh material and make up for the old ones
going backward, gradually.

iii) LIBRARY REGISTER

The introduction of a library register - again
based on ISIS - is very similar to the previous
one. There is, however, a great difference: there
is no need to design a system.

This work practically reduces to entering the
information stored on cards today. Then all kinds
of sophisticated searches will be possible.

Unfortunately, the suppliers offer no course in
ISIS, it has to be learned from the book or find
help outside TISCO.

iv) PROJECT CONTROL SYSTEM

There exists a manual system at TISCO keeping
record of on-going projects and enquiries, time
spent by each consultant and on each project.

The tables prepared monthly from these data help
management to keep an overall control of the
projects, budgets etc.

This well functioning system could be easily
computerized and thus the preparation of the
monthly report would be reduced to a single
keystroke.

The use of the program would be very simple and
easy to learn, but first it has to be developed.
For a professional programmer this program would be
a job for some weeks only. It would be highly
useful if some of the TISCO staff could participate
in preparing it.

v) INDUSTRIAL INFORMATION REGISTER

The register contains information about industrial
establishments in Tanzania, and is expected to
consists a maximum of 2,000 records of
approximately 500 characters each. If the register
is set up so that the information is stored in
structured form, the structured queries, look-up
service, sorted listings etc. will all be possible.

Using a 'desktop-publishing' system (see STANDARD
SOFTWARES D)) TISCO could publish registers like
the one published in 1983 (including advertising)
very easily, even with all kinds of indexing and
cross referncing. Updating would be very simple
and fast saving the time for retyping and proof
reading the whole material. (This type of activity
could be extended to other fields of the economy
too, the registers could appear periodically).

The last element of the chain (mass printing) need
not be at TISCO. This service is available in
Dar-Es-Salaam.

The setting up of the frame is very simple with the
database manager software dBASE III (matter of
days) and the rest is to get the material typed in.

To learn how to use the desktop publishing system
and to make the graphics using the graphical editor
will take more time (matter of months) but these
phases can overlap. With proper timing the first
publication could be prepared by the middle of
1989.

(In case TISCO wants to go into publishing in a
larger scale then copying texts and especially
graphics into the computer would soon became a
bottleneck. To resolve this problem it should get
hold of a 'scanning device' that would make this
step automatic.)

PROJECT MANAGEMENT

There is a score of off-the-shelf project
management software the use of which could be
introduced - first as a pilot, then as a regular
service to design and follow up industrial
projects.

Typical functions are critical path analysis,
timing, costing, resource requirement calculations,
resource allocation etc. It is also possible to
get printed reports (tables and charts as well) at
different stages of the project.

Again, it will take a few month to learn how to use
a software package like this.

SYSTEM REQUIREMENTS

Considering TISCO's projected needs the
requirements can be summarized as follows.

- The starting configuration should contain five
units,

- all capable to run word processing,

- one the unit is capable to efficiently run
programs that require a large amount of floating
point arithmetical operations,

- one other unit has access to a mass storage
device of at least 40 MB capacity,

- all units have acces to a hard disk,

- on-line or off-line communication within the
system

- laser printer

- dot matrix printers

- extendability of the system with any standard
'IBM PC compatible' device (like mass storege
backup Streamer tape unit, further PC-s, printers,
mouse, further hard disc, networking etc.)

- any unit can run off-the-shelf IBM PC compatible
software

Networking is not listed among the requirements
because - for the time being - no intended
application requires it.

After a number of discussions with TISCO staff and
with the potential suppliers it has been found that
there are three essentially different
configurations that fulfills the listed
requirements.

i) INDEPENDENT UNITS OF PC-S

In this configuration all units are standalone
machines, each having a hard disk of 20 MB or 40 MB
capacity, one of the units is extended by a Math
coprocessor to speed up arithmetics, each unit has
separate printer. There are - of course - many
possible solutions depending on the choice of the
individual units. One possibility is the following:

- 1 IBM PC AT-level unit
    Math coprocessor
    40 MB hard disk
    5.25" floppy
    3.5 " floppy
    dot matrix printer

- 1 IBM PC XT-level unit
    40 MB hard disk
    ?" floppy
    laser printer

- 3 IBM PC XT-level unit
    20 MB hard disk
    ?" floppy
    dot matrix printer

The advantage of this solution is that while
communication is possible via floppy diskettes
the units are independent, data save and restore
techniques can be different, the different users do
not interfere with each other's files. The chance
is very small that more than one unit has some
trouble at a time, therefore the programs that are
present in all disk units will never be lost. It is
also an advantage that the physical cabling can be
spared (that can be problematic if distances are
essential and it makes moving of the units much
more difficult.) It is also easier to learn the use
of the single-user operating system.

Disadvantage is that the users can not share
sources (like the capacity of a hard disk unit,
or they can not use the laser printer directly
except from the unit to which it is connected).

ii) LOCAL AREA NETWORK (LAN) OF PC-S

In this solution all PC-s (or a subgroup of them)
are connected in a LAN, that enables the members to
share some sources.

The greatest disadvantage is (for TISCC) that
running of a LAN requires a higher level of
technical knowledge that members of the staff do
not have presently. (The LAN can be established
later.)

There is a small chance that the central machine of
the network breaks down that would disable the
others.

iii) UNISYS B20 NETWORK

A quite different approach is the architecture that
one of the suppliers offered. This is based on a
network of Unisys machines one of which being the
master handling the hard disk(s) while the others
are simple workstations. Although the units as such
are not IBM compatible ones, the operating sytem
BTOS II (and the so called PC emulator software)
is capable to run off-the-shelf IBM compatible
software.

The greatest advantage of this solution that there
is file protection service provided thus there is
no unwanted interference between the files of
different users. This is an advanced technique but,
again, it requires a higher level of technical
knowledge to exploit it.

In this system there is a possibility to
incorporate IBM PC compatible members into the
network (using a communication card).

(Probably, it is harder to get this system serviced
because the hardware elements are not IBM
compatible ones.)

FINANCIAL EVALUATION OF QUOTATIONS

Repeated discussions and careful evaluation of the
quotations show that there are two suppliers who
can deliver either of solutions i) or ii).
These are Business Machines Tanzania Ltd.(BML)
and ICL Computer and Telecoms Systems (T)
Ltd.(ICL). Between the prices of the quotations -
projected to similar configurations - there is no
significant difference.

The comparison of the quotations of these companies
for a ii)-type solution and that of the third
company, MEECO International Company Ltd.(MEECO),
showed that although the adding of a further work
station is less expensive in the third case, this
(financial) advantage pays off only at a higher
number of units.

SOURCES OF SOFTWARE

Although all suppliers are ready to supply the
standard software prices diverge in some cases.
The fact, however, that IBM PC compatibility is
secured gives opportunity to purchase the software
from different sources.

Some special application software have to be
developed. This can either be by TISCO personnel
or by any outside source (e.g. a supplier).

ENVIRONMENTAL REQUIREMENTS

Environmental requirements are very similar for all configurations. Experience shows that the safe operation of the system requires Uninterrupted Power Supply (UPS). This can be purchased independently from the computer system. Requirements are given in the quotations.

The units in question are not very sensitive to heat or humidity, however, the system should be protected from excess heat and from humidity over 80%. A further aspect to be considered is that dust and smoke can substantially reduce the life and errorfree operation of the floppy disk drives.

OTHER SAFETY FEATURES

The protection of the computer system requires the same precautions as anything of high value. In addition to that it is to be mentioned that all materials carrying data like floppy disks or streamer tapes should be protected from strong magnetic fields.

DATA PROTECTION

Those designing and running the different parts of the system should take precaution to protect the file containing confidential information. The supervisor of the system should require and check that the measures are followed.

To prevent damage of the files and loss of important information can be done by systematic backing up of the related files. The save-restore system needs also supervision.

TRAINING RECOMMENDATIONS

The use of the computer system requires some
general knowledge about the system (including
handling of units like a printer).   A short
INTRODUCTORY COURSE would do.

The envisaged overall usage of WORD PROCESSING
requires that all secretaries learn how to use it.
It is also expected that a number of consultants
will also use it routinely. This, however, does
not mean that all must participate in a training
course.

The use of the ACCOUNTING package should only be
taught to members of the Accounts Section.

SPREADSHEET calculations will be necessary to
practice for at least one member from Accounts
Section and several from Economics Section.

DATABASE MANAGEMENT will be useful not only to
Accounts but also to different members of the
Engineering Department (at least one from each
section).

The ISIS package will be useful in the library and
in the Reports Depository.

COMFAR will only be used by people in the Economics
Section.

An outside source could be helpful in introducing
these two packages, since local courses are not
offered.

The SPECIAL PROGRAMS required by the different
sections of the Engineering Department will only be
used there.

ORGANISATIONAL RECOMMENDATIONS

It is recommended to appoint a staff member who is
in charge of supervising all computers. His job
would be to

- supervise that the computers are properly used,
- ensure availability of necessary supplies,
- keep contact with outside parties (supplier,
  maintenance, training),
- report to management on a monthly basis and make
  recommendation on redistribution of resources.

A group of 3 engineers (1 from ech section) should
be selected to form a technical support team, who
know most of the system hardware and software and
of programming in general and able to help others
when needed.

RECOMMENDATIONS FOR ACTION UNDER INTERNATIONAL ASSISTANCE

It is recommended that the following activities be considered for implementation under international assistance:

1) Regarding the computerisation of the Library and Reports Depository:

- the specialist in charge could undertake a study tour of 2 weeks duration in Europe with a view to studying the use of micro CDS/ISIS in library environment and discuss the needs of TISCO regarding the adaptation of this software to the local needs;

- short term (2-3 weeks) advisory services could be provided for the implementation of the adaptation required and for the installation of the system in Tanzania, including short user training;

- the system design of the Reports Depository could be prepared by the same international consultant, extending his/her mission by 2 additional weeks.

2) Regarding the economic evaluation and cost/benefit analysis:

- a national training course could be organised on UNIDO's COMFAR system for the specialists in charge of feasibility and most viability studies and financial and economic projections at TISCO and for those co-operating in these activities in the banks and Ministries concerned. Such a training course could be supported by an international lecturer (4 weeks).

3) The design activities of the Engineering Department could be supported by an IMB PC/AT based architectural design software available through UNIDO free of charge or under very advantageous conditions (e.g. ARCHICAD from Hungary). Local training could be provided under international consultancy arrangements (4 weeks).

4) The material balancing calculations could be
supported by an appropriate linear programming
software. Hungary offered through UNIDO's UNIDPLAN
program an appropriate software free of charge: the
MILP system. This could be adapted to the local
conditions and needs and installed with the
necessary training in Tanzania.

5) The overall advisory activities of TISCO could
be supported by a study tour for a represantative
of the company with a view to studying the
different software tools offered/introduced by
UNIDO's different services in the framework of
various sectoral, statistical, planning, etc.
prjects (2 weeks in Vienna).

APPENDIX

STANDARD SOFTWARES

A) WORD PROCESSING

The introduction of word processor systems in an office means that in the future texts will have to be typed only once. All modifications (corrections of misprints, insertions, deletions, rearranging paragraphs in the text, moving parts of the text to somewhere else, etc.) can be done easily and fast.

By copying selected parts of a document into the other one, work can be sped up even more.

The typing itself will also be faster since the end of line is automatically detected and writing continues in the next line.

Automatic paging brakes the texts into pages of given size and generets the numbering as well.

New quality can be achieved by using different types of fonts: bold, slanted, condensed, enlarged and many others.

To many word processors there exist spell checker facility with a large English dictionary in the background that raises the attention of the user to words that may be misspelled.

A similar service of word processors is the automatic hyphenation, again with a dictionary in the background.

The prepared documents can be saved on the hard disc for common usage or can be put on a floppy disc as well. (The latter technique enables the user to carry the file to another computer even if they are not connected in a network.)

The printing itself is done using an NLQ (Near Letter Quality) dot-matrix printer or - for the final version - a laser printer. (The printing is initiated any time from a computer that is connected to the printer.)

There are two fields of application for word processing. Reports and other office works.

B) SPREADSHEET CALCULATIONS

The software that supports spreadsheet calculations was one of the biggest hit of the last five years on the market.

Its great popularity can be explained for by the fact that the it uses a simple language adapted especially to spreadsheet calculations. It can be learned very easily, thus even beginners in the use of computers can make use of it very fast.

On the other hand its usage is rather flexible since it is not a rigid model provided by a program but a language which enables the user many more variations.

All calculations that can be arranged in the form of a spreadsheet - and most of the financial calculations fall in this category - can be done in a very natural form and reports can be printed from the result.

One of its main fields of application is the so called "what if" analysis in which, having set up a financial model, the impact of the modification of some parameters on the value of others can be studied very easily.

C) DATABASE MANAGEMENT

Efficient access to data stored on a computer
relies very much on the way data is entered and
stored. Database management packages help the user
to organise data in a variety of ways from simple
flat files to sophisticated structures with a
number of internal relations.

A very important software development of the last
years is the family of database handling languages.

Although these are full scale programming languages
enabling the user to write general application
software, the languages have been designed so that
the knowledge of a small subset of the instructions
enables the user to use them efficiently.

Using these database systems small applications can
be developed very fast. The usage of the language
is supported by extensive "Help" environment
instructing the user on the rules and possibilities
of the language.

Database management packages like dBASE III make
sophisticated queries simple to define. The sorting
of data is also a matter of a single instruction.
The package contains an easy to use report
generator program as well.

D) DESKTOP PUBLISHING

A desktop publishing system consists of three main
parts.

The first part is a software package that enables
the user to bring his publication consisting of
texts and images (like a page of a newspaper) to
its final form.

The second part is the use of a quality graphics
printer (preferably a laser printer) that can
produce sample copy of the publication.

The third part of the chain is the mass printing
device (if mass printing is required), having an
interface that can read the files prepared by the
software. This procedure makes the publishing
procedure very simple, automatic and fast.

E) OPERATING SYSTEMS

This piece of software must be present whenever the
computer is running any application. The Operating
System supervises the work of all parts of the
hardware and the software involved.

For single PC-s industry world standard is the
MS-DOS (MicroSoft Disk Operating System), that has
a number of versions. In the report Version 3.3
and Version 4.1 are mentioned. The second one
includes the so called MS-Windows feature, and it
is a 'multitasking' operating system. That means
that the same computer can be used to do more then
one thing at a time, typically a task that requires
no interaction from the user (like getting a text
printed or a lengthy calculation) and another task
(like word processing) that requires communication
with the user.

If more than one PC-s are connected then the
operating system is extended by a further piece of
software that cooperates with MS-DOS and deals with
the communication between the units. This
environment makes it possible to run applications
in which more than one users work simultaneously
(even communacate) using the same program and data
system (e.g. in banking). This is called
multiuser environment. In a multi user system the
file of a user can be protected from those of
another one at system level.

BTOS II is an advanced operating system developed
for the Unisys B20 series computers connected in a
network. It is multiuser and multitasking.
Moreover, it has the capability to emulate other
operating systems like MS-DOS.