Malaysian J Pathol 1988; 10:15-20

ORGANISING A MICROCOMPUTER SYSTEM FOR DEPARTMENTAL USE – A PERSONAL EXPERIENCE

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Summary

The Department of Pathology, National University of Malaysia, acquired a microcomputer system with hard disk storage for use by its academic members. This paper describes the experience of choosing the system and its implementation. Using the disk operating system PC-DOS and BASIC language, a system shell was organised to enable the academic members to have an individual domain on the hard disk to store/retrieve data and use common off-the-shelf programmes such as WORDSTAR, DBASE III and ABSTAT. The good practice of backing-up data is emphasized and an automatic method to ensure such a practice is described.

Keywords : microcomputer, pathology

INTRODUCTION

The Department of Pathology, Faculty of Medicine, National University of Malaysia, acquired a personal computer system with 10 megabyte hard disk in November 1985 for use by its academic members. At that time, that was the only computer system in the Department and the majority of the academic members had no computing experience. The task at hand therefore was how to make full use of the system to benefit the academic members and to introduce gently computer technology to the uninitiated.

HARDWARE SELECTION

The system purchased consisted of an IBM (International Business Machines Corporation, USA.) Personal Computer with 640 KB random access memory, a monochrome green monitor, two floppy disk drives, a detachable keyboard, a dot-matrix printer and a 10 megabyte hard disk.

At the time of purchase, there were few compatibles in the market and their reliability was untested. A decision was therefore reached to acquire a genuine IBM PC. Today with so many reliable compatibles available at an affordable price, a compatible would be a good substitute. The older APPLE (APPLE CORPORATION, USA) compatible was not chosen because of the decreasing software support and the diminishing dealer/service support for the hardware.

A monochrome green monitor was chosen rather than a colour one because there was no immediate need for graphics and upgrading to a colour monitor could be done later when the need arises.

Floppy disk drives were acquired for input and output of data. Two double-sided floppy disk drives were included so that members could use their own programmes without involving the hard disk. The double-sided drive also allowed both sides of the floppy disk to store data. The availability of two floppy disk drives also made duplicating the disks easier. The computer could be instructed to copy part of or the whole disk from one to another. It would be rather inconvenient, with only one floppy disk drive, to copy the contents of a floppy disk to the hard disk, and then recopy from the hard disk to a new floppy disk.

The printer is an important part of the system because the electronic messages stored in the computer can be easily destroyed by electrical and magnetic disturbances. A printed copy on ordinary paper for reference and storage is therefore desirable. A dot-matrix printer with both draft and near-letter quality modes was selected. For ordinary use, printing could be in draft mode whereas for reports, letters, theses and so on, the near-letter quality mode could be used. The advantages of this type of printer were that it was fast, relatively inexpensive and gave a print-out of acceptable quality. A letter quality or daisy-wheel printer would produce an excellent print-out, but was slow and expensive. Besides, the ribbon for the dot-matrix printer was cheap and lasted longer. More recently, it has been possible to recondition and reuse such ribbons.

In view of the high departmental demand for using the system, a hard disk which allowed storage of 10 million characters (10 MB)

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was included in the package. This hard disk has the storage capacity equivalent to about **30** floppy disks. It allows both programmes and data to be stored, while freeing the floppy disk drives for backing up data. If the volume of data to be stored is low and if few people are using the system, a hard disk would not be needed. However, in terms of accessing and storing data, the hard disk drive is much faster than a floppy drive.

SOFTWARE SELECTION

There is a wide range of programmes in the market. The choice is sometimes difficult because off-the-shelf programmes range from simple to complex ones. The former may not cater for the needs of the majority while the latter might frighten off the beginner.

Three main areas of use were identified: i) Wordprocessing, 2) Data management, and **3)** Statistics.

Wordprocessing: The academic members had always complained of the shortage of typists and the slow and painful process of correcting manuscripts. A wordprocessing programme that could be easily used without much training would be ideal. There were many programmes available in the market, such as WORDSTAR from MicroPro International Corporation, USA, WORDPERFECT from SSI Software Incorporation, USA, and WORD from Microsoft Corporation, USA. WORDSTAR was chosen because it was easy to use. Furthermore some academic members were already familiar with it on their own APPLE-compatibles.

Data management: Consideration had to be given to the fact that there were many sections in the Department where data storage and retrieval is an everyday event. Because, in fact laboratory computerisation is a much explored area, commercial packages for data processing in chemical pathology and haematology laboratories are readily available for those who could afford them.

As our computer system has only limited storage capacity, a decision was made to store histopathology records according to a simplified SNOMED (Systematised Nomenclature of Medicine) system. Again, there were many database packages available in the market such as PARADOX from Ansa Software, USA, R:BASE 5000 from Microrim Incorporation, USA, and DBASE III from Ashton-Tate, USA. DBASE III was selected partly because of the ease of use and partly because some academic members were already familiar with DBASE 11 on their own APPLE-compatibles. All academic staff in histopathology involved themselves in data entry to ensure accuracy. This strategy worked very well because an opportunity was given for those academic staff who were not previously exposed to computing a direct involvement and errors of data entry were cut down to a minimum. Although data entry was a dull chore, there was immense satisfaction when the database was subsequently used for retrieval of data. This practice is continued today.

Statistics were often used in the Department. This ranged from compilation of student marks and simple statistical evaluations on them to more complicated analysis of research data obtained from the bench or field studies. There were very few packages available for scientific use at the personal computer level. Giants like SPSS (SPSS Incorporation, USA) were expensive and not available. The ABSTAT statistical package from Anderson-Bell, USA, was selected for its simplicity and versatility. It was originally written for the APPLE-compatible and later adapted for use for the IBM personal computer.

SYSTEM ACQUISITION

When the tender for the system was advertised, there were many bidders. The larger companies were interested, but as expected, the prices quoted were way out of the budget. There were companies of intermediate size, which gave comparable quotations and attractive discounts. Here, the choice was difficult. Many of these companies were new and without much of a track record. The company which offerred after sale support and maintenance services had an advantage over others.

The choice may be easier today. Those companies which have survived would have gained considerable experience in marketing and supporting their products and would include education and training as part of the deal. A visit to the company and talking to the support people would help to make the decision easier. In general, when procuring a system, one must consider (a) the financial status of the company (otherwise if the system fails while in the guarantee period, one, may not be able to procure a replacement); (b) the education and training offered as part of the package and (c) the after sales support and maintenance personnel. If the hardware is defective, it is most likely to fail within the first three months. After that the hardware is unlikely to give trouble for many years to come. However, in the event that it occurs,

one would like to have a trouble-shooting team to standby so that the system can be functional again as quickly as possible.

DESIGN, IMPLEMENTATION AND MAINTENANCE OF THE SYSTEM

To cater for the need of some 20 members of the Department, the system had to be designed to enable members to have a domain of their own. Although there were off-the-shelf programmes that helped one to navigate the hard disk, there was a simpler way of getting the hard disk organised. This was done through the disk operating system (DOS) itself and a few simple programmes written in IBM BASIC. This constituted the system shell.

I. *The Structure of the System Shell*

The shell consisted of a series of computer programme files written in PC-DOS (Personal Computer- Disk Operating System) and IBM BASIC (IBM Beginners All-Purpose Symbolic Instruction Code). The purposes of the shell are as follows:

1. When the system is turned on, it must be able to automatically do some house keeping jobs such as:
   a) asking for a password (for system security);
   b) creating a "virtual disk" or "RAM disk" within the computer memory to store program files of frequent use and for quick access;
   c) asking the user to provide the date and the time if the system lacks a battery operated internal clock;
   d) indicating in which subdirectories the program files are stored;
   e) activating a navigating programme to lead the user to the user's domain;
   f) displaying to the user the name of the current subdirectory in use.
2. When off-the-shelf programmes are used, the user is able to apply them within the user's domain and the data could be stored as data files in the user's area.
3. When the user is ready to switch off, there must be a reminder for the user to backup his/her data files to floppy disks for safe keeping.

The AUTOEXEC.BAT Batch File

The first purpose can be achieved by writing up a batch file called AUTOEXEC.BAT using WORDSTAR in non-document mode. This file must be placed in the ROOT directory. An example is shown below:

The Content of the AUTOEXEC.BAT File
echo off
basica pass
copy c:\wordstar\wsmsgs.ovr d:
copy c:\wordstar\wsovly1.ovr d:
copy c:\wordstar\mailmrge.ovr d:
cls
echo "Please enter date and time."
echo –
echo –
date
echo –
time
echo –
cls
path c:\dos;\batch;\wordstar;\dbase;\abstat
cls
basica code
prompt pg

The functions of the file are as follows:

1. It activates a password program (PASS.BAS) written in IBM BASIC language (called BASICA);
2. Ir copies three WORDSTAR overlay files to the virtual disk called D which can be created on installing the system;
3. It prompts the user to enter the date and time (this step may be deleted if a battery-operated clock is installed);
4. It sets the PATH for the system to search for command files for execution:
5. It executes a code program (CODE.BAS) written in IBM BASIC language (called BASICA) that will help the user to navigate the hard disk or reach the user's domain;
6. It sets the system prompt to tell the user which directory or subdirectories they are in.

The PASS.BAS Program File

A simple password program can be written in IBM BASIC to deter unwarranted snooping. After failure to enter the correct password after three attempts, the computer will emit an unpleasant bleep to force the intruder to switch off. However, it will certainly not frustrate a computer enthusiast attempting to break or bypass the program.

A simple password program may be written as follows:

The Content of **PASS.BAS** File

```
10 PRINT "PASSWORD PLEASE?"
20 A$=INPUT$(9)
30 N=N+1
40 IF N=3 GOTO 70
50 IF A$<> "PATHOLOGY" THEN 10 ELSE 100
70 PRINT "You are an unauthorised user !!!"
75 BEEP
80 GOTO 70
100 SYSTEM
```

The **CODE.BAS** Program File

An example of a navigating program written in IBM BASIC, called CODE.BAS is shown below. It allows the user to supply a code word known only to the user and the system administrator. The system will then bring the user to his/her domain where his/her files are kept. Alternatively, a code word meant for a specific purpose may be used to lead all users to the same domain such as the area where the histopathological database is stored.

The Content of the CODE.BAS File

```
100 REM This is a code reception programme.
110 PRINT "YOUR CODE PLEASE?"
115 X$=INPUT$(6)
120 CLS
125 REM The code is matched in the following segment.
130 IF X$="APPLES" GOTO 500
140 IF X$="ORANGE" GOTO 510
150 IF X$="PAPAYA" GOTO 520
160 IF X$="GRAPES" GOTO 530
170 IF X$="MELONS" GOTO 540
400 REM If the code matches, the user is directed to the
410 REM user's domain, otherwise, to the UKM Subdirectory.
420 GOTO 900
500 SHELL "CD\PATHO\CHEONG":SYSTEM
510 SHELL "CD\PATHO\KM":SYSTEM
520 SHELL "CD\HISTO":SYSTEM
530 SHELL "CD\PATHO\AO":SYSTEM
540 SHELL "CD\PATHO\SNA":SYSTEM
800 CLS
810 PRINT
820 BEEP:BEEP:BEEP
830 PRINT"You may use work area C:\UKM"
840 PRINT
850 PRINT"or you may try again by typing CODE and press ENTER."
860 PRINT
900 SHELL "CD\UKM":SYSTEM
910 PRINT
920 RETURN
```

The BATCH and DOS Subdirectories.

The second and the third purposes of the system shell can be achieved by utilising small program files called batch files that incorporate some PC-DOS commands. These batch files can be placed in the BATCH subdirectory. PC-DOS external commands which are distributed with the hardware can be placed in the DOS subdirectory.

A batch file comprises a sequence of commands which one expects the computer to execute in turn when one types the name of the batch file and press <Enter>.

Using the Batch Files

After the user has entered into his/her subdirectory, he/she may wish to do one of the following:

1. Call WORDSTAR to use the word-processing package;
2. Call DBASE III to use the database package;
3. Call ABSTAT to use the statistic package;
4. Call BASICA to do some programming with IBM Advanced BASIC language.

As BASICA command file is stored in the DOS subdirectory and the computer is given the PATH in the AUTOEXEC.BAT file, the basic language will be made available immediately for use at any subdirectory.

To use WORDSTAR will pose no problem as the computer is given the PATH 'to look for WORDSTAR command file and the overlay files are accessible anywhere since they are stored in the virtual disk in the memory. Thus typing in WS followed by pressing <Enter> will call the WORDSTAR programme.

Using DBASE III and ABSTAT would be tricky because these programmes are not written to recognise subdirectories. In order to enable the programme to be called at any subdirectory, The SUBST.EXE command file stored in the DOS subdirectory is used in the batch file as illustrated below:

The Content of the ABSTAT.BAT File

```
echo off
cls
subst F: C.\ABSTAT
F.
ABSTAT%1
C:
subst F: /D
echo –
echo"Get ready for BACKUP. <Ctrl> <C>
  to abort."
echo –
backup C:*.*A:
```

The command file SUBST.EXE when executed allows the user to use the programme files of ABSTAT from anywhere and to store his/her data file prefixed with C: in his/her subdirectory. The batch file is also written to automatically backup the user's data files to the floppy disk in drive A.

By substituting the word ABSTAT with DBASE, another batch file can be created to use DBASE III at any subdirectory. Since newer versions, for example DBASE 3 PLUS, are designed to recognise subdirectories, the subst.exe command is not necessary and can be deleted from the programme lines.

II. The Organisation of Subdirectories

In order to store programme files and data files separately, various levels of subdirectories were used. This allowed individual subdirectories to be accessed and backed up. The organisation of the subdirectories from the ROOT directory is shown below:

A UKM subdirectory was created as a scratch subdirectory for everyone to use. Any temporary file could be stored there. When one was prompted for a password, failure to supply it will automatically lead one to the UKM subdirectory.

A I'ATHO subdirectory was created and further sub-subdirectories made so that each user had a personal domain for storing data. Individual domains could be backed-up separately using floppy disks. In this way, the need for a backup tape for the whole hard disk was avoided.

Programme files stored in subdirectories were named after the programmes. Histopathology databases were stored in the HISTO subdirectory. It is estimated that for a 5000 records database, one would require about 3 floppy disks for backup.

The Organisation of the Subdirectories

Root Directory	Subdirectories	Sub-subdirectories
ROOT ----------	: – DOS	
	: – BATCH	
	: – WORDSTAR	
	: – DBASE	
	: – ABSTAT	
	: – UKM	
	: – HISTO	
	: – PATHO ----------	: – CHEONG
		: – K M
		: – AO
		: – SNA

CONCLUSION

The system has been implemented for two and a half years and the original objectives for acquiring the microcomputer system have been fulfilled. The most encouraging sign is that since implementation, eight academic members have acquired their own personal systems, some in the office and some at home.

One of the major uses was wordprocessing. It not only facilitated the writing of reports, time-tables, letters and teaching handouts, but also encouraged members to produce academic papers. When the undergraduate curriculum was reviewed and a new one introduced, the enormous amount of paper-work required was greatly facilitated by the wordprocessor. Furthermore, examination questions whether MCQ's or essays were now transferred to the Dean's Office in floppy disks rather than in typed-written form.

Storage of histopathology records in the computer, has made retrieval of data an easy process. This has enabled retrospective study of cases be done readily. With the implementation of postgraduate programmes, students required to write dissertations as part of their training, will be expected to benefit from the histopathological records stored over the last two and a half years.

Statistical evaluation of students' performance using calculators is now a feature of the past. Students' performance from continuous assessments to final examinations can be evaluated quite readily with the statistical package available. The package is equally useful to those engaged in research. In fact, the mainframe installed in the Faculty is now bypassed, freeing it to do the more mundane task of storing patients' records.

As the use of the computer becomes more intensive, the hard disk will soon run out of space for storage despite repeated culling of unused files. This year the hard disk has been updated to 30 megabytes and one hopes that this will suffice for the time being.

Over the years, there has been no major problems, partly due to the cooperation of the users. There were two occasions when the histopathological records were contaminated for no apparent reason. The backed-up disks saved the day.

Indeed, the introduction of the micro-computer has in some way modified our lifestyles and it is now recognised as an indispensable tool in the Department. I would have no hesitation in recommending the introduction of such a system to colleagues. With the price of the hard disk now at an affordable level, I would recommend a 20 megabyte hard disk to be incorporated from the start.