ABSTRACT
This paper describes a unique implementation of the Federal Government's Small Business Innovation Research (SBIR) Program that takes advantage of the best that micros and mainframes have to offer. The SBIR system, developed around dBASE III, freely exchanges data with other microcomputer software as well as with SAS and SAS/GRAPH on the mainframe. The system's initial data load is carried out from proposers' hardcopy submissions with the aid of an optical character reader. SBIR summary statistics and graphs are routinely produced by SAS under control of the micro which can emulate a TEK4010 device to receive SAS/GRAPH output. The procedure has many advantages including:

- ease of use - a user need not be familiar with either dBASE III or SAS
- speed of execution
- a superior user interface complete with colors and viewing
- the ability to produce charts and maps on both the IBM PC screen and ordinary, "unsupported" dot matrix printers, and
- extendability - the technique can be adapted to any situation which can benefit from the combined strengths of micros and mainframes.

THE SBIR PROGRAM
The SBIR program was created by an act of Congress for the primary purpose of encouraging and assisting the country's individuals and small businesses with innovative ideas to develop those ideas into commercial ventures. Any inventions or patents resulting from SBIR funding belong solely to the proposers. Congress has mandated that all major Federal agencies set aside a small percentage of their annual budget to fund the program. Thus, the super agencies such as the Department of Defense, have the largest SBIR budgets.

The annual program consists of three phases. Phase I provides seed money of around $50,000. The most promising Phase I projects progress to Phase II where the funding level is at about half-million dollars. Phase III is the commercialization of the projects - no SBIR funds are involved in this phase. The number of Phase I proposals handled by each agency per year depends on the agency but 1000 - 2000 is about average. An average of 8 - 15 percent of these show enough merit to move on to Phase II.

The SBIR program is a classic example of an application system that requires all of the tools of office automation. Apart from the usual proposal/project tracking, scoring and reporting system required, the SBIR administrator has to contend with such things as matching a group (usually 3 - 5) of expert reviewers for each proposal, communicating with those reviewers and their technical topic managers frequently, and preparing summary reports and statistics for Congress. The program requires quite a bit of form letter and mail label generation and communications by voice or electronic mail.

OVERVIEW OF THE SBIR REVIEW PROCESS
The process begins with the receipt of Phase I proposals which are assigned unique ID numbers in the mail room. The submissions are entered into the computerized tracking system, and acknowledgment letters are mailed to proposers.

The proposals are classified under one of 25 or so topics and mailed to the appropriate Technical Topic Managers (TTM) who has the responsibility of (1) identifying proposals that are "non-responsive" and (2) assigning 3-5 expert reviewers for each "responsive" proposal. The names, addresses and other particulars of each reviewer are communicated to the SBIR coordinator via electronic mail.

The reviewers are then logged into the tracking system, directly from electronic mail data, and matched with the appropriate proposal. The system generates letters to the reviewers and tracks the status of each proposal through the entire review process, including generating thank-you and reminder letters to reviewers.

Based on numerical scores assigned each proposal, Phase I winners are selected. These winners go into the Phase II database where the review process (and tracking system) begins anew.

The Phase I process takes about 4-5 months, and entails the production of daily reports, summary statistics, graphs and other analytical reports. Each year's data are archived and will be used again in the preparation of numerous "sunset" analytical reports at the expiration of the Congressional Act that authorized the SBIR program.

OUR APPROACH
While most agencies use either mainframe or mini-computers to track their SBIR proposals, we elected to go the route of the microcomputer and only use the mainframe (and then only because of SAS) for summary statistics and graphs. The
The system was originally designed using dBASE II on an IBM XT. Although the system worked well and satisfied all requirements, we expended a great deal of effort to program around many of dBASE II's notorious limitations, bugs and slowness. There were also some less serious difficulties with the micro-mainframe connection in that the hand-shaking was not as fluid as we had wanted.

All that has changed with the arrival of dBASE III. Along with it came some changes to the system that others may find useful.

The entire SBIR system is a menu-driven one and uses color and screen windows as appropriate. Figure 1 is the system’s Main Menu.

Where before we would enter proposal data by transcribing the information from proposers’ submission forms into dBASE formatted screens, we now capture the data electronically from the hardcopy forms with the aid of an optical character reader. The proposal form is a specially designed one so that such things as form instructions are printed in color (invisible to the OCR) and only information typed by the proposer is visible to the OCR. Proposers are allowed to use any one of four fonts (they may also mix them on the same form but no one ever does).

The data base is loaded with information from the proposal forms by attaching the optical reader to the microcomputer workstation. A communication program running under the control of the dBASE III tracking system captures the hardcopy data electronically and writes the data into a text file. The system then reads that text file, extracts the desired information and loads the data base with those. Errors generated by the OCR, e.g., from sloppy typing onto the proposal form, are later corrected by simply invoking the Edit module from the main menu.

We generate the large amount of form letters and mail labels (to proposers, reviewers and technical topic managers) with WordStar and MailMerge. A dBASE III program module handles the task of unloading user-specified data in a form directly usable by MailMerge. We could have used dBASE III’s new LABEL FORM facility to handle the generation of mailing labels but WordStar/Mailmerge is so much more versatile. In the past, when only a daisy-wheel printer was available to print all the letters and labels, it was common practice to leave the printer on overnight and even entire weekends. Our system now uses the HP LaserJet to print status and management reports as well as form letters. The LaserJet prints at 8 pages per minute and is so quiet we can actually hear phones from adjoining offices.

THE SAS CONNECTION

The system presently depends on mainframe-resident SAS to produce summary statistics such as the distribution and cross-tabulation of proposals by such variables as minority- or woman-owned businesses (PROC SUMMARY and PROC FREQ) and states (PROC GMAP). We could do something akin to SUMMARLY and FREQ right on the micro, but we are hard-pressed to come up with something as powerful as the SAS map graphics facilities.

The SAS connection is handled by a dBASE III program module which is a significantly enhanced version of GRAF/S that I described at SUGI ’83. It shows the user the fields in the data base, then asks for which ones to extract. It then asks the user (via formatted screens with appropriate Help screens) for the type of statistics, reports or graphs desired. Based on user responses the system then creates a bug-free SAS program intended for the mainframe.

Communication with the mainframe to upload the system-generated SAS program along with the extracted data, and receive the SAS output is handled by a PC-DOS batch (BAT) file which the system invokes using dBASE’s powerful RUN command. Any one of three communication programs can be used depending on the functions desired. If only SAS is to be used (i.e., only summary statistics are required) the program will generally use Crosstalk customized with an appropriate logon script, to automate the process. Kermit is the program of choice if the modem line is noisy.

If SAS/GRAPH is required, mainframe communication is initiated with Crosstalk for the script-driven logon and upload procedure. Crosstalk yields control to PC-PLOT3 as soon as SAS/GRAPH on the mainframe is invoked. PC-PLOT3 is a terminal emulation program that allows the IBM PC’s 4010 device to invoke a Tektronix 4010 device. SAS/GRAPH output can then be displayed on the screen, saved to disk for later recall, or dumped to an Epson-compatible dot matrix printer. PC-PLOT3’s emulation of TEK4010 is severely limited by the graphics resolution of the IBM PC. However, the program does come with a device driver for an HP plotter, so it is a simple matter to display SAS/GRAPH output in a resolution much higher than that afforded by a dot matrix printer.

All communication programs run from within the dBASE III system. The user returns automatically to the system’s main menu when the session with the mainframe is complete.

ADVANTAGES AND EXTENSIONS

As outlined at the beginning of this paper, the system offers many advantages. For one, it makes maximum use of the computing power available from both micros and mainframe, without requiring the casual user to know anything about dBASE III, SAS or communications. Anyone who can turn on the PC and the modem and make menu selections can use it without any training. For another, the system provides a way for obtaining SAS/GRAPH output on dirty-cheap, "unsupported" devices.

Clearly, the system does all it is designed to do with off-the-shelf, popular software and standard PC hardware. In that regard, anyone can develop a similar system with resources and equipment they already own. Those who are planning to implement a similar system are reminded that PC-DOS programs such as Crosstalk and dBASE III (but not WordStar) that can invoke an external program without leaving
the program itself has the ability to invoke DOS itself via the RUN COMMAND command. This loads a secondary copy of the DOS command processor, COMMAND.COM. One can chain back to the original program in a split second with the DOS EXIT command. This facility offers boundless possibilities.

REFERENCES


DATA ENTRY/EDIT

...... PROPOSAL ...... E) Go to Reviewer Menu
A) Add new proposals
B) Edit proposal record
C) Delete proposal record
D) Undelete proposal record

REPORTS

G) Change destination of report
H) Reports Menu

MAILMERGE

I) Generate MailMerge from Proposal Data base
J) Generate MailMerge from Reviewer Data base

OTHER

K) Fix (re-index) the data bases
L) Add TTM names/mailstop (DO THIS BEFORE YOU QUIT FOR THE DAY)
X) Exit this program

PICK A LETTER .....