ACBPS: A Budget Planning & Reporting System Using SAS/FSP

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The Cyanamid International Group of American Cyanamid Company in collaboration with ORI, Inc. designed, developed and implemented an interactive, generalizable, and menu-driven software system for the maintenance of financial data and the generation of profit & loss reports. This system is called the Budget/Planning System (BPS).

BPS replaces an ad hoc system of IBM PCs, calculators and 13-column accounting pads with a common system for collecting and analyzing financial data for each of the various organizational groups within Cyanamid International. BPS currently captures financial data from approximately 50 foreign subsidiaries (in their local currencies) plus numerous home office adjustments and additions. After consolidating the financial data, the system outputs reports in both local and U.S. currencies at various levels of detail, e.g. product groups, subsidiaries, selling markets (referred to as "profit centers"), and division or department summaries.

Most frequently, the above type of application has typically been a candidate for a Data Base Management System (DBMS). BPS, as illustrated in Figure 1, was implemented using an alternative strategy where we combined the impressive resources of SAS (ease of programming, Full-Screen Product (FSP), and data management capabilities), IBM TSO CLISTS, and IBM Systems Productivity Facility (SPF). The resulting system provides the ease of maintenance, ease of operation, and flexibility that have historically eluded end-users who are implementing their application using a traditional DBMS package.

Naturally, there were trade offs in using BPS in place of a DBMS. BPS does not have the interactive query language (IQL) of a traditional DBMS. However, it was felt that due to the sometimes very complex and flexible requirements of the reports, in addition to the fact that two or three hour turnaround is substantially better than the one to two day turn-around that the analysts were accustomed to, interactive reporting or an IQL did not become a design necessity. In fact, the absence of an IQL removed a needless level of complication, which resulted in a faster implementation of the software system.

BPS was successful in meeting the following requirements:

- User friendly
- Require minimum of user training
- Handle complexity of Cyanamid International currencies and detailed input data
- Interface with other Cyanamid systems, both input and output
- Conform to Cyanamid accounting code structure and also provide degree of security and integrity
- Flexibility - can be modified to reflect changing management patterns and future enhancements or organizational changes
- Maintainability - must be maintained and serviced by small staff, most without training in traditional DP languages
- Must be operational in six months at a development moderate cost

In the remainder of this paper, the design and implementation of BPS is described. Special attention will be given to how the three basic system components - SAS, CLISTS, and SPF, were blended into a single system. This discussion is divided into five topics:

- Data and the dataset design
- Supervisor
- Editing - interactive updating of data
- Report writing
- Report writing - an alternative strategy
- First-year results and future enhancements

1. DATA AND DATASET DESIGN

The data elements outlined below, provide that financial data for all time periods of a particular account/situation are on one record.

A. Keys (for querying, sorting and reporting)
   - Division or Department
   - Subsidiary or Company
   - Profit Center (Market)
   - Product Group (Sales and Cost only)
   - Income or Expense Item (Line Account Code)

B. Financial Data
   - "As Submitted" - B periods (Prior Year, Current Year Budget, Current Year, and Estimated/Actual, Next Year Budget, and four future Plan and Years)
   - "Current/Revised" - B periods

453
Both sets of financial data are kept in order to track changes during the budgeting process. Only the Current/Revised data is altered, the "As Submitted" is for reference purposes and helps when reporting back to the subsidiaries on the changes to their original submissions.

The financial data is kept in the local currency of the subsidiary or company. A currency conversion table is maintained to make conversion to U.S. Dollars when necessary.

2. SUPERVISOR

BPS is written in SAS and the various modules are stored in a source code library. One method to operate this system might be for the user to manipulate these modules. This would require considerable user training in SAS as well as other user interface computer commands. Since this was one of the conditions we were trying to avoid in the design of the BPS, a system supervisor composed of TSO CLISTS which control SPF menus was developed, as illustrated in Figure 2.

The user selects options from these menus which in turn execute the necessary SAS modules stored in the source code library. All applicable file allocations are also done at this time by the supervisor. For instance, to produce a report the user indicates: which prewritten report they want; the level of aggregation (using keys); number of copies needed; and to which printer should the output be directed. On the other hand for editing the data base, the user simply indicates who they are (i.e., Name, Division, and Company). Then the Supervisor selects the appropriate data base for the user and executes the necessary SAS/FSP (PROC FSEDIT) modules for interactive editing.

3. EDITING-INTERACTIVE UPDATING OF DATA

The editing function is performed using FSEDIT, as illustrated in Figure 3. The user changes the financial data by first overwriting it with a new value, and second, setting a flag to indicate the nature of the change:

- **N** - No update to the specific field (default flag is N for all fields).
- **R** - The new value should be a direct replacement for the original value.
- **A** - The new value should be added to the original value.
- **S** - The new value should be subtracted from the original value.
- **M** - The new value should be multiplied by the existing value.

In addition to changing the data, the user also can indicate a "change number" and a description "reason for the change". This information along with the changes are stored in a separate audit trail file which keeps a record of each data base change.

To locate the applicable record, the user most often uses the "observation number". A printout of the data base, by profit center/market, with the observation number ranges can be obtained by the user as one of the report options. Also, the FSEDIT "Find" command is another alternative to locating a certain record.

The implementation of the edit update process is described in another paper presented here. "A Generalized Interactive Full Screen Edit System Using SAS Software", describes the general techniques that were used.

4. REPORT WRITING

The user is provided with a listing and sample printouts of about 30 or so prewritten reports. The selection was made on user needs as well as corporate requirements. These reports include:

- Company
- Profit Center/Market
- Product Group Details
- Division/Department Summaries
- Special - Audit Trail, Datasets

The standard report layout has time periods across (columns) and financial elements (rows) down the page, in local or U.S. currency. However, there are variations which also include analytical columns (Percent of Sales Ratios or Growth Rates). In addition, a limited number of "Spread Reports" are included in the selection. In this type, the columns are Companies or Profit Centers which add across to a Divisional total for one time period.

The reports were written using SAS's COMPUTAB. This method was chosen because of Cyanamid's familiarity with this procedure, the ability to modularize the commands, and the lack of time to learn other procedures. Rows Statements, RowcalcS, Columns Statements, and ColumncalcS were each stored in various program modules.

The structure for a typical report program is illustrated in Figure 4.

Therefore, the design of any new report is largely a selection of the applicable Row and Column Modules from the basic set of modules already written.
5. REPORT WRITING - AN ALTERNATIVE STRATEGY

Another mechanism for reporting was also developed. A function which allows users to interactively define how report lines are calculated was developed. This capability is functional equivalent to what exists in many spreadsheet type systems. It includes the following three components: definition of master account lines; definition of financial reports; and generation of summarized accounting account lines and report definitions.

The first function controls data using master the integrity of the master list of account lines (input, calculated or header) that may be defined or used in any financial report. These master account line definitions are stored as a SAS data set which is updated through FSEDIT.

Potential account lines for inclusion in any report are defined through a line number (LINE). The account lines themselves may correspond to “input” account codes “header” lines or “calculated” lines. Account Lines which correspond to “input” account codes, are defined by associating the proper ACCTCODE with the appropriate LINE value. “Header” Lines allow for the addition of “intermediate” level title lines if required. They have no numerical data values associated with them, only a report Stub. For “calculated” Lines, the “formula” for the calculation is defined in the ACCTCODE field.

“Calculated” Lines are defined using the following rules:

- All calculations must be defined in terms of valid LINE values (i.e., line numbers).
- Calculations may be defined as a sequence of actions or subtractions of LINES.
- Individual LINES in a calculation may have a multiplication factor applied to them.

These rules are best illustrated by examples:

Desired Calculation Syntax
\[1 + 2 + 3\] \[1 + 2 + 3\]
\[9 + (10 \times 11) + .5\] \[9 - 10 \times .5 - 11 \times .5\]

The LINE numbers referenced in a calculation may be calculations themselves. For example, if LINE 1 is \(2 + 3\) and LINE 5 is \(4 - 1\), the user may specify the calculation for Line 5 as \(4 - 1\) rather than \(4 - 2 - 3\).

The master list of account LINES with their definitions are be easily maintained through the SAS FSEDIT procedure.

Once the master account lines are defined, multiple report types can be defined by specifying for each report a different subset of the previously defined master account lines. For each report, the list of lines it contains is stored in a SAS data set that is updated through FSEDIT.

The report definition mechanism gives the user to define the formats of many reports, the update stage allows addition/deletion of lines for each report. The lines specified may be input account codes, calculated lines, or header lines. For a Line that is calculated, the user need only give the line number which was previously defined to be the appropriate computation for the line to be included in a report.

A generalized MACRO (SAS 79) was developed to facilitate the development of highly sophisticated SAS financial report programs using the master list of account Lines (generated from the account Line definition function Master Compile); the master report list definitions input lines (generated from the master set of report definitions function Report Compile); and the “Current Master” or “As Submitted” data base to create a data set composed of all combinations of selected account lines by each organizational group, i.e., Department, Profit Center, and Company. All the matching and table look-up of these master lists and data are performed within SAS "macro-driven" procedures and data steps. Any specified data fields can be summarized by account lines within all combinations or organizational groups.

During any report program designed by the user, the user can specify the variables and data set or collection of data sets to be used. The user can also select from the current master list of report account lines the specific set of account lines, by choosing which report, the function is to use when creating the output data set. The method for assigning these attributes within the program is through the use of SAS "macro statements" before invoking the function.

Using the output data set financial statements can be prepared by simply using PROC PRINT. More sophisticated/complex reports can be generated through the use of SAS FILE & PUT statements.

6. FIRST YEAR RESULTS AND FUTURE ENHANCEMENTS

BPS was completed on time and was used during the fall 1983 budgeting and planning cycle. The successful implementation of BPS illustrated that SAS systems can be flexible and powerful enough to perform many of the data management functions of traditional DBMSs.

The initial operation of BPS was not without any problems. However, the ease of the SAS language made it possible to correct or make changes to the program, quickly and without interrupting the user.
For the future, we have a sizeable list of proposed enhancements as suggested by us and also the users.

Some of the enhancements that we are considering:

- Improving and redesigning certain report formats
- Take advantage of the new SAS MACRO language version. BPS was written in SAS 79.6
- Improve data input systems
- Improve running and cost efficiency
- Provide prewritten graphs
- Automate overhead expense allocations
- Price/Volume/Mix analysis

FIGURE 1

BPS SYSTEM DIAGRAM: SUPERVISOR CONTROL

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**FIGURE 2**

1984 INTERNATIONAL BUDGET PLANNING SYSTEM

SELECT OPTION \[ \rightarrow \] 1

1. EXIT — EDIT/ADD PLANNING DATA
2. REPORT — SUBMIT BATCH REPORT
3. ALLOCATE — ALLOCATE COST (CSIA DEPARTMENTS ONLY)

X EXIT — TERMINATE USING LIST/LOG DEFAULTS

ENTER DEPARTMENT NUMBER \[ \rightarrow \] XXXXX

**FIGURE 3**

PBEDIT SCREEN MODIFICATION

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>SCREEN 1</th>
<th>OBS 120</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DATA CHANGES OR ENTRY</th>
<th>—</th>
<th>CEIA BUDGET &amp; PLANNING SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURRENCY</td>
<td>AMOUNT</td>
<td>TYPE CHANGE</td>
</tr>
<tr>
<td></td>
<td>1988 DEM</td>
<td>&quot;TYPE CHANGE&quot; KEY</td>
</tr>
<tr>
<td>PLAN YEAR 6 (1986)</td>
<td>300</td>
<td>N</td>
</tr>
<tr>
<td>PLAN YEAR 4 (1987)</td>
<td>200</td>
<td>N</td>
</tr>
<tr>
<td>PLAN YEAR 3 (1988)</td>
<td>200</td>
<td>N</td>
</tr>
<tr>
<td>PLAN YEAR 2 (1989)</td>
<td>270</td>
<td>N</td>
</tr>
<tr>
<td>PLAN YEAR 1 (1990)</td>
<td>240</td>
<td>N</td>
</tr>
<tr>
<td>CURRENT YEAR (1990)</td>
<td>391</td>
<td>N</td>
</tr>
<tr>
<td>BUDGET</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>PRIOR YEAR (1992)</td>
<td>196</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ACCOUNT LINE (ACCT)</th>
<th>PROFIT CENTER (PCTR)</th>
<th>COMPANY (CMP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-200-200</td>
<td>1999</td>
<td>259</td>
</tr>
<tr>
<td>ADMIN EXP.</td>
<td>GERMANY</td>
<td>CY GIBRTH</td>
</tr>
</tbody>
</table>

CHANGE NUMBER ______________________ REASON FOR CHANGE ______________________

457
REPORT-WRITING

USER

REPORT MENU

REPORT WRITING

WHICH REPORT
SORTED BY WHICH KEYS
PRINTED AT WHAT LOCATION

REPORT SELECTED

WRITING REPORT

BPS DATABASE

FOREIGN CURRENCY CONVERSION TABLE

458