The installation of a new software package can be a difficult task in any organization. During the installation phase, many technical problems can arise. The problems can complicate the installation, but eventually, the system is ready for use. It is at this point that an even greater problem surfaces: achieving user acceptance. The factors that affect user acceptance are varied and may differ from one organization to the next. Two factors that aid in achieving user acceptance involve establishing and maintaining the interest level of the user, and offering a system that is easy to use.

During the past year, the interest in computer generated graphics has increased significantly, particularly with the financial, marketing, and sales departments. Graphics are viewed as an effective method of visualizing and representing information that might otherwise be reviewed by reading through a voluminous report. Management views graphics as a viable way of analyzing results and trends in a manner far less time consuming than that of reviewing large reports. With this in mind, establishing and maintaining the interest level of the user community was not a problem. Rather, the opposite was the case, users wanted the graphs immediately, if not sooner.

The second factor affecting user acceptance deals with the ease with which a particular software package can be used. Users have traditionally avoided, or completely refused to get involved with, any "program development". The fear of operating various terminals and the fear that they will do something wrong with the software account for some user's refusal to get involved. Others feel that this is a waste of their time. In order to reduce the apprehension on the part of the user, MIS professionals must offer an alternative that is both technically sound and easy to use.

When SASGRAPH was installed, MIS personnel reviewed the user guide and through use became familiar with the various statement formats and options available in SASGRAPH. Through project work that included graphic output as part of the system, MIS personnel developed a firm understanding of the SASGRAPH system and were able to utilize it effectively. An important fact to remember, however, is that the MIS professional has had the training in the use of these types of packages; the user has not. Also, the MIS group may use SAS or SASGRAPH routinely on a daily basis; the user will use it occasionally. Also, all users do not reside at the same facility. There are fourteen plants in ten states, six sales regions in six states, and a headquarters operation that must all be supported. The geographic location of these facilities makes on-site support by MIS too difficult and expensive.

Within the organization the graphics area has been divided into two distinct functions, production graphics and non-production graphics. Production graphics are those graphs which are produced on a routine basis from data that resides in existing applications. This would include graphs of marketing and sales data, financial data (including general ledger data), personnel data, and various transportation and distribution data. The non-production function deals with the graphics that are required for a presentation. The presentation may be internal or possibly used outside the organization to customers and other organizations. These graphs are generally used one time and then discarded. The areas of use include budget and forecast presentations, capital spending reviews, customer and sales meetings, long range plan reviews, etc. In many cases, the user requires a quick response to their request with the output produced either on 35MM slides or transparencies. Regardless of the category of the user request (production or non-production), the user has the option of producing the graph on paper, transparency, 35MM slide, tape cassette, or using the graphics terminal itself. Currently, over one hundred graphs are produced on a monthly basis in the production environment. The non-production activity is greater, with two hundred graphs being processed between 10/15/80 and 12/1/80. Estimates indicate that the non-production volume will remain constant, while the production volume will increase to over one hundred and fifty graphs monthly, by mid-1981.

Current MIS staffing levels cannot handle the volume of non-production graphs noted above. To provide the user areas with the required level of support, a system was developed that would make the development of graphs a simple operation, even for the occasional user. The system that was developed utilizes an in-house developed package called SMS (Screen Management System) which provides the capability of developing formatted 3270 screens. These screens are then interfaced to a COBOL program which is used to translate the user request into SASGRAPH statements. The system incorporates three procedures in SASGRAPH: GPLOT, CONLIDE, and GCHART. The system reduces development time, performs various edits required by SASGRAPH, and is easy to use by both MIS personnel and the occasional user. The system assumes that the user has never seen, or may be only vaguely familiar with SASGRAPH; and therefore, the user need not
know the format of the SAS instructions. The system also provides for the retention of the instructions so that it can be tested or modified at a later date. This particular software package has enabled MIS to train novice timesharing users, who do not know SAS or SASGRAPH, to develop their own non-production graphs.

SAS/SMS Interface

The SAS/SMS Interface is a pre-processor for SAS/GRAPH which allows users to use TSO (Time Sharing Option) to create both the commands and files required to produce slides and charts.

The system has been developed for the Tektronix 4027 color graphics display screen and the Tektronix 4663 two-pen plotter. It will be expanded to other devices and will be updated as new equipment becomes available.

The format and syntax of the screens are oriented toward the non-MIS person and the infrequent user. The emphasis always is on a system which is easy to use with numerous default options.

Types of Graphics

The following types of graphics can be produced using the system:

Slides
- Text only

Pie Charts

Vertical & Horizontal Bar Charts
- Simple
- Comparative (side by side)
- Stacked (sub-divided bars)

Plots (1 to 4 lines)
- Single or multiple lines
- Needle
- Regression analysis with/without confidence limits

Exhibit 1. User describes what action to take, gives an identifying number, describes the type of graphics to be created and gives a short description.

ACTION CODE ===> C
C CREATE A NEW PROGRAM
X TO TERMINATE

MODIFY AN EXISTING PROGRAM
M GENERATE A NEW PROGRAM FROM AN EXISTING PROGRAM

OLD PROGRAM NAME =========> G
NEW SCREEN NAME
THREE CHAR SYSTEM CODE ===> SUM
TWO DIGIT SEG NUMBER ===> 21
DIVISION NUMBER =========> 349
CHART OR SLIDE =========> C
SCREEN OR PLOTTER =========> S
TYPE CHART =========> V
IF ACTION CODE = C ENTER
PROGRAM DESCRIPTION =========> STACKED BAR CHART

CHART OPTIONS:
FMC
SAS/GRAPH INTERFACE

FMC
SAS/GRAPH INTERFACE
Exhibit 2. User defines color, height and font values for Title, Footnote and Note Lines; default values are provided.

MODIFY THE APPROPRIATE DEFAULT ATTRIBUTES

0 HEIGHT OF THE NOTE FONTS ARE: ====> 2 (SLIDE ONLY)
1 MAJORITY OF THE NOTE FONTS ARE: => COMPLEX (SLIDE ONLY)
2 MAJORITY OF THE NOTE COLORS ARE: => MAGENTA (SLIDE ONLY)
3 HEIGHT OF TITLE ONE LINE IS: ===> 2
4 FONT FOR TITLE ONE IS: ============> TRIPLEX
5 COLOR FOR TITLE ONE IS: ============> RED
6 HEIGHT OF OTHER TITLE LINES ARE: => 1
7 FONTS FOR OTHER TITLE LINES ARE: => SIMPLEX
8 COLOR FOR OTHER TITLE LINES ARE: => GREEN
9 HSIZE===================================> 10 (PLOTTER ONLY)
0 VSIZE===================================> 08 (PLOTTER ONLY)

CHANGES MAY BE MADE TO THE EXCEPTIONS ON FOLLOWING SCREENS

Exhibit 3. User enters text for Title and Footnote lines. Modifies font, color and justify values if different from default values.

<table>
<thead>
<tr>
<th>TITLE</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRIPLEX R J= C TITLE==&gt; F M C</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>FOOTNOTE</td>
<td>FOOT</td>
</tr>
<tr>
<td>FONT2</td>
<td>CLR</td>
</tr>
<tr>
<td>SIMPLEX G FJ= C FNOTE==&gt;</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
<tr>
<td>SIMPLEX G C ::</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 4. User defines color, axis and label values; blanks are valid default values. MULTICO indicates chart is multi-color.

CHART OPTIONS AVAILABLE

*** PIE CHARTS ***
*** VBAR/HBAR ***

COLOR1=> MULTICO COLOR2=> MULTICO

FILL=> SOLID AXIS=>

**** G PLOT OPTIONS ****

COLOR......IF NOT MULTI COLORED ENTER A VALID COLOR (SEE ABOVE).
FILL......MUST BE X IF USING THE PLOT.
AXIS N....VERTICAL AXIS RANGE EG -10 100.
VAXIS......RANGE ON VERTICAL AXIS EG 00,00 TO 0.90 BY .10
Exhibit 5. User enters field names and data. Number of columns of data depends on type of chart.

<table>
<thead>
<tr>
<th>COL 1 NAME</th>
<th>COL 2 NAME</th>
<th>COL 3 NAME</th>
<th>EXAMPLES: DIVISION, YEAR ETC.</th>
<th>USE WHEN MAKING A COMPARATIVE CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>YEAR</td>
<td>DIV</td>
<td>VALUE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COL 1.</th>
<th>COL 2.</th>
<th>COL 3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>DIV-1</td>
<td>46.6</td>
</tr>
<tr>
<td>1979</td>
<td>DIV-1</td>
<td>43.9</td>
</tr>
<tr>
<td>1980-FDR</td>
<td>DIV-1</td>
<td>33.8</td>
</tr>
<tr>
<td>1981-PLN</td>
<td>DIV-1</td>
<td>45.6</td>
</tr>
<tr>
<td>1978</td>
<td>DIV-2</td>
<td>1.5</td>
</tr>
<tr>
<td>1979</td>
<td>DIV-2</td>
<td>11.2</td>
</tr>
<tr>
<td>1980-FDR</td>
<td>DIV-2</td>
<td>7.0</td>
</tr>
<tr>
<td>1981-PLN</td>
<td>DIV-2</td>
<td>13.2</td>
</tr>
<tr>
<td>1978</td>
<td>DIV-3</td>
<td>24.3</td>
</tr>
<tr>
<td>1979</td>
<td>DIV-3</td>
<td>38.2</td>
</tr>
<tr>
<td>1980-FDR</td>
<td>DIV-3</td>
<td>28.2</td>
</tr>
<tr>
<td>1981-PLN</td>
<td>DIV-3</td>
<td>24.0</td>
</tr>
</tbody>
</table>

NOTE: COL 1 DATA MUST BE ALPHABETIC.
LAST COLUMN WITH DATA MUST BE NUMERIC.
ENTER: 1 TO 7 DIGITS PLUS DECIMAL POINT OR 1 TO 8 DIGITS.
DECIMAL POINT IS OPTIONAL.

Exhibit 6. User indicates name of bar (Col. 1 or Col. 2), Type of chart, whether multi-patterned and whether a legend is desired.

<table>
<thead>
<tr>
<th>GROUP 1.</th>
<th>GROUP 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GROUP 1.</td>
<td>GROUP 2.</td>
</tr>
<tr>
<td>1... YEAR</td>
<td>2... DIV</td>
</tr>
<tr>
<td>NAME OF BAR IS=&gt; 1</td>
<td>ENTER 1 OR 2</td>
</tr>
<tr>
<td>TYPE OF CHART=&gt; 3</td>
<td>ENTER 1, 2 OR 3</td>
</tr>
<tr>
<td>MULTI PATTERN=&gt; Y</td>
<td>ENTER Y OR N</td>
</tr>
<tr>
<td>LEGEND=&gt; Y</td>
<td>ENTER Y OR N</td>
</tr>
<tr>
<td>FREQ=&gt;</td>
<td>REF=&gt;</td>
</tr>
<tr>
<td>** 1..SIMPLE **</td>
<td>** 2..COMPARATIVE **</td>
</tr>
</tbody>
</table>

Exhibit 7. User enters color and pattern for each bar sub-division.

<table>
<thead>
<tr>
<th>COLOR</th>
<th>HATCH</th>
<th>AVAILABLE HATCH OPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED</td>
<td>R1</td>
<td>X1 THRU X6 CROSS MATCH XXX</td>
</tr>
<tr>
<td>BLUE</td>
<td>X1</td>
<td>SLANT FROM LEFT ///</td>
</tr>
<tr>
<td>MAGENTA</td>
<td>R1</td>
<td>SLANT FROM RIGHT ///</td>
</tr>
<tr>
<td>GREEN</td>
<td>L1</td>
<td>SOLID E EMPTY</td>
</tr>
</tbody>
</table>

NOTE: 1 THRU 5 INDICATE INCREASING THICKNESS OF HATCH LINES
Exhibit 8. End of chart. User indicates whether to terminate the TSO session or proceed to additional slides or charts.

```
::: SUM21349 HAS BEEN LOADED :::
::: TO RESTART :::
::: MOVE CURSOR TO SELECTION DESIRED :::
::: 1 TERMINATE THIS SESSION :::
::: 2 CREATE MORE SAS PROGRAMS :::
::: 3 :::
::: 4 :::
::: 5 :::
::: SUM21349 HAS BEEN LOADED :::
::: TO RESTART :::
::: MOVE CURSOR TO SELECTION DESIRED :::
::: 1 TERMINATE THIS SESSION :::
::: 2 CREATE MORE SAS PROGRAMS :::
::: 3 :::
::: 4 :::
::: 5 :::
```

Exhibit 9. Generated SAS/GRAPH commands and data for a stacked bar chart.

```
*** TSO FOREGROUND HARDCOPY ***
DSNAME=FM.CG,T35A,GRAPHP \SUM21349

OPTIONS DEVICE=TEK4027 BAUD=1200 HST7E=10 VSIZE=08 COLORS=IR R G B Y W C M;
*STACKED BAR CHART:*
DATA SASDATA:
INPUT YEAR $ DIV $ VALUE ;
CARDS:
1978 DIV-1 46.6
1979 DIV-1 43.9
1980-FOR DIV-1 33.8
1991-PIN DIV-1 45.6
1978 DIV-2 1.5
1979 DIV-2 11.2
1980-FOR DIV-2 7.0
1991-PIN DIV-2 13.2
1978 DIV-3 24.3
1979 DIV-3 30.2
1980-FOR DIV-3 28.2
1981-PIN DIV-3 24.0
1978 DIV-4 9.0
1979 DIV-4 42.7
1980-FOR DIV-4 6.1
1981-PIN DIV-4 7.5
1
PROC GCHART;
VAR YEAR / SUBGROUP=DIV SUMVAR=VALUE ;
PATTERN1 C=RED V=RI;
PATTERN2 C=BLUE V=XI;
PATTERN3 C=MAGENTA V=X2;
PATTERN4 C=GREEN V=LI;
RUN;
```
**SUMMARY**

This project is seen as a step forward in extending the use of data processing in a meaningful way to the larger user community.

With the SAS/SMS interface anyone will be able to produce slides and charts without relying on technical experts.
STATISTICS (GLM)

CHAIRMAN:
Kirk Steinhorst, University of Idaho