INTRODUCTION

Many businesses face increased demand for quality graphics output for both presentation and publication purposes. In evaluating methods to meet these demands, a corporate graphics center structure stands out as a good choice to provide the greatest access to a variety of graphics devices for the entire population of your company. This paper presents ideas related to the development of a corporate graphics center with emphasis on issues to be considered by those making decisions that will affect the structure and use of your center. Primarily discussed are the software necessary to meet the needs of your users. Other topics included are rationale for the corporate graphics center approach, choice of output devices, training, and support.

MEETING GRAPHICS NEEDS OF YOUR USERS

Each organization has its own particular uses for graphics output. However, generally speaking, most companies will find the needs of their users fall into two broad categories: presentation and publication.

Graphics output for presentation purposes typically includes any visual aids to be used during a speech, training session, sales presentation, and the like. Even more varied, graphics output for publication might include in-house presentations, handouts to accompany presentations, sales brochures, figures in books, and numerous other applications. Although color can enhance the impact of visual aids, much graphics output to be published is done in black and white to reduce cost of reproduction, particularly for documents used only inside an organization.

As is true of any organizational structure that is attempting to meet the needs of multiple groups of people, discussing the perceived needs with individuals of the organization may be the best way to understand the ideas or applications for which the center may be used. With this information in hand, you can better evaluate the available ways to meet your users' needs within the centralized structure. You can determine the software, hardware, training, and support required to meet these needs and then realistically decide whether you can answer all requests for graphics services or whether the value of the finished product from some requests will be worth the expenditure for equipment, salary, and supplies needed to meet the request.

RATIONALE FOR A CORPORATE GRAPHICS CENTER

After determining the needs of your users and recognizing the variety of those needs, applying the ideas supporting the development of a corporate graphics center to those will, in all probability, lead you to follow this centralized approach.

The diversity of graphics hardware available and the multiplicity of characteristics associated with each device makes the choice and use of graphics equipment less than straightforward. Briefly, some of these characteristics include varying ranges of line and page sizes, different horizontal and vertical resolutions and aspect ratios, and different ranges of colors and patterns. In addition the extensive options offered by most graphics software can make software use complicated, especially for beginners. The interaction of the software with each piece of hardware may require options specific to the characteristics of each device. Selection of colors, fonts, and patterns for each component of a visual is a large number of options to choose, particularly for users unaccustomed to designing so many pieces of information. The variety of formats used to display data graphically can also be overwhelming to users of graphics software. Given a limited familiarity with graphical design issues, other ideas that present difficulty to users include developing a layout for graphics output with consistency in color and design, placing realistic limitations on the amount of text for graphics used as visual aids, and producing visually pleasing graphics output for greater value or impact.

Although the previous considerations primarily affect the users and technical support staff of a graphics center, concerns focused on reduced costs due to centralization of hardware can be easily recognized by others in the organization who would not otherwise be affected by improved graphics facilities. By centralizing the location of hardware, duplication of equipment purchases can be eliminated. In addition, users will have greater access to a variety of equipment, as opposed to more limited access to equipment that is perceived to be "owned" by one or another group in an organization. Besides the issue of ownership, there is often easier access to centralized equipment due to better information and documentation on its use. Centralization also allows the consolidation of technical graphics hardware expertise. This can reduce costs by eliminating redundancy in areas of expertise for several employees.

Centralization promotes consistent and up-to-date training for support personnel. Again, this can bring about a reduction in costs through decreased personnel costs and increased efficiency in use of graphics equipment by users who have access to knowledgeable support staff.

The rationale presented above gives issues that can greatly affect the ease and efficiency of use of graphics equipment and also contribute to overall better organization of what can sometimes be a hodgepodge of equipment and expertise within a company. The next section of this paper addresses mechanisms for developing and maintaining this centralized structure through choice of software tools, necessary qualities or features of hardware, and establishment of training and support services.

SOFTWARE TOOLS

To meet the needs of the graphics center users, the range of software tools must cover technically unsophisticated to highly experienced graphics users. Systems designed with extensive front-end processing to make them user friendly and understandable must be available for inexperienced users. The advanced user will benefit from these systems as well because they reduce the iterative, trial-and-error nature inherent to graphics output development. However, to provide the flexibility and capabilities demanded by experienced users, it is also good to offer systems that give very limited intervention in creating graphics output. Experienced users can then take advantage of easy access to the equipment and support personnel, yet have total control over production of their graphics.

 Planned and completed software tools development for our graphics center has addressed both the levels of sophistication.
of our users and the variety of purposes for which our users need graphics output. These tools are described in the remainder of this section.

**Word Charts**

Using a menu-driven system, the user can enter the text to create graphics output in the form of word charts. The user's choice of formats and styles leads to a template appropriate for the layout of the graphics to be produced. The template guides the amount and placement of the text on the output, which eliminates the possibility of overcrowding.

The burden of choosing colors, fonts, size of lettering, and the like can be totally removed, reduced to a few choices, or expanded to numerous choices depending on the desired flexibility for the system. With any choices made available to the user, the system designer can ensure that the output produced by those choices will be readable and visually pleasing. You can eliminate graphics output that uses so many colors or combinations of fonts or so much text that it is distracting or unreadable by the audience.

The system we have designed to fulfill the requirements for production of word charts uses SAS/AF® and SAS/FSP® software to perform the front-end processing to increase user friendliness and make it easily understood by inexperienced users. SAS/GRAPH® software is used for the actual production of the graphics output.

Through a series of menus or fill-in-the-blank screens, users can select the tasks they need to perform — enter, edit, and output text — to produce graphics output. They are prompted for each step in the process of producing word charts including selection of output medium and overall format for a set of graphics output. Within each format, the user can choose from five template styles, set up as a series of PROC FSEDIT screens. Again, this gives the user realistic guides (and even limitations) on the amount and placement of text. Using the menus and templates requires no knowledge of SAS® software or operating system commands with the exception of naming a two-level SAS data set. In fact this information is explained in help panels accessed with the system.

The following table and set of figures demonstrate a typical sequence for producing a set of graphics.

**Table 1** Word Chart Sequence

<table>
<thead>
<tr>
<th>Process</th>
<th>Function</th>
<th>Screen</th>
<th>Format</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTRY</td>
<td>choose primary task</td>
<td>menu</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>name data set to be created</td>
<td>blank</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>choose output medium</td>
<td>menu</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>choose format</td>
<td>menu</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>enter text</td>
<td>data entry</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

After the initial data entry session, the user may choose to output text to a line printer for proofreading or enter additional text. However, we are showing the output process as the final steps of the production sequence (so as not to be repetitive). The editing process begins also at the primary task menu.

**Figure 1** Screen for Primary Task Menu for Producing Word Charts

**Figure 2** Screen for Naming (Creating) Word Chart Data Set

<table>
<thead>
<tr>
<th>Command</th>
<th>Where Will We Store Your Slides?</th>
</tr>
</thead>
<tbody>
<tr>
<td>=&gt;</td>
<td>Please enter the two-part name of the SAS data set to contain the visuals you are creating. =&gt;</td>
</tr>
<tr>
<td>Warning:</td>
<td>If the data set entered above already exists, its contents will be completely rewritten. If you want to edit an existing data set, exit this screen and select option 2 on the primary menu.</td>
</tr>
<tr>
<td>Generation of visuals cannot continue unless the library of the SAS data library for the above data set has been allocated. You can, however, use the 'X' subcommand to issue an ALLOCATE statement on the command line at the top of this screen.</td>
<td></td>
</tr>
<tr>
<td>For more information on using the 'X' subcommand, press HELP or enter HELP on the command line.</td>
<td></td>
</tr>
<tr>
<td>If you want to return to the primary menu or exit this program, type CANCEL on the command line and press ENTER to exit.</td>
<td></td>
</tr>
<tr>
<td>Press ENTER to continue</td>
<td></td>
</tr>
</tbody>
</table>
Figure 3 Output Medium Menu

Select Option:  
1. 35 mm slides (landscape - wider than tall)  
2. 8.5" x 11" transparencies (portrait - taller than wide)  
3. Help - more information on output media  
4. EXIT OUTDOOR AID PROJECTION SYSTEM

Please select a medium from the list below.

Figure 4 Format Menu

Select Option:  
1. Format 1 - simple lists and optional bullets  
2. Format 2 - accented lists with rule lines  
3. HELP - what are the available formats?  
4. EXIT OUTDOOR AID PROJECTION SYSTEM

Please select general format from the list below.

Figure 5 Sample Data Entry Template

Command:  
EDIT SAS data set: WORK.SLIDES  
Screen 1  
Data 1

Figure 6 Screen for Naming (Re-accessing) Word Chart Data Set

Command:  
Modify or Add to Existing Set of Slides

Please enter the two-part name of the SAS data set containing the visuals you have created.

Warning: Modification of visuals cannot continue unless the library of this SAS data set has been allocated. You can, however, use the 'X' subcommand to issue an ALLOCATE statement on the command line at the top of this screen.

For more information on using the 'X' subcommand, return to the primary menu and access the MANUAL.

If you want to return to the primary menu or exit this program, type CANCEL on the command line and press ENTER to exit.

Press ENTER to continue.

Figure 7 Screen for Creating Header and Trailer to Identify Output

Command:  
Where are you located?

In order to identify your output, we need to know whether you are at the Institute office in Cary or Denver.

Enter your site:  
(A for Atlanta or D for Denver)

You may enter a label up to 30 characters to further identify this set of graphics output (for example, SAS-NAME.XML).

Enter label:  

If you want to return to the primary menu or exit this program, type CANCEL on the command line and press ENTER to exit.

Press ENTER to continue.

Figure 8 Screen for Naming (Identifying) Word Chart Data Set for Printing

Command:  
Preview or Produce Your Slides

Please enter the two-part name of the SAS data set containing the visuals you have created.

Warning: Production of visuals cannot continue unless the library of the SAS data set for the above data set has been allocated. You can, however, use the 'X' subcommand to issue an ALLOCATE statement on the command line at the top of this screen.

For more information on using the 'X' subcommand, press HELP or enter HELP on the command line.

If you want to return to the primary menu or exit this program, type CANCEL on the command line and press ENTER to exit.

Press ENTER to continue.
Nongraphics terminals can be used for every task necessary to produce high quality output. If the user wants to preview the output on a terminal, a graphics terminal is required. However, the option of printing the output on a line printer for ease in proofreading removes the necessity of viewing the output on the terminal before sending it to its final output device. Other options to preview output on less expensive graphics devices such as a black and white laser graphics device might also be chosen prior to output for the final product. Due to the use of a template for entering text, it is impossible to place text so that it overlaps or lies partially off the output medium. This significantly reduces the need to preview output in the exact form in which it will finally be produced. Once users are familiar with the system and have seen the finished product their text creates, they can begin to use the preview options less and less, except for proofreading from line printer output, and trust the system to create graphics output that will require no adjustments in placement of text.

Another feature our users enjoy is the ease of producing a set of graphics output that is consistent in appearance, even if multiple template styles are used. The choice of templates allows for differences between types of graphics output, lists, columns, and straight text, without violating overall consistency for titles, color, and so on.

A black and white (reduced) example of output from the word chart system is shown in Figure 13.
Enhancements to the existing word chart production system under consideration are additional formats and color choices, change to one additional font on each graphic, and better identification of each particular graphic.

Screen Image Capture

The ability to produce graphic output from nongraphic input serves many useful functions. Again, inexperienced users can produce quality graphic output without knowledge of SAS/GRAF software and operating system commands. Experienced users gain those same benefits as well as other simplified methods for capturing more sophisticated graphics or nongraphics information displayed on the screen.

In our screen capture system, all text images that can be displayed on the screen while the user is executing the SAS System can be saved and replayed through graphics devices and standard printers. That means, screen displays, containing text that is normally not easily printed, such as full-screen displays of PROC FSEDIT, SAS/AF directories, and display manager windows can be captured and replayed as graphics output or standard text. The user executes the SAS System while in ISPF (Interactive System Productivity Facility) from a specially designed panel. On the panel, the user can designate any SAS system options as desired or leave them to default to those set by the installation. The SAS display manager is invoked and a typical interactive SAS session is underway. The user can enter and process code and receive output in the same manner as normal. However, when any text image is displayed that the user would like to save, the user issues a command (or presses a preset function key) and the image is captured. When the SAS session is ended, a full-screen management/production panel is displayed. On this panel, the user can perform the following tasks: label the images for identification, sort the images, preview images, delete images, or select images for output to graphics device, standard printer, graphics catalog, or sequential or partitioned data set. Of course, graphics images cannot be printed on a standard printer. However, in addition to the printing options, text (interpreted as graphic images) can be directed to a graphics catalog. In addition, text images can be directed to sequential or partitioned data sets. This variety in manipulation of saved screen images makes this system a very powerful tool.

The next section of tables and figures demonstrates a typical full-screen capture sequence.

### Table 2 Full-Screen Capture Sequence

<table>
<thead>
<tr>
<th>Function</th>
<th>Screen Format</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>choose primary task</td>
<td>menu</td>
<td>14</td>
</tr>
<tr>
<td>execute SAS to display images</td>
<td>blank</td>
<td>15</td>
</tr>
<tr>
<td>manage captured images</td>
<td>selection</td>
<td>16</td>
</tr>
<tr>
<td>submit job to print graphics</td>
<td>blank</td>
<td>17</td>
</tr>
</tbody>
</table>

---

**Figure 14 Primary Task Menu for Full-Screen Capture System**

---

**Figure 15 Screen for Executing the SAS System**

---

**Figure 16 Screen for Managing Captured Screens**

---
Figure 17 Parameters for Batch Job to Print Graphics

Figure 18 Example Output from Capture System on Standard Printer

Figure 19 Example Output from Capture System on Graphics Device

Figure 20 Typical Interactive SAS Session Using Tool Kits

When applied, for example, to a situation for developing sample code, screens, and output for a document, this system greatly simplifies the process. An exact copy of the code as it appears in the display manager window, data entry screens such as PROC FSEDIT, and full-screen catalog directories can be included in the document with ease. Time spent in creating dummy examples can be eliminated.

Tool Kits

Tool kits allow users easy access to graphics hardware and let them devote their efforts toward the actual graphics design, not communicating with equipment. Although our tool kits were primarily designed for experienced users, many of our beginning SAS/GRAPH software users have found the use of a tool kit has simplified graphics production and removed the stumbling block of transmitting their data to a graphics device.

Example JCL for sending output to each piece of hardware is available to users executing in batch. For interactive processing, macros to allocate and free the appropriate SYSOUT files are maintained for each device. For either case, macros have been developed for setting GOPTIONS appropriate for each device and creating header and trailer graphics to identify output. By employing these tool kits, all that is left to the user is the SAS/GRAPH code needed for the actual graphic.

Using our tool kits, users refer to documentation for the names of the appropriate macros to use for their applications and insert them where needed. Figure 20 shows a typical interactive sequence.

Other Tools Under Consideration

The development of a front-end processor using SAS/AF software to interface with some of the SAS/GRAPH procedures is being considered. We think our inexperienced users would find menu-driven and fill-in-the-blank screens of great assistance in helping them operate such procedures as PROC GCHART, GCONTOUR, GMAP, GPLOT, GSLIDE, G3D, and G3GRID.
CHARACTERISTICS OF OUTPUT DEVICES

Apart from the service and cost issues such as reliability, load capability, purchase price, and cost to maintain, other issues related to characteristics of output devices need to be considered. Again, after evaluating the needs of your users, you must make decisions about the output mediums to be offered. Generally, choices include 35-mm slides, transparency film, and paper. In addition, the choice of color or black-and-white output for each type medium must be made. Not surprisingly, it is likely that you will find a demand for all of the combinations listed above.

Equipment that can meet as many needs as possible is best from a cost effective standpoint, for example devices that can handle paper or transparency film. However, to perform all the functions mentioned above, expect multiple pieces of hardware. In judging volume of graphics output, figure on output to increase dramatically as ease of access is improved through a centralized structure. Consider speed of the output devices. With your volume of output in mind, think about the time it will take on each piece of equipment to produce output and whether duplicate equipment will be necessary to handle that volume. Evaluate cost with an eye toward draft versus production quality output. In graphics output development, it is often necessary to preview output multiple times before creating the final copy. Devices that can be operated less expensively (particularly black-and-white laser graphics) but that can still provide a reasonable approximation of the final product can in the long run justify their purchase price by reduced cost in overall use.

TRAINING AND SUPPORT

A key to overall effectiveness and success of the corporate graphics center structure is training and support for its users. We incorporate extensive help panels in any system that is developed as a tool for our users, as well as provide written documentation. See Figures 21 and 22 for example tutorial panels. When on-line help is not feasible (as with the tool kit), complete documentation with working examples is a must. The availability of formal and informal training through courses and individual attention is important. The group responsible for performing your in-house user assistance needs a working knowledge of use of the graphics center.

CONCLUSIONS

This brief discussion of strategies we have used in developing our corporate graphics center shows that primary importance needs to be given to making a variety of well-supported software tools available to graphics users. Removing the mystery from being able to produce quality graphics in a relatively error-free manner goes a long way in helping users access and effectively use graphics equipment. It is not enough to have graphics equipment available. Users require tools designed to meet their graphics output needs that are flexible and straightforward to use. A centralized environment that encourages the development and support of such software will make your graphics center a considerable resource to the company.

SAS, SAS/AF, SAS/FSP, and SAS/GRAPH are the registered trademarks of SAS Institute Inc., Cary, NC, USA.