ABSTRACT
Caterpillar Inc. developed a supplier quality system that uses drilldown capabilities to provide information concerning a supplier's performance. The system was designed and developed internally for Caterpillar Inc. using SAS software. This paper focuses on the use of SAS software to develop a user interface that significantly reduces the time required to gather the data relating to a supplier's quality performance.

INTRODUCTION
A supplier's quality performance is critical to any business seeking to maintain high levels of customer satisfaction. Caterpillar Inc. has striven since 1985 to achieve one standard source to retrieve a supplier's quality performance. Part of achieving this goal was the development of the Supplier Quality Report Card (SORC) that monitors a supplier's total quality performance. SAS software was used to internally design and develop the application which provides drilldown capabilities for analyzing the quality data.

The SORC allows easy access to corporate DB2 databases and SAS data sets to monitor a supplier's quality performance by providing timely reports and graphs. This paper explains how the use of SAS software allowed the development of a user interface that significantly reduced the time required to access data related to a supplier's quality performance.

BACKGROUND
During the 1980's, the Supplier Quality and Purchasing departments realized the need to consolidate supplier's quality data into one central storage location instead of having different departments writing their own programs to access the data from source systems. This would allow purchasing and quality personnel easier access to the information and improve the overall accuracy for the reported information. The result was the creation of DB2 databases for storage with a menu driven system to retrieve the data. The menu system was created using Interactive System Productivity Facility (ISPF) panels, Command List (CLIST), and Query Management Facility (QMF). The data relating to quality includes receipt costs, rejection costs, quantities, nonconformance documents, supplier ratings for quality audits, warranty claims, complaints, and delivery performances.

With the development of this system, data access was notably improved. However, the system required over ninety menu, inquiry, and maintenance screens which made it difficult for the infrequent user to remember how to access the information that he desires. To reduce the need for navigation when inquiring on only one supplier's data, the Supplier Quality Report Card (SORC) was developed. SORC minimizes the need to remember menu and inquiry screen codes by substituting point-and-click drilldown capability. This significantly reduces keyboard input for specifying criteria and menu selections. Besides providing easier access to the data, SORC also provided graphical depiction of the supplier's data.

The SORC was originally designed to operate on mainframe computers for the MVS environment using SAS software for Release 6.07. The SAS software that the system uses include Base SAS®, SAS/AF®, SAS/GRAPH®, and SAS/ACCESS® Interface to DB2. SORC uses Screen Control Language (SCL) extensively for screen navigation, validation of input for errors, popup lists, and overall system development.

USER INTERFACE
The objective for the development of the user interface was to minimize the training required for the user to access the desired quality information. This was achieved by allowing point-and-click capabilities, reducing the number of menu screens required, and replicating the corporate systems menu, input screens, and function keys closely.

The first screen (Figure 1) requests the user to enter the supplier code or supplier name with the option of using wildcards.

Figure 1
If nothing matches the selection criterion, then an error message will appear at the bottom of the screen. If multiple suppliers match the input criterion, then a selection list will pop-up to select the exact supplier.

Once a specific supplier is determined, data is retrieved from 082 tables using the Structured Query Language (SQL) procedure pass-through facility along with information from SAS data sets. This information is then presented on a Supplier Quality Report Card screen (Figure 2).

The supplier report card screen provides a summary of the supplier's performance for either the past year or for the current year. On this screen the user can click with a mouse on attribute fields that are color coded. These attribute fields are defined with a single choice group and use the attribute list value to pass the selection to the SCL program. (Figure 3).

Based upon the CHOICE GROUP's value, the program retrieves the desired information. The user will then be presented with additional menu screens, data input screens, extended tables with certain variables defined for additional selection and drilldown, or screens that report the requested information.

The best example of this can be explained by detailing the process for retrieving a supplier's receipt and rejection information. The user would first place the cursor on "PREV 12 MONTHS RCPT/REJ" or "YEAR TO DATE RCPT/REJ" and click with his left mouse button. The next screen presented would be the Receipt/Rejection SubMenu (Figure 4).

Next, if the user places the cursor on the screen code "DA1" or types it in the next screen field the user would view an inquiry screen (Figure 5) to further qualify the selection criteria.

After specifying the criteria and pressing <ENTER>, the user would see monthly receipt and rejection information displayed in an extended table (Figure 6).

For further detail, the user would select the month desired and view receipts and rejection at the ident level (Figure 7).
If there are rejection dollars or pieces for a given item, the user can select the item and view a list of nonconformance documents (Figure 8).

The detailed rejection information is then accessed by clicking on the MRDR/QCIR number (Figure 9).

APPLICATION DEVELOPMENT

During the development, three critical areas needed addressed. These included the following:

1) Ability to drill down from extended tables with scrolling
2) Imitation of the current corporate system for printing
3) Creation of charts and graphs.

Extended Tables

Extended tables were very useful in the development of the application. However, a stumbling block was noticed when selecting a row from an extended table that required scrolling. The design required that after more detailed information was reviewed the user would then return to the extended table with the row that was previously selected at the top. To accomplish this a macro variable was created that stored the value for the row selected from the extended table. Then when returning from a lower level screen the row selected would be displayed as the first row instead of the first observation in the data set. The code that was used follows:

```plaintext
INIT:
TRMNUM=SYMGETN(TRMNUMROW);
IF !(TRMNUM = . OR TRMNUM = _BLANK_) THEN DO:
CAll TOPROW(TRMNUMROW);
CAll SYMPUTN('TRMNUM _CURROW,j;
END;
RETURN;
PUTROW:
IF (ISSELLCURROW,j) THEN DO:
CAll SYMPUTN('TRMNUM _CURROW,j;
END;
RETURN;
The above code stores the extended table row in the macro TRMNUM and if it is not missing or blank uses it with the CALL TOPROW Screen Control function to make that row the first row displayed upon return to the extended table.

Printing Reports

The corporate system allowed the user to press the PF9 function key to print reports on local and mainframe printers. Therefore, on any screen that provides the user with supplier's quality information, he can press the function key PF9 and a report routing screen appears. The report can then be routed to a local printer or a high speed mainframe printer. For a local print this is accomplished by using the following corporate developed macros.

%MACRO LPRTON(DEST=j);
%IF %SUBSTR(&SYSVER,l.l)=5 %THEN %DO;
%DMSCMD(X ESFALLOC FT25F001 DEST(&OEST)
RECFM(FBA) LRECL(133),WID=P)
PROC PRINTTO UNIT=25;
RUN;
%END;
%ELSE %DO;
DM "PGM";
```
The SORC provides easy access to a supplier's quality performance through a user-friendly information system that integrates SAS software. By employing point-and-click drilldown capability, the user is relieved from memorizing the screens required to access supplier data. This allows the user to route the information necessary for the Supplier Quality and Purchasing departments to accomplish their primary task of analyzing supplier quality performance.

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PORTING TO PERSONAL COMPUTER PLATFORMS

SORC was easily transported to both Microsoft Windows and OS/2 using SAS/CONNECT to move SAS catalogs and partitioned data set members from the MVS environment. After the transport of the application, minor modifications were required to the Screen Control Language to allow SAS/CONNECT remote access to the data. The major benefits gained by using the SAS System for personal computers are reduced usage of mainframe resources and improved graphics output by having access to attached personal computer output devices. Unfortunately, response time is longer when downloading large data sets.