Using SAS/AF® Software and ODS for Reporting and Analysis

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Abstract

Streamlining data analysis and reporting steps is critical for any organization to compete in the marketplace. However, these analytical and reporting tasks are often performed by individuals with little or no programming and/or statistical expertise. Consequently, decision makers are forced to base critical decisions on sub-optimal data. SAS/AF and ODS can be used to overcome this dilemma. In this paper, we demonstrate how these two powerful tools can bypass labor-intensive analytical and reporting steps, yet can be easily customized by the end user. SAS Programmers can make use of such tools to create user-friendly applications with a capacity to be effective across diverse departments.

Keywords: SAS/AF, ODS, PROC Report, PROC Tabulate, Statistics

Background

Information technology and globalization have revolutionized modern business. A byproduct of these advances is the proliferation of data and the increased speed of business. In order to survive and lead the competition, businesses need to constantly change to react to the market and the environment demands a pace of learning that requires a disciplined organization supported by Information Technology.

Supporting this disciplined organization, in part, involves providing decision makers with the information that they need to make crucial decisions. However, creating and maintaining such a disciplined organization is an arduous task. The reality is that knowledge is often processed inefficiently.

One common inefficiency is for workers without significant programming experience to analyze and report on data. Often these workers use popular data management and analytical tools (e.g., Microsoft® Access® and Microsoft Excel®, respectively). However, such tools are often only able to analyze a limited volume of data. Moreover, workers spend an inordinate amount of time manipulating data before it can be analyzed.

Another possibility is that relatively simple analyses and reports are performed by experienced programmers. Organizations are better served if these programmers addressed more challenging tasks. Such a refocus would also increase programmers' satisfaction with their work because they would personally benefit from improving their programming skills.

Output Delivery System (ODS) and SAS/AF can be used to overcome these inefficiencies. In this paper, we will demonstrate their joint capabilities. Specifically, how ODS and SAS/AF can streamline the reporting processes, without a loss in the quality of knowledge that is produced.

For the purpose of this demonstration, we will focus on hypertext mark-up language (HMTL) output; rich-text format (RTF) and printer output are also possible. In addition, we will concentrate on the ODS interrelation with PROC Report for its popularity and with PROC Tabulate for its diversity, but not with PROC Print (see Reference 1 for additional information on ODS).

Solution

To demonstrate the usefulness of the combination of ODS and SAS/AF, we present a hypothetical hospital, City Insurance. City Insurance maintains a large Data Warehouse (e.g., DB2, Oracle, etc.). However, it now wishes to track its surgical procedures and reallocate its resources, if needed. City Insurance instructs its Information Technology department to develop a reporting tool for its employees.

The Information Technology department decides to access City Insurance's medical claims database using the SAS Software. In PC SAS, it develops analytical programs, along with reports summarizing City Insurance's inpatient, outpatient, and pharmaceutical utilization. IT then develops a SAS/AF application, "Utilization Analysis Tool," that allows City Insurance's analysts to run these reports, by simply pointing and clicking buttons. This application then remotely submits the SAS programs to UNIX, while accessing partially summarized data from the Data Warehouse.

Figure 1 displays the application's main screen, where the analyst can choose one of three areas to investigate. Assuming the "Inpatient" button is clicked, the application displays options regarding City Insurance's inpatient utilization (Figure 2). We will focus on the "Create Reports" option, which leads us to the other focus of this paper: ODS.

PROC Report and ODS

The first output is a gender-stratified summary of the surgical procedures performed in 2001 (Figure 3). Information Technology enhances this report with ODS; the following code demonstrates the beginning of this code:

```
ODS HTML BODY='inpatientsummary.html';

PROC REPORT DATA=perm.endodata nowd
   style(REPORT)={background=red}
   style(HEADER)={foreground=blue background=white
         font_weight=bold font_size=2}
   style(COLUMN)={foreground=green background=white}
   HEADLINE HEADSKIP PS=60 PSPACE=10;
```

The above code initiates ODS and establishes global styles and structures for the generated table. The ODS output is presented in Figure 4.

The difference between the two outputs is dramatic. However, the format of the ODS-generated report is not static. That is, the SAS/AF application can incorporate a frame that enables the user to customize the color of every table element; the user's preferences can be passed via macros to the PROC Report.

There are other noteworthy aspects of the ODS-generated PROC Report presented in Figure 4. For example, the combination of the COMPUTE and PICTURE formats conveniently displays the percentages within the table

```
PROC FORMAT ;
   PICTURE PCT(ROUND)  LOW-100 ='009.99%';
RUN;


COMPUTE AFTER;
    GENDER='TOTAL' ; NETPCT=.;
ENDCOMP;
```

Another interesting aspect is the selection of the variables analyzed. Rather than focusing on surgical procedures and payments by gender, we could have easily incorporated other variables. For example, an analysis of diagnoses and associated co-payments by age could have instead been performed. This is possible using macro variables that are controlled by the user's input on the corresponding SAS/AF frame. This approach is advantageous because the report structure would remain the same, without duplicating programming code.

PROC Tabulate and ODS

Back to our hypotetical application. Based on the previous report, City Insurance administrators decide to investigate Procedures I, III, and IV. The application user then opts to focus on these three procedures, as well as age and gender stratification; PROC Tabulate is used to accomplish this (Figure 5). As before, the PROC Tabulate statement is supplemented to initiate and define the ODS output. Here is the beginning of the PROC Tabulate code:

```
%LET layout =
   background=white font_weight=bold font_size=2 ;

ODS HTML BODY='niceoutput.html';

PROC TABULATE DATA=perm.endodata
   s={foreground=green &layout};
  class surg_proc sex_mf age / s={foreground=blue &layout};
  classlev surg_proc sex_mf age
     / s={foreground=purple &layout};
  var patient netpay
     / s={foreground=black &layout};
```

```
keyword all sum
    / s={foreground=white &layout};
```

Notice that the code begins with the establishing the "layout" macro variable. This helps to maintain uniformity throughout this output. Rather than re-entering the same style commands, this macro variable can diminish the amount of coding and lessen the possibility of typographical errors.

In addition, we have incorporated a logo (i.e., stethoscope) using PREIMAGE:

```
box={label="Surgical Procedures by Gender"
S={foreground=purple background=white
PREIMAGE = 'C:\ stethoscope.GIF'}};
```

Conclusions

Everyday we all perform to a business process set whether it be in planning and analyzing, negotiating, communicating or operating the business. It is during these steps of the process that we need a better understanding. If we could call up knowledge about the subject given by experts, be provided with a best practice checklist, make observations to debate with others that responded predictably and allowed me to skill up with the subject in hand; all during the input being considered, this would enable me to perform and turn around tasks with a learned approach predictably. Indeed, compared with today this provides the following benefits:

- Measured increase in performance by reducing duplication and repetition

- Measured predictability of turnaround time of processes, shortened by not continually having to research the information required

- Up-skilling individuals to levels of knowledge shared with each other that provides consensus and less debating time more easily

- Relating reward to contribution of work in terms of increased process performance and providing the effects the business requires based on understanding the causes in the least amount of time

The challenge therefore is to provide the environment and the leadership that facilitates the dissemination of knowledge to decision-makers.

The combination of ODS and SAS/AF can help in the creation of a knowledge-rich environment. In this paper, we have demonstrated the relative ease in building a powerful, yet easily customizable application. Moreover, the combination of ODS and SAS/AF is adaptive (e.g., connectivity to existing databases), flexible (e.g., can passes multiple user-defined variables to a single program), and dynamic (e.g., does not rely on static data).

It is imperative that IT managers promote the benefits of corporate-wide implementation of ODS and SAS/AF solutions. Experienced SAS programmers could develop these solutions, as again, the programming involved is relatively easy. With a corporate-wide adoption of this approach by SAS programmers, IT can then concentrate on more challenging tasks. As a result, ODS and SAS/AF solutions can contribute to an organization's strategic success and employee growth.

Reference

1. Haworth, L. "ODS for PRINT, REPORT and TABULATE." SUGI 26, Advanced Tutorials, Paper 3-26.

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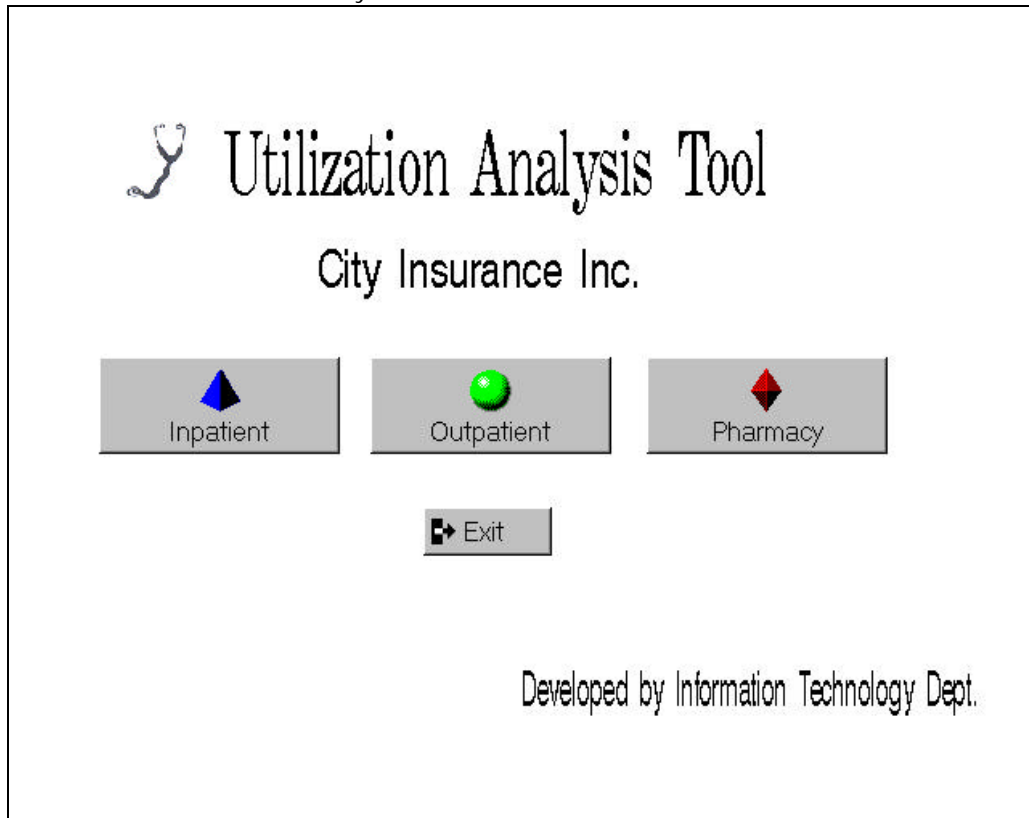Figure 1. Main screen of the "Utilization Analysis Tool"

Figure 2. Inpatient utilization screen of the "Utilization Analysis Tool"
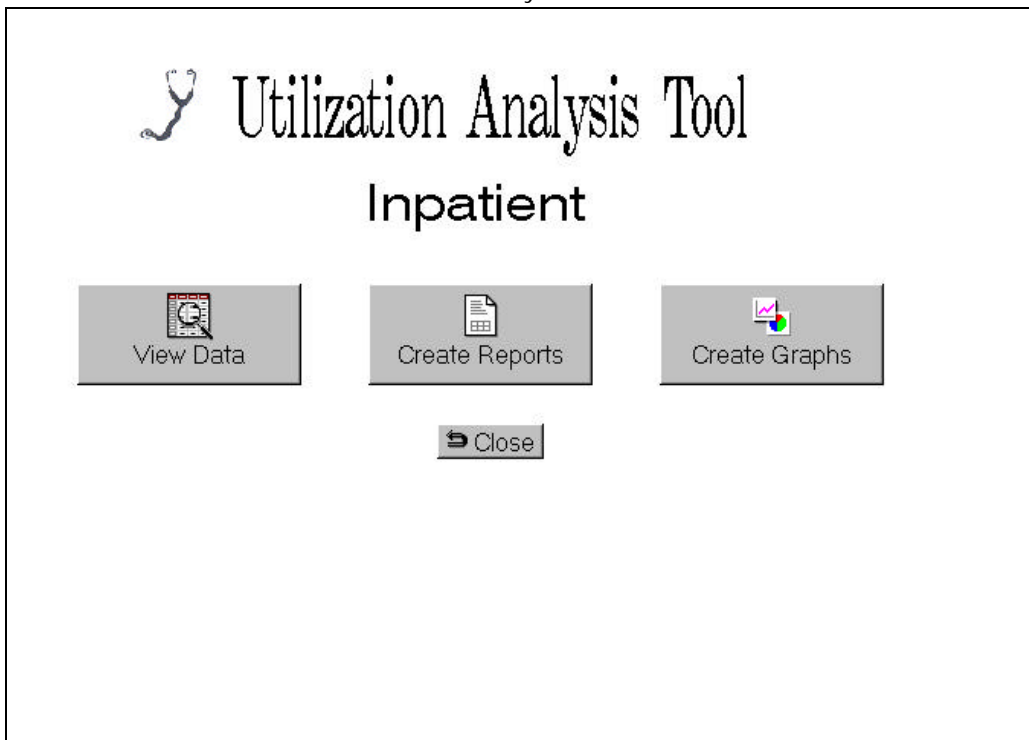
Figure 3. PROC REPORT Supplemented by ODS

Figure 4. PROC REPORT Supplemented by ODS

Figure 5. PROC TABULATE Supplemented by ODS

SELECT SURGICAL PROCEDURE AND PAYMENT DISTRIBUTION
BY GENDER AND AGE
Calendar Year 2001

Surgical Procedures by Gender		Age Group (Years)											
		0-19		20-34		35-49		50-64		65+			
		Pati-ents	Total Payments	Pati-ents	Total Payments	Pati-ents	Total Payments	Pati-ents	Total Payments	Pati-ents	Total Payments	Pati-ents	Total Payments
Surgical Procedure	Gender												
PROCEDURE I	FEMALE	85	$65,770	781	$360,421	3,207	$1,517,552	7,299	$3,418,278	1,625	$403,375	12,997	$5,785,396
	MALE	79	$68,600	595	$264,255	2,822	$1,377,222	7,160	$3,618,751	1,606	$528,736	12,262	$5,857,564
		164	$134,370	1,376	$624,676	6,029	$2,894,774	14,459	$7,037,029	3,231	$932,111	25,259	$11622960
PROCEDURE II	Gender												
	FEMALE	0	0	0	0	1	$1,770	2	$357	0	0	3	$2,127
	MALE	0	$577	1	$430	0	0	2	$2,828	0	$142	3	$3,977
		0	$577	1	$430	1	$1,770	4	$3,185	0	$142	6	$6,104
PROCEDURE III	Gender												
	FEMALE	9	$7,904	49	$43,906	79	$80,706	84	$99,875	52	$23,166	273	$255,717
	MALE	9	$6,832	14	$9,783	38	$44,261	48	$85,347	42	$31,678	151	$157,901
		18	$14,736	63	$53,769	117	$125,047	132	$185,222	94	$54,844	424	$413,618
PROCEDURE IV	Gender												
	FEMALE	298	$85,351	777	$230,495	1,917	$582,050	1,802	$622,030	716	$123,331	5,510	$1,643,257
	MALE	306	$91,487	686	$200,312	1,665	$537,592	1,596	$600,847	600	$143,956	4,853	$1,574,194
		604	$176,838	1,463	$430,807	3,582	$1,119,642	3,398	$1,222,877	1,316	$267,287	10,363	$3,217,451