

MANAGING HUMAN RESOURCES INFORMATION:
USING THE SAS AND SAS/FSP PRODUCTS

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Abstract

A Human Resources Management System (HRMS), under development for the Personnel Department at the Washington University School of Medicine in St. Louis is described. The primary function of the system is to match applicants with employer requirements.

A pool of applicants is created, composed of potential employees. The pool contains applicants' skill levels for 211 skills, in addition to standard application data. Employers specify minimum levels acceptable for these same skills on job requisitions.

The applicant pool is searched using a requisition to identify candidates with skills meeting or exceeding the requisition levels. Personnel staff may interactively relax or strengthen the search criteria. Potential employees are identified, and records of all referrals to employers and employers' decisions are kept for each applicant. When applicants are hired, they are added to an Employee Skills Data Bank.

The system is interactive and menu-driven, using SAS modules under the control of an EXEC2 main module. Data entry is accomplished with FSEDIT. The Applicant Pool and Skills Data Bank are queried through FSBROWSE. Standard and ad-hoc report generation will be supported.

Techniques for using SAS and SAS/FSP in the CMS environment are presented, focusing on the following topics: 1) system access, security, and monitoring, 2) EXEC2 and SAS interfaces, 3) screen design, and 4) user education.

System Overview

The HRMS is designed to be the primary means of identifying applicants qualified for employment by Washington University School of Medicine departments. Initially, applicants complete a battery of forms and are interviewed by the Personnel Department.

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Some of the most important data obtained are applicants' self-rated levels of skill for 211 skills. For each skill, applicants indicate one of the following: 1) I consider myself proficient with this, 2) I have done this occasionally, 3) I have never done this, but I have some knowledge or understanding of the principles involved, 4) I am not at all familiar with this, or 5) I do not want to be considered for a position which would require me to do this. The skill-level data and other information from the application process is then entered into the HRMS.

Departments ask the Personnel Department for assistance in locating qualified applicants to fill their needs by submitting a job requisition form. Two different forms are used, a Technical and a General Requisition. Together, these two forms contain the same 211 skills listed on the applicants' Skills Data Sheet.

Employers indicate skills and the minimum level of skill required with the following scale: 1) frequently done-we need someone proficient with this, 2) occasionally done-we need someone who has done this occasionally, 3) willing to train-we need someone who can do this, but initially no ability is required. The requisitions are sent to the Personnel Department through campus mail service, and entered into the HRMS.

The HRMS is then used to find applicants that meet or exceed employers requisitions. By selecting a menu option to match applicant and requisition skills, all qualified applicants in the Applicant Pool are identified. Depending on the number of applicants selected (too few, or too many), Personnel Department staff may tighten or relax the matching requirements, and re-run the option.

Applicants selected are referred to employers for further consideration and interviews. A complete package of application data is provided, including applications for employment and applicants' resumes.

A Referral Form is also sent with each applicant package. When departments have completed reviewing the applicant, the form is returned to the Personnel Department. These forms, giving the results of the department's review, either hired, not hired-interviewed, not hired-not interviewed, are entered into the HRMS.

When an applicant is selected for employment, their skills data is added to the HRMS Employee Skills Data Bank. Personnel Department staff simply select the appropriate menu option for loading this information.

System Access, Security, and Monitoring

Human Resource information must be treated as sensitive data. The Personnel Department was especially concerned about the protection of applicant information.

Four CMS Virtual Machines are utilized in the HRMS system configuration. One machine (the System Machine) is used by our programming staff. The primary disk space (A disk) on this machine is used as a 'system' disk. The different SAS modules, screen datasets, and the EXEC2 file which drives the HRMS are maintained here, as well as master and backup copies of SAS data libraries.

The other three virtual machines belong to the Personnel Department. One machine (the Input/Edit Machine) supports all of the system's functional capabilities, but is used primarily for data entry and editing. The remaining two virtual machines (User1 and User2) are restricted to running the matching routine, making queries, and producing reports.

This configuration is accomplished by assigning access mode passwords to the System Machine's A disk. These passwords, when used with a CP LINK command in each of the Personnel Department machines' PROFILE EXEC, makes the System Machine's disk available. The machines are linked to the system disk as illustrated in Figure 1.

Access mode, also part of the CP LINK command, guarantees the integrity of the system. The 'R' mode, read only (R/O), is used as the access mode for User1 and User2 links to the system disk. This mode allows access only if the System or Input/Edit Machines do not have the system disk in write status.

This would occur if the System Machine's master data libraries were currently being updated by the Input/Edit Machine. As shown in Figure 1, the Input/Edit Machine has WR (Write/Read) access to the system disk. WR access supports write access only if User1 and User2 do not have the system disk in read status; then an alternate access of read only is given.

When the access mode requested at logon cannot be granted, a message is displayed and the system automatically takes the appropriate action. For instance, suppose User1 attempts to run the matching routine (an R access to the system disk) while the Input/Edit Machine is updating the master files (WR access to the system disk). The message 'FILES CURRENTLY BEING UPDATED -- TRY AGAIN SHORTLY' is displayed, and the User1 Machine is logged off.

Of course, the CMS Userid and Password offer a minimal amount of protection. Additional security was built into the HRMS by prompting for a 'user' password (usually a person's first name) after successful logon. User passwords are changed by our staff on a regularly scheduled basis, or at the discretion of the Personnel Department.

Trying an unauthorized password results in an immediate logoff. Once a user has gained entry to the system, their activities are conditioned by their authorization. For instance, certain names are only allowed access to the database for queries; FSBROWSE supports their needs. Other users are authorized to input, update and query; modules with FSEDIT gives these users access.

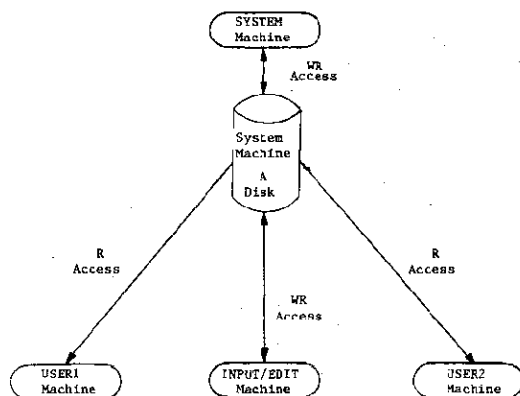
The HRMS not only checks for user passwords. A log of successful and unsuccessful access attempts is maintained. The EXEC2 predefined variables &DATE and &TIME are very useful for this purpose.

By spooling console output on and off at appropriate times, system access is monitored. A message is also logged when an authorized user enters and exits a menu option. In between these messages, important segments of the SAS SASLOG are retained. At the end of the main module, just prior to logoff, the console log is punched to the user machines virtual reader.

EXEC2 and SAS Interfaces

A single CMS EXEC controls program flow in the HRMS. This EXEC is initiated at the very end of PROFILE EXEC, which is automatically executed at logon.

Figure 1: CMS Virtual Machine Configuration and System Disk Access



Note: System Machine's RR Access To The Other Machines' A Disks Not Indicated.

Using this means of controlling the HRMS has several advantages. One of the main benefits is the ability to intersperse communications with users, calls to the different SAS sub-modules, and CP and CMS commands in one source file.

Menus, allowing users to select options, are easily displayed. This is accomplished with the &BEGTYPE command and inserting the menu text as it will appear on the screen.

By reading the selection entered with &READ followed by several &GOTO statements, the EXEC branches to an appropriate section of EXEC code. For instance, if a '1' is entered, the EXEC branches to the label, -APPLICATION. The screens for entering application forms are then generated by calling SAS EXEC with an argument of APPLICANT. SAS is executed with NODATE and NONOTES options to minimize the appearance of unnecessary messages on the screen display.

APPLICANT is the name of a file with a filetype of SAS containing the PROC FSEDIT source for the appropriate data and screen datasets. The procedure is called using OPTION=1, so that the first screen for data is immediately displayed, instead of the FSEDIT primary option menu.

PROC FSEDIT has control until the user presses PF3 to end. Control then returns to the main EXEC, and an &GOTO -MAIN_MENU command is issued. The EXEC branches back to the &BEGTYPE containing main menu text, which is displayed on the screen.

The user may select another option, and similar EXEC, SAS interfaces occur. If RETURN is pressed to end the session, the EXEC issues a CP LOGOFF command.

The HRMS is always under the control of the main EXEC, from session beginning to end. Users are never given the opportunity to issue commands in CP or CMS mode.

Screen Design

Seven forms are used as source documents for the HRMS. Applicant related forms include an Employment Application, Staff Affirmative Action Data Card, Interview Evaluation, and Skills Data Sheet.

Nine screens were needed to accommodate the four applicant forms. All four of these forms are presented when the option to enter applicant data is selected from the main menu.

The inclusion of four different forms under a single option for entering applicant data affected screen design. In one instance, data items from two different forms, the Staff Affirmative Action Data Card and the Interview Evaluation, appear on the same screen. This screen was formatted to indicate which data items referred to a particular form.

The two job requisition forms used in the system each require three screens for display. The Referral Form sent to employers is easily displayed on one screen.

Two important considerations repeatedly surfaced during screen design: 1) accurate replication of a form on the video display, and 2) adding information to aid data entry. These considerations often resulted in a trade-off; doing one precluded addressing the other.

Space on a single screen display was the factor limiting the ability to address both concerns. Often times there was not enough room to closely reproduce a form or form section and include data entry prompts. We simply used our judgement; generally, preference was given to making the screen look like the source document.

Designing forms to conform to FSP cursor movement is advisable. On several HRMS source documents, checklists of skills are completed by moving down columns, and then across the form. For example, applicants give skill levels on the Skills Data Sheet for Clerical-Secretarial and Office Machine skills by going down column 1, and then move to column 2 to indicate Administrative/Managerial, Professional Field, and Specialty skills.

Our FSP screen datasets transpose this organization, presenting checklists for each job category as the cursor moves across rows and then down the screen. While this has not been a serious problem, the time required for data entry would probably be less using a common movement pattern.

User Education

We have enjoyed a friendly relationship with the users in the Personnel Department. Every effort has been made to inform them through formal presentations, training sessions, written documentation, and on-line assistance.

New users of automatic data processing are anxious about information systems. One of their concerns is the retention of crucial data beyond their field of vision. We addressed this need by generally explaining the system's hardware configuration.

The functional capabilities of the system were introduced as tasks to be performed. For example, users with full access may wish to: 1) enter application forms, 2) enter technical requisitions, 3) enter general requisitions, 4) match applications and requisitions, 5) enter referral forms, or 6) add new employees to the Employee Skills Data Bank. These tasks became options displayed on the main menu after logon.

Full descriptions of each option are provided on-line. From the main menu, entering '?' displays these descriptions. Pressing RETURN gets the user back to the main menu.

A common nomenclature for FSP screen displays has been valuable. Vocabulary was established for several important concepts. One useful convention has been to differentiate data items (the prompt displayed), system data item names (SAS variable names), data item fields (the spaces provided for entering data), and data values (data occupying item fields).

Interchangeably referring to data as records and observations required clarification. The manner in which a SAS dataset observation number changes for a given record due to record additions and deletions was also emphasized.

Data file structure and its presentation through FSP screens were also important concepts. The difference between moving from screen to screen (left and right) and from observation to observation (forward and backward) was graphically presented.

Personnel Department staff were schooled on use of the terminal devices supporting the HRMS. FSP PF key definitions and control code functions were explained.

A User's Manual was written. The manual covers several topics, ranging from establishing communication (logon procedure) to locating an observation.

Detailed appendices were included in the User Manual. One of the most important appendices is a Data Dictionary, listing SAS variable names and labels by screen location. The dictionary was created using the SAS listing from PROC CONTENTS and tailoring the output with a text editor.

We wish to acknowledge and thank J.L. Midkiff, Gene Mueth, Lois England, and the entire School of Medicine Personnel Department Staff for their contributions to and support of the Human Resources Management System.

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