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ABSTRACT

A framework for monitoring quality control (QC) of processor contracts administered by the Department of Education's Office of Student Financial Assistance (OSFA) is presented and applied to the Pell Grant program. Guidelines for establishing QC measures and standards are included, and the uses of a sampling procedure in the QC system are outlined. Attention is focused on both the QC plan and the role of the contractor in following the QC measures. The processing function performed by the contractor is the handling of information passed between the financial aid applicant and the OSFA, including applications from students or institutions, accounting reports, or invoices. For each of the following areas, methods for developing QC measures and standards are considered: production control; fiscal control; software quality assurance; QC reporting, monitoring, and corrective action; and quality of data. Appended are a series of sample production control reports; the application of a fiscal control system to the Pell Grant application processing system; report formats for monitoring cost centers; a matrix of software testing techniques; sample productivity reports for the Pell application process; and a list of minimum requirements for a processor QC system. (SW)

A FRAMEWORK FOR A QUALITY CONTROL SYSTEM FOR VENDOR/PROCESSOR CONTRACTS

by

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EXECUTIVE SUMMARY

The delivery of the Education Department's (ED) financial assistance programs depends on the coordination of several interrelated parts, a critical one being the processing function--the handling of information passed between the applicant and the Office of Student Financial Assistance (OSFA). The processing function is performed by firms on contract with ED; therefore, ED must monitor the contractor's performance to ensure the effective delivery of the program. A quality control QC system with measures and standards for critical activities can be used to monitor the processor contractor and to improve the management of the contract. This report presents a framework for establishing such a QC system and applies the framework the to Pell application processing system.

The four areas of concern for establishing QC measures and standards in processing contracts are:

- Production control
- Fiscal control
- Software quality assurance
- Productivity

Production control is the monitoring of the steps that are involved in processing the information coming in and producing the final output document of the system. Fiscal control is the monitoring of the sources of costs within the system. A cost control system routinely gathers data on the costs by cost center. Software quality assurance is the method by which the computer programs used in the different production steps are tested for accuracy and efficiency. Productivity refers to the efficiency of the labor component in all the manual steps in the production process.

A general framework is developed that is applicable to all processing contracts. Then it is applied specifically to the Pell application processing contract. Specific guidelines are proposed establishing QC measures and standards for each area in the process. In addition, the uses of a sampling procedure in the QC system are outlined.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The Office of Student Financial Assistance (OSFA) within the Education Department (ED) offers services to students and institutions through a number of financial assistance programs. These programs are large and complex to administer. The Pell program has more than 5 million applicants and over 2 million recipients, and the GSL program has more than 11,000 lenders. The delivery of student aid programs involves several inter-related parts all working together in some coordinated fashion. One of the largest parts of the delivery system, and perhaps the most important, is the processing function.

This function is the handling of information passed between the applicant and OSFA and the transformation of that information into a medium that will permit the delivery of the services of the program. In the student assistance programs, this information is usually applications from students or institutions, accounting reports, or invoices. The processing functions are typically very large operations. They require large staffs to perform several different complex tasks. The processing functions are sometimes also highly automated, requiring sets of software that perform complex calculations and produce documents to send back to the potential recipients. All the major processing functions in the student assistance programs are done by contractors outside of ED.

Processing contracts differ in a significant way from other contracts in that they are central to the delivery of the student assistance programs. The monitoring of quality control (QC) procedures in these contracts is critical for two reasons: to ensure that the contractor is performing its function in a cost-effective manner, and to protect the fiscal integrity of the program by keeping spending within the program's budget. The sizes of these contracts, however, make effective monitoring extremely difficult. Methods must be established for evaluating the contractor's performance against standards set prior to the contract's initiation. Since the processor function is usually contracted to private firms, the process of providing quality control for this function has been characterized as vendor/processor QC.

This report suggests an overall framework for monitoring QC aspects of processor contracts administered by OSFA. In the final chapter, this framework is applied specifically to the Pell contract, and guidelines are recommended. Before discussing the contents of the report, it is necessary to review some background on the processor function in OSFA.

BACKGROUND TO THE PROCESSING FUNCTION

The processing function is only one of several parts of the student assistance delivery system. Other major parts include policy determination, budget formulation, awarding of aid, and fiscal reconciliation. The delivery of student assistance is dependent upon the efficient interaction of all the parts. The system is complex because the parts of it can run either sequentially or simultaneously. That is, the decision from one part is needed before another part can begin its function if the parts are running sequentially. If the parts run in parallel, they follow different tracks at the same time with several common points between them where information is passed from one function to another. In such an environment, the system must run smoothly in order to deliver the programs effectively. If a decision is delayed, for instance, the other functions may not be able to perform their tasks. An obvious example of this is the effect decisions on the Family Contribution Schedule have on the processing of applicants. Without all the parameters and rules in place, much of the forms design, dissemination, and processing of applications cannot be done.

A delay in a part of the system can cause problems for the contractor beyond its control. A change in a program's policy may have significant effects on the way the processing function is to be performed. If the change is delayed, not fully integrated into the processing system, or technically complex, then the processing function may encounter problems that cannot be overcome during the processing cycle.

Current Situation

Problems with the delivery of student assistance can be traced to two sources: the idiosyncracies and unpredictability of the policymaking process and the complexity of the delivery system itself. Being a central part of the delivery system, the processing function has been both subject to and a cause of some of those problems.

The delivery of student assistance involves a large number of people both inside and outside OSFA. The development of policy--setting the parameters of the program--involves the coordination of several OSFA divisions. Decisions made outside the Division of Program Operations (DPO) affect what the processor will do and when. This requires extensive communication among divisions that does not always occur. The situation is exacerbated by the fact that the structure of OSFA is drawn along functional, not program lines without a project or matrix management structure. Communication may be more difficult because program decisions cut across divisions.

The method for delivering student assistance has evolved with the changes in programs' structures. There has never been an evaluation at any point to determine if significant changes in the system are needed. This is also true of the processing functions. Part of the second stage of the current Quality Control study focuses on the way the current delivery system works and what changes might improve its efficiency. The result of this evolutionary process is a system that is somewhat fragmented with no easy way to evaluate the total system's performance. Only recently has a systematic attempt been made to establish quality control standards within the processing contracts and to monitor their performance from a managerial perspective. Standards are explicitly put into the contracts, and contractors are held to them.

There have never been significant attempts to improve the quality control of processor contracts. Usually QC general guidelines have been included in the requests for proposals, and bidders have responded with general industrial QC standards. The result has often been that the QC components of processor contracts have not adequately addressed the unique requirements of student aid processing. This report is an attempt to take a step back and ask in a general sense what QC procedures could be implemented for processor contracts.

Ideal Situation

In an ideal world, all parts of the delivery system would function smoothly in both a structural and a temporal sense. The system would be evaluated periodically for efficiency rather than allowed to evolve freely. The different processes within the system would be evaluated to determine whether their configuration is the best suited to deliver the services of the program. QC would also be integrated into all aspects of the processor function. Any modifications to the processes would then be made within established QC standards for performance, and ways to measure performance would be firmly established. The standards would focus on the critical points of the processes, and measures would be put into place to assess performance against those standards.

In a temporal sense, the ideal system would have efficient coordination and communication among divisions so that decisions required before processing, such as those regarding policy, would be made in a timely fashion. The operational managers would work closely with the policy managers and determine what is feasible from both a policy and an operational sense.

Interim Solution

The ideal system does not exist. An interim solution to the current set of problems regarding the system and the processor function within the system is to establish a parallel system of quality control. A formal mechanism should be established that would set performance standards for the processing functions and determine methods for measuring actual performance. Then, an incremental approach could be used to slowly integrate QC standards into processor contracts. Over time the quality control measures and standards could become a formal part of the system.

To begin an approach for establishing these standards, a general quality control framework for all processing functions should be developed and standards of performance established. Ways of measuring performance should be developed and tested. The measures should be flexible and subject to change depending on whether or not they are effective. As the processing function changes, so should the measures and standards. The measures and standards should then be applied to specific contracts to determine their effectiveness. As ED managers become more comfortable with the monitoring process, the measures and standards may be applied more extensively to contracts, and as a result the process of integrating quality control into the system can begin.

GENERAL APPROACH

A single framework for establishing a method of quality control in processor contracts that cuts across all aspects of the processing function is developed in this report, whose purpose is to assist the monitors of the processor contracts in OSFA in the construction of a quality control system for the contracts. The system should be used by the managers to monitor these contracts more effectively. The desired result is an efficient and cost-effective processing function.

In an overall quality control function, two aspects must be defined:

- A quality control plan
- The respective roles of the contractor and OSFA

This report focuses on both the quality control plan and the role of the contractor in ensuring that quality control measures are taken. The role of OSFA is one of quality assurance, involving monitoring the quality control procedures necessary for effectiveness. The issue of quality assurance will be the topic of a second report on vendor/processor QC.

A quality control plan can be established for all processing contracts within OSFA. The first step is to identify how the processor functions are similar. Although the processing functions serve different purposes in different programs, from a process point of view they all contain certain steps and procedures. For instance, at least a part of all functions are automated. Therefore, in order to ensure that the computer programs are performing their functions accurately and efficiently, there must be some common way to test them.

Once the functions' commonalities have been identified, a set of measures and standards can be determined, modified, and applied to the particular processing contract. The first step in establishing the standards and measures is to identify the following critical areas that require quality control procedures.

- Production Control--The steps of the production process require monitoring for efficiency and accuracy.
- Fiscal Control--Costs of the processing function must be closely monitored to ensure that the contract remains within its budget.
- Software--The computer programs that compute values or process information which must be accurate and efficient, should be thoroughly checked and continuously monitored because of their complexity.
- Productivity--Some of the steps in the processing function are manual; since labor costs are high an efficient mix of labor and machine must be determined.
- QC Reports--The managers of the contract must receive the pertinent information from the processing function in order to effectively monitor all aspects of the contract.
- Corrective Action--If the production process requires change, there must be a mechanism for effecting it that minimizes dislocations and time delays in the process.
- Quality of Data--The production process must generate accurate information; or if additional work or corrections are needed to rectify errors, the process is inefficient.
- Rework, and Redundancy in Production Processes--If the production steps are not sufficiently designed, inefficiencies and unnecessary backlogs could occur as a result of redundancy.

In each of these areas, methods for developing QC measures and standards are considered, and particular steps can be identified as being amenable to quantitative measurement. The remainder of this report looks at different aspects of the processing function and identifies areas that should be monitored. For each area a methodology for establishing measures and standards is developed. The final chapter illustrates the utility of applying this framework to the Pell process.

Each of the first four areas represents particular components of the processing function and is dealt with explictly in its own chapter. The latter four are critical areas that transcend particular areas of the process and need to be addressed by managers in any of the processing areas. QC reports and corrective actions are management tools used to ensure that the production process is running smoothly. Quality of data and rework are areas that need to be constantly tested for so that corrective actions may be quickly implemented.

CHAPTER 2

PRODUCTION CONTROL

The processing function in the delivery of student assistance is geared toward producing a product. That is, the function obtains a great deal of data, processes it, transforms it into a set of information needed to deliver the service, and produces an output document. For example, the primary processing task of the Pell application processor is to produce a Student Aid Report (SAR). Other output documents, such as applicant rosters and state agency data tapes, are also produced. But the SAR is the major output.

To ensure its integrity, the production process should be monitored at each step in the process. This monitoring activity is known as production control. Measures to reflect the actual performance of the activity should be determined, and standards for performance at each step should be established. Each step will include different types of activities: some are manual, others are purely automatic, and some are combined (manual and automated). The measures and standards associated with each step differ in nature depending on the kinds of activities required to complete the step.

The processing functions in delivery systems for the student assistance programs differ according to what data are being processed, who provides the data, and who uses the output documents produced. However, one can identify general steps in the processor functions. The first step in designing measures and standards for production control of the processor functions should be to identify the steps within the production process. Figure 1 shows the following steps in the processing function of the student assistance programs:

- Receipt of Information--The point where the information from the applicant is received and sorted into homogeneous groups for processing. In the Pell program application process this step is the point where applications are collected and put into batches for initial processing. In the Campus-based application system, FISAPs are received and put into batches separating the initial application from those being returned for corrections.

- Data Entry--The process by which raw data from paper forms are key entered into the computer system. This is the initial data transformation step of the process. For the Pell program it also includes entering applicant information or SARs received from the institution into the PIMS. In the case of the PIMS institutions can supply SARs on magnetic tapes, although only a few institutions have selected this method of data transmission. Regardless of the entry method (e.g., keypunch, on-line key entry), it is necessary to enter data in the system at certain points.

- Data Edit--The process by which data from forms entered into the system are checked for accuracy and consistency. This step is a more generic production step than some of the others because it can occur at different points in the process, sometimes more than once. It can be done manually or automatically. It can also be folded into another production step. In the Pell application process, an application goes through an initial manual editing process that checks for a few conditions (such as signature) that would preclude the application from further processing.

- Compute--The actual processing of the raw data is transformed into the type of information needed to deliver the program. This step is usually an automatic process performed by computer. In the GSL

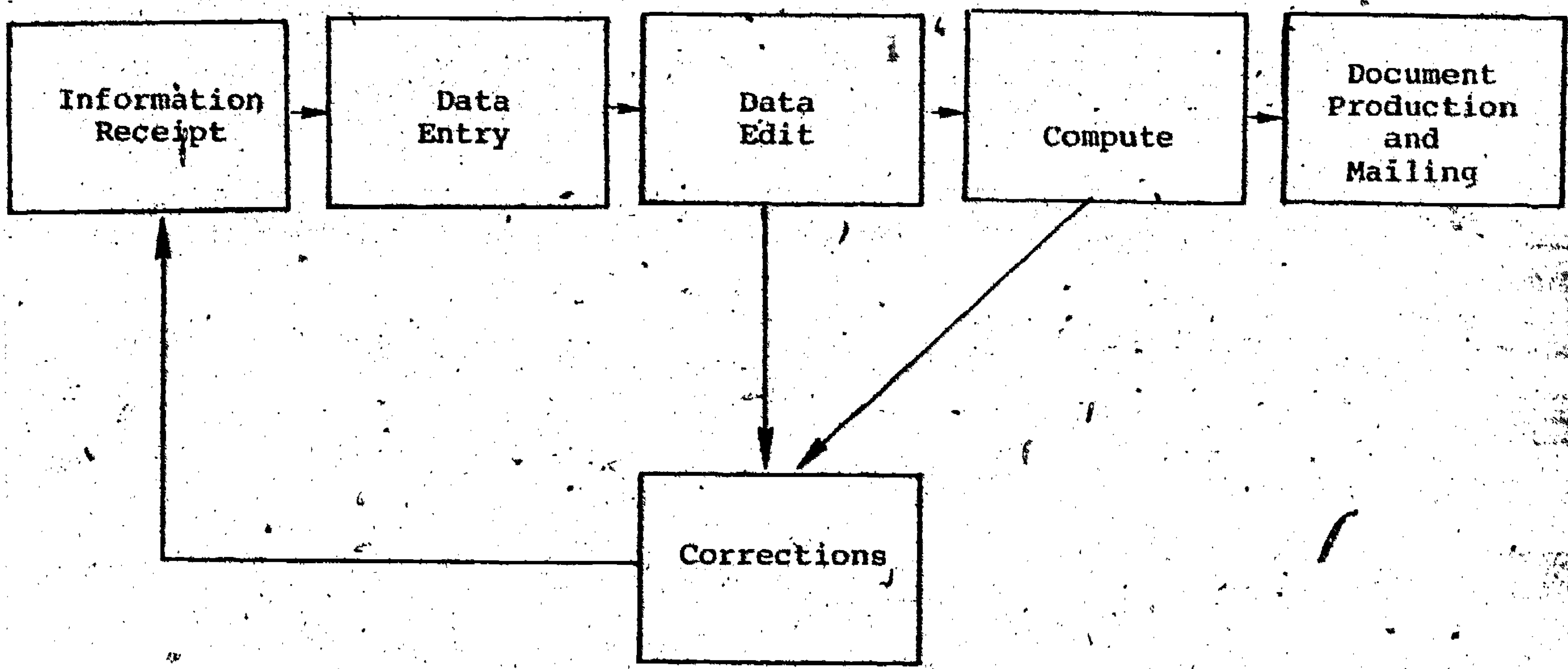

FIGURE 1

STEPS IN A STUDENT AID PROCESSING SYSTEM interest billing system, lenders' requests for payment of interest on their portfolios of in-school loans are processed and an amount computed. In the Campus-based system, the institutional allocations are determined.

- Document Production and Mailing--Each processor produces a primary document that is sent to the applicant. The document may be a notification of award, which confirms the claim of the recipient or lists errors in application. This step includes the production of the document containing the correct information and the transmittal of that document to the recipient. In Pell, the document would be the SAR; in Campus-based the document would be the award letter.

- Corrections Procedures--The procedures for handling inconsistencies or abnormalities in the production process. This step, like the data edit step, is a generic production activity. Different systems handle it in different ways at different times. In most cases, the corrections process deals with corrections to the information that comes into the processing function. These corrections are sometimes requested by the system, which is part of this step, or they are externally motivated. In Pell application processing, the applicant is notified of any corrections required and allowed to submit unsolicited corrections. Then, when corrections are submitted, the applicant's record must be updated and perhaps a new SAR computed.

While these major steps cover the spectrum of activities in the processing functions, each has its own sequence of steps. For a deeper analysis of the steps of each of the processing functions, one may refer to Advanced Technology's Comparability Report, June 1982.

MEASURES AND STANDARDS

The two major objectives of production control are to:

- Ensure maximum efficiency of each production step
- Highlight deviations from pre-established production standards

Given these objectives, the first task in establishing a production control component of processor QC procedures should be to establish measures and standards for each step in the production process. Critical points in each step of the processing function should be identified and a set of measures and standards developed for monitoring the activities required to complete the step. Since each processing function has its own structure for these steps, only general types of measures and standards can be identified in this framework. The framework can then be applied to specific production steps, as illustrated in the final chapter of this report.

Information Receipt

The objectives of this step are to receive the information and to transform the incoming document into a form that can be used in the processing stream. First, this requires grouping the different types of incoming documents into similar types of documents. The crucial points in this step are the initial screening of the information and the grouping together. Therefore, the activities that should be measured are:

- How much information is coming in
- How fast is it being prepared for further processing
- How well the groupings are being made

The standards for this step should establish tolerances for the timing and accuracy of these activities. This step is among the most time-consuming of the steps in the production process, especially when its design is not well conceived. Accuracy should not be sacrificed for timeliness, since an error will cause a slowdown and a retracing of a number of actions. Conversely, accuracy should not be achieved at any cost. A well-designed system should be both quick and accurate. Therefore, it is important to develop measures and standards for both timing and accuracy, which should include:

- The turnaround time for the entire step, from the time information comes in to the time it is ready for further processing
- The accuracy of separating the information into the correct groups for processing
- Sampling, which can be used as a measurement mechanism for both standards

Further, specific incoming documents should be identified by the contractor for each type of document, and time of entry should be noted. The documents should then be rechecked at the end of the production step for timeliness and accuracy of grouping. All documents can be dated in this way so a sample can be drawn at any activity point in this step.

Data Entry

Data entry is usually a manual process that is relatively time-consuming. The entry of data from any type of form that contains a large number of data items is complex and error-prone. Since this step is the first to use the specific data needed to run the processing system, accuracy is of utmost importance. If the data entry is inaccurate, an error will occur at some point in the process; usually further reworking or correction within the production process will be needed.

The development of measures and standards for this step should focus on accuracy. Industry standards for this type of data entry should be used in the evaluation of the actual production process. Specifiying units of measures is critical, since standards can be applied to keystrokes, data elements, or entire forms. Moreover, data entry errors should be classified by types of data elements, depending on the units of measurement used. In the complex cases, judgment is required, since some data elements are crucial to further processing while others are less important and can be easily rectified. In addition, standards of timeliness should be balanced to ensure maximum accuracy and efficiency. The simplest way to obtain measures of these steps is to take a sample of the data input documents and compare the transformed data with the raw data.

Data Edit

This step can be performed more than once in the production process, either manually or automatically. The objectives of this step are to ensure that:

- Incorrect data are caught for the right reasons
- The right responses are sent to the recipient

Portions of the activities contained under data editing can be subsumed under other steps. For instance, when data are received, cursory edits of particular items can be done and the document flagged for special handling. Measures and standards can be developed for use whenever a data editing step is performed in the processing function. Such measures should emphasize:

- Frequency with which the editing procedures are invoked
- Correctness of the system's response to the recipient
- Accuracy in the total editing process

These measures are redefined as follows. First, the frequency should measure the occurrence of each particular editing error (or those deemed particularly important) or possible groups of critical editing errors. This can be done automatically if the edit is computerized or by a manual tally sheet if the edit is manual. Second, there should be a measure of correctness of the edits. Are the edits flagging the correct errors in the proper way? Sample cases can be used for this measure, or a random selection of live cases known by some other criteria to contain incorrect data items should be used to test the edits. Third, it is important to measure the accuracy of the responses. This measure pertains most specifically to the manual editing, where a form letter or some other device is used. However, it can also apply in a more general way to computer edits. A random sample of cases can be flagged to provide a general measure of the accuracy of the procedure. Lastly, a measure of the turnaround time should be used so that corrective time can be minimized. This measure can be a part of the overall timeliness measure of the production steps.

Compute

This step is almost always automatic; therefore, the main concern should be whether the computations necessary for the accurate delivery of the program have been performed. An output document is the end result of this step, and it must contain accurate information.

The measures and standards for this step overlap with software quality assurance. The software quality assumes procedures discussed in the next chapter, which should ensure that the computations are correct. Since the central processors handle a large amount of information, inefficient manual procedures in a primary computing system may be harmful to the overall production. Although the computation step may be the least time-consuming, timeliness standards should be set to allow managers to:

- Compare current performance to established standards and historical performance
- Compare the timeliness of the step with other production steps

Another measure for this step is a count of the number and type of computes done for a particular time period. Alone it may not be a very useful measure, but in comparison with production statistics from other steps it may signal problems within the compute step.

Document Production and Mailing

This step is the main result of the processing system, one which usually includes both automatic and manual procedures.

Accuracy--in the sense of sending out the correct document(s) to the correct applicant--and timeliness of production is crucial.

The development of measures and standards for this step should focus on the correctness of the output documents and other information sent to the applicant. The applicant should have complete information to minimize the number of transactions within the system. Standards should be set for the timeliness of the production and mailing or communicating the results. The crucial measures are:

- First, the primary measure for this step should be the count of output documents produced by the system. This measure should be used in conjunction with counts from other production steps to ensure the integrity of the system and that nothing is being lost. Control totals across steps should be maintained on an ongoing basis.

- Second, measures of accuracy of this production and mailing process should be taken. Random samples of output documents immediately before they are to be sent out should be checked for the correct documents, etc.

- Third, as a part of the overall timeliness of the production process, the turnaround for this step should be measured.

Corrections Procedures

This step, like data edit, is a generic step that may be performed several times throughout the processing cycle, depending on the system and the type of correction. Corrections should be handled efficiently and accurately to minimize the number of transactions within the system. This step is often combined with the data edit or compute steps. However, once a correction request has been sent out, the system must be able to handle the correction when it comes back. Individual records have to be updated, information recomputed, and new output documents produced.

The standards for these measures should be focused on reducing both the time of making a correction and the number of times an individual's record must be corrected. Once a correction is received, how long does it take to get put back into the system and a new output document produced? Since correction procedure standards almost parallel the standards for the rest of the system, the timing should be less. Also, error resolution standards should be set up so that efficient ways to resolve errors are in place and work properly. Measures for this step include:

- Timeliness of the corrections put into the system once they are deemed correct
- Types of error resolution procedures including frequency counts of types of error resolution procedures
- Time necessary for flagging & correction to go back out to the recipient for further correction
- The efficiency and effectiveness of resolution procedures

ESTABLISHING A PRODUCTION MONITORING SYSTEM

The purposes of establishing the performances and measures standards are to evaluate the actual operations and to monitor effectively the production process. There are two ways such monitoring can assist managers. First, it checks the current status of the process. This is easiest when there is a single figure in each step of a predefined set of figures for each step. Second, monitoring indicates to managers that some part of the process is not performing up to the established standard or a trend is developing that would, if not checked, result in a substandard situation. Briefly, a set of comparative statistics (or standards) can be used to produce the information needed to alert managers of production problems. The steps required to accomplish this are:

- Identify a number of indicators crucial to good production control. These may include all the measures identified in the previous section or a subsample; or, particular measures may be chosen to be reported in a regular fashion where other measures may be used on an ad hoc or as-needed basis.
- Establish production standards in the system by putting them on reports as standards.
- Insert the measures desired into the system by creating measurement mechanisms to routinely collect, store, and retrieve these data for future comparative purposes.
- Construct the correct comparative statistics which would be useful.

It may be possible to construct particular statistics, such as averages, that are automatically recomputed after additional data are obtained. These data can either be kept as part of the subsystem in which they are collected or be sent to a centralized location where retrieval would not disrupt the system. The entire system can then be updated on a daily basis. Such production statistics would be a useful management tool.

The reporting format for errors in the production process is one of the most important aspects of OSFA's control of monitoring, especially of the processor function. The process can collect a mountain of data. Therefore, care should be taken with the volume and types of reports produced for OSFA. Reports should be concise and cover only areas crucial to effective management by OSFA, with emphasis on areas of substandard performance.

The reports should be geared to particular levels of managers in the OSFA. Daily or weekly production statistics by step are not necessary for top managers; aggregated data over several steps can be accumulated for them. If exceptional cases at a specific step are highlighted, the information can be passed along quickly.

Once the pertinent items have been identified, the reports should be produced with data from different time periods for comparison purposes. For instance, frequencies of edit checks over the most recent week, an average over the last month, and the total to date can be more informative than just the weekly and yearly totals. Statistics of trends are as important as cumulative statistics. Also, if possible, frequency distributions rather than averages, or in addition to averages, should be presented. Averages can hide trends that may be occurring or outlying cases that should be identified.

If a trend or a statistic falls out of the tolerance range, it should be highlighted either with a flag or in a summary report. If put into summary terms, along with an explanation, OSFA contract managers can glance at the report and obtain a great deal of information about areas of immediate concern. One disadvantage of a summary of exceptions is that the project manager may become too reliant on the summary and not on the report itself. The entire report, if done well, should be of interest to the OSFA manager.

CHAPTER 3

FISCAL CONTROL

Establishment of fiscal control is a key element of the overall contractor quality control system for the processor function. OSFA needs assurance that its vendors are performing in as cost-effective a manner as possible without sacrificing quality. This chapter details a methodology for establishing contractor fiscal controls. The level of fiscal monitoring should vary by:

- Type of contract (i.e., cost-plus-fixed-fee [CPFF] contracts need different monitoring from that of fixed-price contracts)
- Size of contract (it may not be cost-effective to use on-site monitors for small contracts)
- Previous OSFA experience with the contract

Fiscal control should be established individually on a contract-by-contract basis, for the reasons outlined above, and should be jointly established by OSFA and the contractor. In this case, controls would be less burdensome to the contractor. For example, if OSFA required biweekly reporting but the contractor accumulated costs on a semimonthly basis, the contractor would have to maintain an extra reporting stream just for this OSFA contract. The following steps are required to establish fiscal controls:

- Develop fiscal control guidelines.
  - Identify major cost centers for measurement (when)
  - Select specific types of costs to measure (what)
  - Determine methodology of cost measurement (how)
  - Identify the unit of measure or standards (where)
  - Establish tolerance levels (how much)

- Specify guidelines (if applicable).
  - Require response from contractor
  - Evaluate response
  - If applicable, modify guidelines
- Develop fiscal control system jointly with contractor.
  - Flexible budgets for low, high, and average volume
  - Reporting mechanisms and formats
  - Specific agreement on guidelines developed above
- Develop guidelines for OSFA monitoring.
  - On-site auditing
  - OSFA management role
  - Reconciliation of reports to contract invoice

The relationship between these steps is illustrated in Figure 2. The steps are detailed as follows.

DEVELOP FISCAL CONTROL GUIDELINES

This section presents a comprehensive fiscal control system approach applied to cost-plus-fixed-fee contracts. Obviously, the role of fiscal controls in vendor quality control diminishes in relationship to the dollar volume of the contract. For example, a $100,000 fixed-price contract should not require fiscal controls of the type outlined here. However, the methodology detailed in this section could be applied to any contract. The steps required to develop sound fiscal controls are outlined below.

First, past experience should play an important role in developing fiscal control guidelines for any OSFA contract going out for bid. Fiscal controls should be established for all major work areas, or <u>cost centers</u>, with overrun cost projections in the past. For example, it may be necessary to establish tight

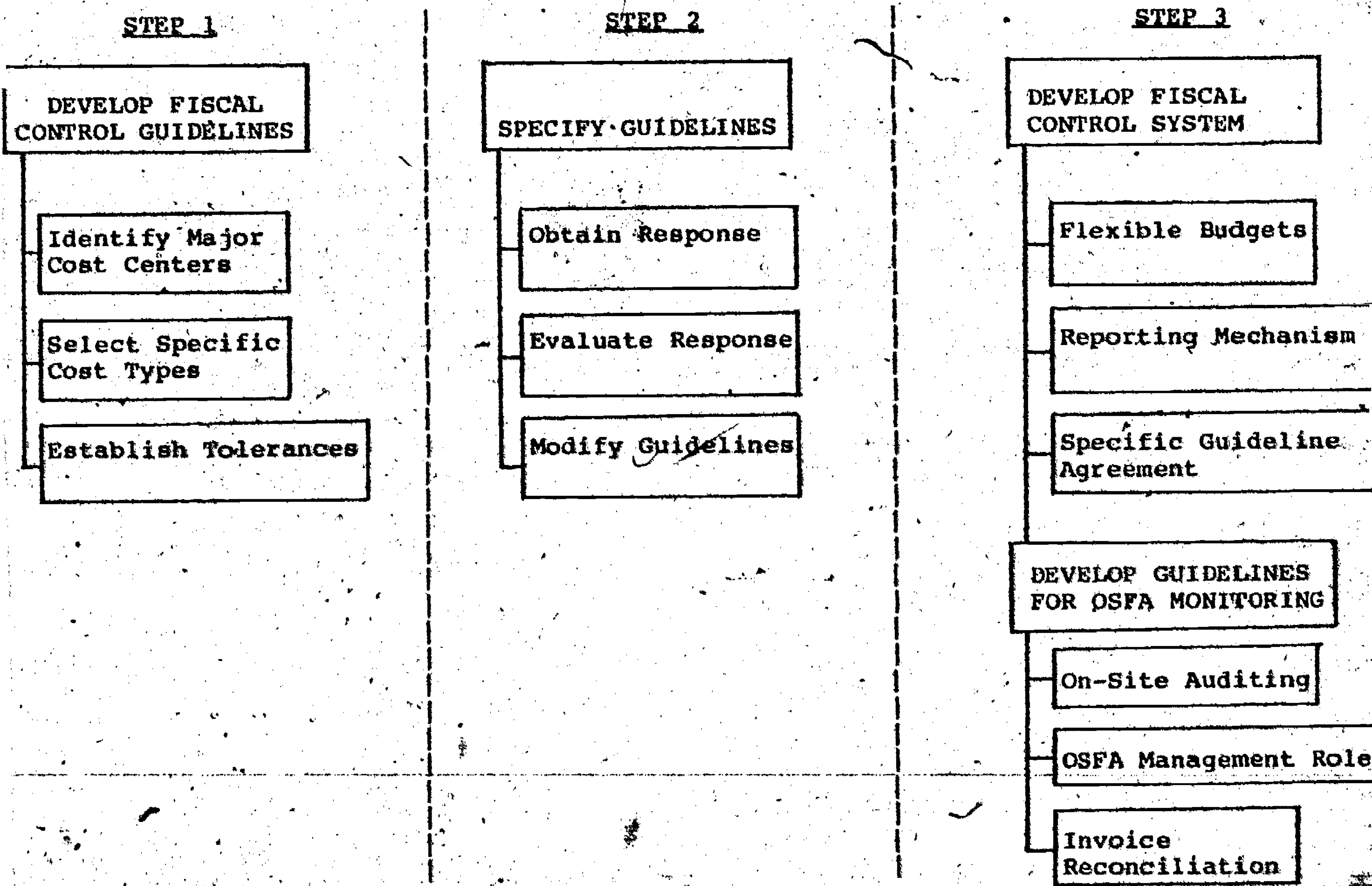

FIGURE 2

FISCAL CONTROL SYSTEM WORKPLAN

Federal controls for types of costs that have proven difficult to control, such as computer time. However, it may not be necessary to use the same controls to monitor relatively immaterial costs, such as reproduction costs. Identification of major cost centers and types of costs to measure should also be based on:

- Relationship of cost center to volume
- Relationship of costs of the center to the total cost
- Inability to develop controls in this or other OSFA contracts

The second step, once cost centers are estimated, should be to establish routine reporting of all associated costs (direct labor costs) to management and reporting of deviations for established standards to management. This is currently done by other government agencies and may be useful where no contract history exists. For example, Housing and Urban Development (HUD) uses this procedure for some processor contracts. Alternatively, direct (or "loaded") labor costs for all cost centers in excess of a certain percentage of the contract should be singled out.

Third, after identifying major cost centers and specific costs, a methodology of cost measurement should be determined. Basically, there are three options:

- Person-hours (labor only)
- Direct costs (labor plus other direct costs)
- Loaded direct costs (including fringes, overhead, etc.)

This decision should be based on the nature of the procurement. Person-hours should only be selected if labor is a major cost (more than 60 percent of the total cost). Time and material contracts should be monitored only by using loaded costs, since that is how the contract will be billed. In general, loaded direct costs should not be used unless satisfactory monitoring can be obtained via one of the other methods.

Fourth, establishment of tolerance levels must be considered. In general, an acceptable tolerance level would be a 10 percent variance around the standard unless experience shows that costs fluctuate more than that on a monthly basis. A tolerance level of less than 10 percent would generate a needlessly high volume of exception reporting. The tolerance level (standard) should be applied to each major cost center. It is important to remember that this is the mechanism for early warning on contract overruns.

SPECIFY GUIDELINES

Once cost centers, measures, and standards are identified, clear specifications for the processor must be developed. The guidelines must not be burdensome to the vendor yet meet OSFA's requirements. Vendors should be required to develop a management plan for implementing cost control procedures.

OSFA should then evaluate the response received to the cost control guidelines. This evaluation should address two questions: Can the vendor implement a fiscal control system meeting OSFA's requirements? And should the guidelines be modified to accommodate the vendor? In evaluating the vendor's response, the following factors should be considered.

- Direct responsiveness to the guidelines
- Experience in performing this function on other contracts
- Innovative suggestions for improving cost control
- The ability of the vendor's internal contract costing system to meet the requirements

Often, contractors with Federal contracts will have internal contract costing systems that will meet the guidelines. Thus, most vendors will not have to develop a new system to respond to OSFA requirements. OSFA might request copies of reports of current systems, although some vendors would be hesitant to release the reports.

DEVELOP FISCAL CONTROL SYSTEM

One of the first tasks to be done should be to develop a fiscal control system. This would be done jointly by OSFA and the contractor. When evaluating the contractors' system, OSFA should note:

- The comprehensiveness of the procedures
- Apparent deficiencies in the system
- Contractors' suggestions that should be incorporated

These items can be discussed by the contractor and ED and, hopefully, specific agreement can be obtained.

A budget should be developed for each major cost center which will become the standard by which performance will be measured. The budgets should be tied to the processing calendar along with the actual production schedules. In this phase, OSFA and the contractor should jointly develop a budget for each cost center. The steps required to accomplish this are:

- Segregate fixed costs from variable costs, which vary in relationship to workload (e.g., number of applicants)
- Develop a factor for relating variable costs to workload volume for budgetary purposes

This process can be done on a general level, since audit accuracy is not required. It is important to recognize that very few costs are truly fixed, and variable costs usually do not vary in direct relationship to workload. OSFA and the contractor should remember that the initial budgets represent a fiscal control standard to monitor spending; a workable tolerance level can serve as an effective early warning system to potential major cost overruns. Therefore, the relationship between calendar and budgets should be thought through to produce exception reports when a problem occurs, but not so often that the early warning reports are produced on a regular basis. The final step in the process should be to total the variable costs. Multiply them by the projected volume factor and add them to the fixed costs to ensure that the projected budget equals the bid cost. This step can also be tied to the production calendar.

Early warning systems can function only if they provide the information on a timely basis. However, systems requiring weekly reporting will tend to be inaccurate, inefficient, and burdensome to the contractor. Monthly reporting will probably not provide the information on a timely basis. Therefore, a biweekly (or semimonthly) system may be desirable. This choice must be made by the contractor so that it can be retrofitted easily into his existing accounting system.

Three levels of reporting are needed:

- Detailed reports for each cost center (to be reviewed by the monitor)
- Management summaries (to be submitted to the project officer)
- Exception reports (to be submitted to the project officer and the on-site monitor)

Keeping the volume of exception reports to a minimum should be a goal of both OSFA and the contractor. The effectiveness of this tool will be lost if the volume of reports is too great. In all likelihood this will involve adjustments, especially with a new vendor. These adjustments may include:

- Budget- or tolerance-level adjustments
- Requiring fewer exception reports for each cost center (especially on large contracts)

Such adjustments should be agreed to by both OSFA and the contractor.

Exception reports should include an explanation from the contractor detailing:

- Whether or not it was a one-time only occurrence
- Reason(s) for the problem
- When it could occur again
- Proposed budget modifications (if it can be offset)

Reports must be delivered to both the on-site monitor and the OSFA project officer on a timely basis to prevent surprises. We recommend a one week timeframe. The on-site monitor should be contacted in person or by phone immediately when major (e.g., 25 percent) cost overruns are detected--prior to report issuance.

DEVELOP GUIDELINES FOR OSFA MONITORING

Auditing of fiscal control reports should be the responsibility of the OSFA on-site monitor. Detailed guidelines for this process will be included in the next report. Basically, they include:

- Selection of about 10 percent of the reports at random for review
- Checking for mathematical accuracy
- Review of data for reasonableness (e.g., verifying that all three programmers reported from a cost center really are there)

The on-site monitor should also respond to detailed questions raised by the OSFA Project Officer, following up with contractor personnel as required.

The role of the OSFA project officer in this area should basically be that of a liaison, responsible for:

- Review of reports for reasonableness, requesting clarification as required
- Summarizing information to management
- Reconciling reports to contract invoices

Invoice reconciliation should proceed smoothly. (In the real world, problems will occur, but this is a theoretical discussion.) It should be a simple mathematical process of adding two reports for a month and comparing the total to the invoice.

CHAPTER 4

SOFTWARE QUALITY ASSURANCE

An effective software Quality Assurance (QA) system can ensure, within reasonable limits, that all software meets ED standards and specifications and avoids the countless expenses and delays incurred when software problems are discovered after the system is in the production stage. The problems that result from an absence of software QA are obvious. Minor software errors can cause major problems in the normal processing cycle. For example, minor software errors in Pell processing can cause SARs to be distributed with false information, possibly causing incorrect awards. An error detected in the production stage usually requires temporary shutdown of the system possibly during peak operation. When the system is in production all new applications must be reprocessed along with the backlog that accumulated while the system was shut down for correction, adding to production costs. Software corrections made quickly often cannot be tested as thoroughly as they should be. This condition often leads to further computational problems.

This chapter outlines strategies which, if implemented, could result in an effective processor software QA system in OSFA. In order to avoid the occurrence of software problems, a number of Quality Assurance/Quality Control techniques can be utilized. Each strategy has specific advantages and disadvantages, which are discussed in detail in Appendix B. The following techniques are considered:

- Software testing
- Software verification
- Software validation
- Internal control techniques

In combination, these techniques can lead to effective verification of software additions and changes that can improve the overall effectiveness of software already in production. Since time and resources dedicated to Quality Control are always limited, this discussion will be focus on practical methods designed to maximize the quality of the software.

QUALITY CONTROL AND QUALITY ASSURANCE

Quality Control in software refers to the procedures followed by the contractor to ensure that the software functions properly on a day-to-day basis, including the performance of test procedures for minor software modifications. Quality Control refers to procedures that should be followed by the contractor, described in the section on informal testing.

Quality Assurance refers to the procedures used by OSFA to verify that the specifications for software design and modification have been implemented correctly. Since the contractor is almost solely responsible for all modifications to the system, the role of Quality Assurance is to verify as carefully as possible the correctness of the entire system, using a combination of the applicable techniques described in the following sections.

SOFTWARE TESTING

Software testing is a function that should be performed by the processor. Both informal and formal techniques are considered below.

Computer-Based Testing (Informal)

Informal computer-based testing can be performed by the contractor while modifying the system. No formal reports or approval from ED is necessary. This informal testing should be part of the normal activities of programmers and systems analysts. Four types of tests should be performed as part of the ongoing modification or documentation process. Often several of these tests can be performed simultaneously.

- Unit Testing--Unit tests are performed on all individual modules compiled separately. It is necessary to check that each module functions according to the specifications from which it was developed. At each step in the design and implementation process, the correctness of the logical structure should be confirmed by the coders and programmers.

- Subsystem Testing--After completing the unit test the program module should be tested as part of the test for the subsystem to which it belongs. Subsystem tests evaluate the performance of a group of program modules that normally execute together as a unit within the overall system. Problems with individual modules are not always identified until the modules are required to function within the framework of the subsystem.

- Integration Testing--Integration testing checks the way in which all or some of the system modules are connected. Specifically, the communication between the system modules is reviewed to assure that the subsystem can receive and pass data between individual modules. Similarity or compatibility of record and file formats used by the modules is one possible source of problems identified by this process.

- Component Testing--Component testing confirms that a functional unit within the system performs correctly. Functional units or components can consist of part or all of a subsystem or can cross subsystems. In a component test the functional unit is tested by verifying that all the parts of the system that deal with the particular functional unit can be executed to produce the correct results. For example, in the Pell processor some functional units in the corrections subsystem are the processing of student requests for duplicate SAR's and the processing of address correction requests.

Computer-Based Testing (Formal)

Formal computer-based testing refers to the thorough testing that follows customer-approved test plans. The tests are designed to confirm that all system software meets the specifications exactly. Formal testing is usually performed when the system is being evaluated but before its initial production use. The following are four different types of formal tests:

- Subsystem Integration Testing--This is similar in purpose to integration testing at the informal testing stages. During formal testing a much more complete set of tests should be specified to ensure that the connections between all program modules are tested and reported on. Sometimes the output of the individual programs and subsystems will be sufficient evidence of correct operation. In other cases additional reports must be established.

- Prototype Testing--Prototype testing is used to check the correctness of the basic design of program modules or subsystems. Tests are performed on a system which is a precursor to the final system and may not include all the features the final system includes. Prototype testing can often give early insight into design problems which can then be remedied early, making for less rework in the final system.

- System Testing--System testing is done from detailed customer output examined thoroughly by qualified personnel. All initial input and final output must be correlated to all intermediate input and output. The system test should confirm that the system specifications have been followed precisely and that the system is completely operational. If not, the system test should identify the program units or subsystems where errors have occurred.

- Acceptance Testing--Acceptance testing is similar to system testing but it determines whether or not the system can be accepted and put into production. Each subsystem is evaluated separately and parts of the system may be accepted while others require further modification or corrections. When there are no bugs or only very minor bugs, the system (or subsystem) can be accepted for production. It is not desirable to accept a system with errors of any type remaining, but due to time pressure it is sometimes possible to accept programs with errors such as improperly formatted output. Errors of this nature do not affect the proper functioning of the programs.

Manual-Based Testing

Three types of manual software testing are useful in the evaluation of the design and completeness of system software. Manual testing uncovers errors well before the system is in production and is one of the only ways to discover certain types of errors. Manual checks can improve the most basic unit of the system, the individual program. Quality at the program level reflects on the quality and efficiency of the whole system. Manual quality control is one of the least costly methods of software testing and is also one of the methods most seldom used. Much more emphasis should be put on the following manual techniques:

- Design Evaluation--Design evaluation refers to the careful examination of the system and subsystem design by studying specifications documents. Functional requirements, system specifications, and program specifications are reviewed in search of design flaws, inefficient design, or overall inconsistencies in system design.

- Product Evaluation--Product evaluation refers to the review of the actual program code and also system and program documentation. The logic and efficiency of the code are examined by an experienced programmer other than the author of the program. This evaluation should be performed before the computer-based testing of the system. Problems found and corrected at this stage will simplify the later system testing stage, and improve the quality of all the programs and hence of the overall system. The accuracy of the software documentation can be verified at the same time as the code is reviewed,

- Structured Programming Technology--Structured programming, also known as top-down programming, can be used to improve the quality of the code, to standardize internal program organization, and to make program code more easily readable to other programmers. Programs flowcharted and written using structured programming techniques contain fewer errors to begin with and are much easier to debug because they are easy to read, even in the absence of program documentation. Another structured programming technique is the walk-through--a set of techniques performed at different times in the software development stage. The walk-through, executed by a group of technical members of a project team, reviews the work of all employees. Program specifications, test preparations, code, and output are all reviewed for correctness and compliance with established standards.

SOFTWARE VERIFICATION AND VALIDATION

Software verification and validation techniques can be used by OSFA for quality assurance of the processor function. The following techniques could be integrated into processor contracts.

Verification

Software verification is the process of determining whether the results of executing system software in a test environment agree with the original specifications. Verification is concerned with the correctness of the logic of the software--that is, making sure the software satisfies the functional requirements defined in the specifications. The following six techniques used to verify software are normally used in conjunction with each other and/or other techniques.

- Drivers--Driver programs are written to perform unit testing and some integration testing in the implementation stages of software development. They are superfluous code that will not become part of the system but are needed to test program modules. Driver programs are often used to generate test data and to drive a group of other programs.

- Test Data Base--A test data base is a collection of data that closely matches the actual data that will be used in the production cycle of the software system. The test data should contain records and files that are representative of the variety present in the actual data, although the quantity is usually considerably less. It is also important to create records that contain invalid data to ensure that the software properly edits, flags, or rejects the data systematically.

- Design Verification--Design verification refers to the examination of software specifications for the purpose of finding design errors before the software is coded. After the contractor has created the preliminary design for the program modules, according to customer specifications, the customer reviews the software design. The customer is presented with detailed technical descriptions and flowcharts of what the software modules will be like when completed. This avoids the creation of useless software that would need to be modified at a higher cost later in the development stage.

- Execution Analysis--Execution analysis refers to the automated monitoring of computer-based software testing and the collection of data from this testing. The data are then analyzed manually and used to predict the duration and cost of testing and also the quality of the software product.

- Automated Network or Path Analysis--This is a technique that analyzes the program module source code to determine the minimum set of paths through the code that will make use of all logical branches of a program module. This technique can be used in the system implementation stage of software development to optimize code efficiency.

- Statistical Prediction--In this technique errors are inserted into the program module code and the program is tested until all errors are found. A confidence factor is then computed which indicates the effectiveness of the programming and verification process.

Validation

Software validation is the process of determining whether executing the system in the production environment causes any problems. The system in this case refers not only to the software modules but also to the hardware, user procedures, and personnel. Validation is concerned with confirming that the specifications and production environment information (used initially in the designing of the system) are complete and correct. Following are three commonly used software validation techniques:

- Functional Testing--Functional tests are designed for a very specific functional capability of a program module or software system. The emphasis of the functional test is on the specification rather than the overall program module. It verifies that the user requirements have been programmed correctly. The test also can be used as a verification technique.

- Design Validation--Design validation refers to the procedure of designing a software system for finding program errors. This technique is similar to the design verification technique, but it occurs earlier in the software development stage. Design validation is basically a review of system software plans which are analyzed manually to make projections for upper management and customers on project status, existing problems, and whether or not schedules are being met.

- Matrix Analysis and Problem Statement Language--This technique makes use of a forms-oriented language or a formal syntax language to communicate the needs of the user to the analysts. The use of this technique can facilitate the detection and elimination of logic errors by the user because the analyst and the user work closely in evaluating system requirements.

Internal Control Techniques

Internal controls are statistics and edits written into the program modules and designed to perform internal checks on the performance of the program module. Internal controls produce data to be used in performance monitoring of the program. Six internal control techniques are described here.

- Limit Checks--Limit checks in programs can be used to identify data and combinations of data likely to be invalid. The programs use a series of software instructions that compare certain conditions and refer to a table that contains high and low limits for parameters. When errors are detected special reports are created that report the error conditions to management. Appropriate action must be taken to remedy the problems.

- Record Counts--The internal counting of records and the review of the counts is essential to keeping track of data within a system and verifying that the programs are passing, sorting or updating files properly. Counts are normally performed at least twice within a program--once when the record first enters the program and again at an appropriate point, usually immediately before it is passed to another file or program.

- Batch Totals and Counts--When a specified number of records are processed together as a batch, as they are in Pell Grant processing, it is necessary to keep track of these batches as they flow through the system. This is done by calculating a batch total on a data field common to all records in the batch. The batch total, batch count, and batch number are then reconciled at appropriate points in system processing. Any discrepancies must be researched and corrected.

- Control Totals--Control totals are statistics computed on significant data elements before they are processed by the system. Totals on the same data elements are calculated again during or at the completion of processing by the software system. Control totals give an estimate of the magnitude of the software errors in the system. Record counts provide similar information but are concerned only with the volume of errors; control totals are concerned with the value of errors.

- Hash Totals--Hash totals are calculations computed on insignificant data such as Social Security number or serialized document number. Hash totals are calculated as the data enter computer system processing and during later system processing. Differences between these hash totals indicate missing records and sometimes can be used to identify the specific documents that are missing.

- File Labels--Internal labels can be placed on magnetic tapes to identify data records contained on that tape. Header labels become the first record on the tape and can be verified by program software so that wrong tapes are not read by the program. The program can stop processing immediately and alert the production staff to the error. This will save processing time and expense. Trailer labels often contain record counts and control totals, as described previously.

ADDITIONAL CONSIDERATIONS

The following are additional issues that should be considered by OSFA when developing QA and QC guidelines for processor contracts.

- Privacy and Security--This is a complex problem when large volumes of information are being processed through a production software system. Basic precautions should be taken at each step where the data are handled by production staff. Personnel must be informed of the proper methods for treating confidential data as well as their responsibilities under the Privacy Act of 1974. After the data are keyed onto tape or disk they are not easily accessed unintentionally so security becomes a matter of limiting access to the data and software to only those authorized to handle it.

- Computer Systems Costs--There are numerous ways to minimize the costs of operating a large software system. Many of the previously discussed QA procedures will improve the quality and efficiency of the software from the program module unit up to the entire system. Although there is an initial personnel cost in implementing these QA techniques, the cost of operating the system on a day-to-day basis can be reduced drastically. It is important to keep central processing unit (CPU) time and size to a minimum.

- Program Change Controls--All program module source codes should be protected against unauthorized changes. The use of a secure source library system, like PANVALET, can help control usage of a source code. The object code should also be protected, but due to its nature it is not usually as easily modified.

- Documentation--Complete documentation for a large software system such as the Pell Grant system should consist of at least a maintenance manual, users' guide, and systems overview documentation for nontechnical personnel at ED.

- Production Control--A detailed plan must be written that is specific enough to be followed routinely by the production staff but flexible enough to account for the daily fluctuations of quantities and types of data. Each member of the production team should be assigned specific types of duties and authorized to perform only these duties. When problems of any type occur, the method and the person responsible must be clearly defined.

- Data Control--The handling and storing of data should be outlined in the production plan. Data must be serialized and filed in an organized and secure manner. Procedures for transferring data must be set up, and all data processed by the system should be clearly marked with its final destination so that operators and production staff do not misplace any data. Careful daily documentation of processing will guarantee that all new data units (tape or disk) will be easily accessible when they are required in future processing.

- Magnetic Media Control--In addition to the careful organization and filing of tapes, previously described, they require additional care. Tapes must be protected against environmental hazards. Backups should be kept for all system tapes. In order to reduce the volume of tapes procedures should be established for disposing of those no longer needed.

CONCLUSION

Software quality control and quality assurance have an important function in an overall quality control system for the student aid processor function. In the final chapter the techniques outlined here are applied to the Pell processor.

CHAPTER 5

PRODUCTIVITY

The processing function is composed of several production steps, some of which involve manual activities. Particular attention should be paid to manual activities because:

- They are usually the slowest activities in terms of processing.
- Labor costs are usually a very high percentage of total costs, so for a given processing system these costs should be minimized.
- In processes with unevenness in processing (i.e., peaks and valleys), the labor function usually becomes most sensitive to changes in level of processing.

OSFA monitoring of manual activities for efficiency should not focus on personnel efficiency. Instead, it should focus on how personnel are fit into the production steps. These steps were outlined in a general way in Chapter 2--that is, the activities should be scrutinized for how well they use personnel in processing rather than for how productive personnel are. The most efficient production process is the one that most efficiently combines personnel and mechanized devices. Too much labor per unit of machine results in excess capacity, and labor costs will be too high. Too little labor will slow down processing, and accuracy problems may occur.

The most direct way to assess productivity in a production process is to begin by looking at the different production steps and the manual activities within them. These steps should coincide with the cost centers identified in the process. At this level, data on the number, cost, and time of personnel and total costs can be gathered and compared.

STAGES IN MONITORING PRODUCTIVITY

There are two stages in monitoring productivity. The first stage is establishing efficient processes for manual activities. This can be taken as a given, or it can be varied if it is determined to be inefficient. The second stage is the ongoing monitoring of resource requirements and the mix of personnel and mechanical devices over the course of changes in the parameters of the process, including the level of incoming documents. This two-stage approach is analogous to establishing measures and standards.

The establishment of standards must rely on the judgment of OSFA managers, experience, and the ability of the contractor to be flexible. With a lack of information on historical trends on productivity, a method for assessing maximum efficiency must be devised. Since mechanical devices are labor-saving, they should be used as a standard of performance. The number of these devices that can be used and the number of people who can use one device should be calculated. Observing working patterns of idle time or overtime for given levels of incoming documents should give a rough idea of how efficiently personnel are being used. Changing the ratio of personnel to machines and seeing what effect this has on processing time should give an idea of the optimal mixture of personnel and machines. In activities where there are no machines, observing processing or activity time and varying the number of personnel should give an idea again of how the activity may work more efficiently.

In this initial step, data should be collected on the number and type of people, how much they work, the number of mechanical devices available, document volume, and turnaround time. Multivariate statistics of ratios per unit of volume or ratios by turnaround time should be computed. These, then, become the standards to which subsequent measures are compared. They hold constant variable volumes and turnaround times.

The second stage of the monitoring procedure is merely collecting the same kinds of data and computing the appropriate statistics. If the relationships between labor amount and volume and turnaround time are stable, then as volume grows it will be possible to predict how many additional personnel will be required and what their cost should be. Total contract cost for a small time period will be directly estimable. Also, if the statistics begin to vary significantly, it should be possible for management to pinpoint approximately where the bottlenecks are and how to solve them.

This kind of monitoring is actually easier than it sounds because the measures are based upon the assumption of stable relationships rather than economies or diseconomies of scale in the processing function. That is, if fixed costs must be changed drastically at some threshold level of document volume, or if the training facilities for personnel are not kept at the same pace as the need for a particular type of personnel, then the statistics will not be accurate.

TASK SCHEDULING AND COST MANAGEMENT

For extremely large processor contracts, OSFA should consider establishing, jointly with the contractor, a task scheduling and monitoring system that would enable OSFA project monitors to:

- Monitor performance on a previously established performance schedule
- Estimate the cost savings of changing performance standards in various steps in the production process
- Establish a reliable mechanism for estimating staff requirements for each step in the production process
- Estimate the costs of major delays in the production schedule, such as congressional delays in reconciling the program budget or final Family Contribution Schedule

Currently, a number of automated systems could be used for this purpose. In particular, the Department of Defense uses these strategies for the management of large defense projects. If OSFA were to use this strategy, a variety of options would be available, including:

- Requiring the processor contractor to establish such a system and to use it for production control, cost control, and productivity management
- Establishing a cost control scheduling system in OSFA that could be used to monitor the OSFA contract
- Issuing a separate contract for the purpose of cost control and scheduling of large processor vendor contracts in OSFA

The selection of a strategy for developing a task scheduling and cost control system depends on the goals of the Department. If the processor contractor maintains such a system, the first is the most viable option. Since OSFA does not currently have experience with such a system, the feasibility of the second two options is limited.

The use of an automated task scheduling and cost monitoring system has the potential to improve production efficiency for manual activities. If the two-stage process described above were used to develop productivity measures and standards these requirements could be entered into the system and monitored as part of the overall system. In fact, all aspects of quality control and processor contract management considered here could be effectively monitored through a cost control system. This issue will be considered in more depth in the second report, on vendor/processor QA.

CHAPTER 6

QC REPORTING, MONITORING, AND CORRECTIVE ACTION

The previous chapters identify areas in the processing function where quality control standards and measures could be established. This chapter considers the ways in which the processor function should be monitored and how the information gathered for quality control can be conveyed to the managers of the system. This chapter does not deal directly with the quality assurance role of ED and how it should perform that role. This topic will be considered in a second report. Instead, this chapter considers the relationship between OSFA and the contractors for processor contracts. The three critical areas for monitoring QC components of processor contracts are:

- Reporting
- Monitoring
- Corrective action

Quality control reporting is the way in which the data collected on the performance of the production process are conveyed to OSFA managers. The data should be timely and accurately reflect the condition of the system without overburdening the managers with a mountain of useless statistics. QC Monitoring is the method by which the production process is evaluated. This involves who should do the monitoring and what roles the contractor and ED should play in the monitoring. Corrective action is the way in which problems in the system can be corrected most efficiently.

That is, how should a decision be made on what corrective action should be taken, and who should make that decision?

QUALITY CONTROL REPORTING

If all aspects of processor quality control discussed in this report were implemented, the production process would produce several reports based on data collected in the areas describing the condition of the process. These reports would contain information on production control, fiscal control, software performance, and productivity. There would be a great deal of information--probably too much--to be reviewed by the managers of the system. The goal of the reporting system should be two-fold:

- The reports should contain only the most crucial information on a routine basis needed by managers to effectively monitor the system.
- Various levels of reports containing unique information (or just aggregated information) should be geared toward different levels of management.

For contracts subject to intensive and routine quality control specifications, the types of reports should be specified before the contract implementation stage. This report identifies specific areas in the processing function that should be monitored. In addition, given the unpredictability of the policy process, additional information may be required. However, OSFA managers should decide which of the areas identified are most crucial for managing purposes. Information related to these areas should be reported routinely to OSFA project monitors.

Other types of information can be included in the QC system but reported on only when QC standards are not met.

OSFA management should decide the timeliness of the data and how often they should be reported. The lag between the production of data and the generated report should be minimized for crucial data.

For most of the large processing contracts, numerous people at ED need to know the performance of the processing function. Different groups have different information requirements. Some groups are related horizontally, such as managers in contracts who are in charge of controlling costs of automated data processing. Other managers are related vertically. Top management in OSFA should be concerned only with summary reports or special problems facing the processor function. Some groups are interested in the actual operation of the processing steps, while others are concerned with how the processing function is performing in the context of the overall delivery of the program. The reports must reflect the divergence of the groups and their information needs. In the development of the processing function, the top-level managers of the system must identify who should receive what types of reports containing what types of information.

The lower-level managers who monitor relatively small, well-defined parts of the processing function should receive the most detailed information on those parts routinely. The information may be simply specific costs within a cost center--or the number of applications rejected or corrected for all the computer edits in the system. Going up the management ladder, the reports should be geared to the major interests of each manager and the data aggregated to the appropriate level. For instance, a manager interested in applicant flow in the Pell program may want to know only the number of applications in the previous week, month, and year-to-date as compared to last year at the same time. Such a report is simple, but it gives the manager everything he needs to know at a glance. The reports should be comprehensive but not filled with extraneous information.

QUALITY CONTROL MONITORING

The processor and ED should both monitor the processing contracts. The roles differ in that the contractor should be more concerned with the quality control procedures in the system, while ED should play a quality assurance role and evaluate the contractor's procedures. Monitoring should be done on several levels, ranging from individual production steps or activities within those steps to the overall system. This demands that the contractor monitor and evaluate the system in an ongoing way.

The most effective means for an ongoing evaluation of the system is to have the contractor establish a quality control team independent of the production process. This team should spend full time evaluating the system and trouble-shooting areas of potential problems. The size of the on-site team should vary depending upon the size and complexity of the production process. The team should observe the process and try to anticipate problems in it. A way to do this is to have the team receive its own set of reports from the system in great enough detail to identify potential problems. In turn, the quality control team should submit reports to the higher level of management of the contractor and to the ED managers. In addition, this team should act as an intermediary between the ED managers and the contractor's managers of specific QC steps.

A problem apparent in the ED monitoring of processing contracts, especially large ones, is the lack of intimate involvement in the day-to-day operations. As was alluded to earlier, ED managers often split their duties between a number of activities. As a result, they rely on the contractor and on reports for information regarding the operations. For large contracts, ED should monitor contracts on-site, especially when the actual work site is more than 50 miles from Washington. The responsibility of the on-site monitor should be to oversee the operations in a general sense and to make the immediate decisions necessary from ED. In addition, the on-site monitor should be the key communicator of information between the contractor and OSFA and the first point of contact for each side.

Although OSFA should be concerned about the efficiency and effectiveness of the processing function, it should not be closely involved in its operation. Therefore, OSFA personnel should not deal directly with the quality control aspects of the contract. Instead the contractor should be the responsible for seeing that the operation runs smoothly. It is more appropriate for OSFA personnel to evaluate the quality control procedures and determine how they can improve operations. The reports OSFA receives should reflect the kinds of quality control procedures the contractor has put in place. When the reports show a problem, ED should step in and inform the contractor that the operation needs to be changed and then closely watch to ensure its successful alteration.

QUALITY CONTROL CORRECTIVE ACTION

A mechanism for implementing change in the processing function should be established, and when a change is warranted for some reason, corrective action should be taken. Both the contractor and OSFA should be told of the changes and their implications. The internal quality control team should be able to identify needed changes and determine, with the contractor how to make those changes. The proposed method for monitoring the process should aid the change procedure. This information can be passed along to the on-site monitor who can evaluate the proposal and give some indication of ED acceptance. This can then be passed to the central office of ED which should make an informed decision, given the information of the contractor and the assessment of the monitor.

If OSFA wishes to initiate corrective actions in the processor function it can convey its information to the on-site monitor who can evaluate it in terms of the impact on the system and then gather the contractor's reaction to the proposed change.

The monitor can then act as an intermediary who knows the operation well and yet represents the interests of ED. Agreement on how the change should take place and what the fiscal impact is should come quickly because the lines of communication are open.

CHAPTER 7

PROCESSOR QUALITY CONTROL IN THE PELL GRANT APPLICATION SYSTEM

The issues of quality control of the processor function for the Pell Grant Program are considered explictly in this chapter, which has two sections:

- The development of QC measures and standards for the Pell processor system
- The use of a sample for improved QC of the vendor processor function

While most of the data needed to monitor the system effectively should be derived from the universe of applications, some can be obtained from a sample of applications. A sample can be used in two ways:

- As a spot check of the system in the production stage. Many of the measures and standards referred to in the following section use samples of applications, SARs, and so forth to check the accuracy of the system.
- As a free-standing slice of the product of the system. A sample of applications can be used in a wide variety of ways beyond management purposes.

QC MEASURES AND STANDARDS

The previous chapters of this report develop a framework for establishing a system of measures and standards of performance for different areas of student aid processing contracts. The framework provides a way to monitor the Pell processor contract in the following areas:

- Production control
- Fiscal control
- Software quality assurance
- Productivity

In addition, the overriding concerns of QC reporting, quality of data, and research underlie the discussion of each of the areas. The guidelines established for them take into account these concerns. If the correct measures and standards are established, and they are reported effectively, then the system should produce accurate data in the most efficient method possible.

The framework proposes a methodology for developing measures and standards for the generic steps of any student aid processing function. The purposes of this chapter are to identify the crucial areas for QC within the Pell application processing function and recommend guidelines to develop measures and standards of those areas of performance. Appendices to this chapter contain sample report formats and more specific guidelines that can be used for the Pell contract.

Production Control

The Pell application process includes the production steps outlined in Chapter 2. Consequently, the production process can be broken down into six steps:

- Receipt Control--The point where the initial application, correction, telephone call, or data tape from an MDE site comes into the system

- Cursory Edit--The point at which the first stage of editing is done on the application or tape

- Key Entry--The point at which the data are put into the system

- Compute--The automatic processing system which conducts edits on the data for consistency and also computes an SAI

- SAR Production--Whether or not an SAI can be computed, production of an SAR, which is sent to the applicant

- Corrections Processing--Where corrections to data are made in order to change the data on the SAR

The objectives of a production control system are to:

- Ensure that applications move from one production step to the next in the least amount of time without sacrificing accuracy

- Keep track of where the applications are in the process at any one time

Achievement of these objectives depends on effectively monitoring the production process. To accomplish this, the processor's reporting system must show:

- The movement of applications through the different steps

- The time for each step or group of steps

- The accuracy of each step monitored from an overall perspective

- Measures and standards for activities in each production step

In receipt control, counting the incoming applications and preparing them for the initial editing are the two areas of concern. An initial count is required to reconcile with the counts of applications at other points in the process. Also, the applications must be put into the proper form so they may be easily reviewed for errors. The critical measure for this step is a count of the incoming applications at specific times.

In the case of telephone calls, the number of completed calls and the accuracy of the responses are of concern. The time a caller is on hold awaiting assistance should be minimized. Once a caller is connected to an operator, the caller should receive helpful information. From a management perspective, the measures of this activity include a count of the phone calls that are put on hold. For an accuracy measure, a selection of types of questions should be developed and individuals should call in to see if correct answers are given. In addition, to measure the effectiveness of the activity, ratios could be developed of the number of phone calls per application. This measure would indicate how the whole system works and is understandable to the applicant, and provide a projection of the number of calls there will be at different levels of volume processing. The goal of this step is to ensure accuracy; the groups must be homogeneous if the appropriate treatment is applied.

The key entry step is the start of the automated system. It is critical to count the number of applications going into the system and measure the backlog at this point, as well as the accuracy of the key entry. The measures of the backlog in key entry should be set up at specified intervals in the processing calendar. And the key entry accuracy should be measured with a sample of applications throughout the year.

In the compute step, the procedure is automatic. The critical measures are the accuracy of the compute procedure and whether or not the machine edits are flagging the correct items in the correct way. Software quality assurance determines the accuracy of the compute on test cases, but from a production control point of view, the system must produce accurate SARs efficiently for different volumes of applications. The number of times particular edits are used to provide important information on the quality of the data and the system should be noted.

At the SAR production step it is necessary to check that the data transmitted from the compute are accurately transferred to the SAR, which must be mailed out along with the proper information to the correct applicant. Counts of SARs being produced and the number of SARs mailed out should be kept, and spot checks should be made on the accuracy of information on the SAR. Finally, this step in the system should be used as a point for timing how long it takes an application to make it through the system by following a sample of applications through the process to their final destination.

The corrections process must dispose of corrections in the most expedient way and ensure that the correct data are entered into the system. Sampling of incoming corrections should be made to see whether the correct data are being used. The counts of different types of corrections should be tracked for corrective actions purposes.

In summary, the types of information on the different aspects of the system can be combined into the same or a small number of reports. Appendix A contains a series of sample production control reports. At the lowest managerial level, all the information cited above for each step should be included. This would give an overall view of the performance of the system. Reporting of these various steps can be done by grouping the data into different types of applications such as those eligible, those validated, and so forth. Whichever way they are grouped, the basic information on their status should be included.

Fiscal Control

The application of a fiscal control system to the Pell application processing system appears in Appendix B. To adequately establish a fiscal control system, the cost of each production step should be thought through ahead of time so it can be integrated into the system. The fiscal control system should be a part of the system and not run parallel. The steps for ensuring that the correct issues are addressed by the managers are outlined in the appendix. The issues are grouped into two steps: 1) those to be addressed in the guidelines; and 2) those to be addressed after basic agreement has been reached with the contractor. Appendix B also contains report formats that can be used to monitor the cost centers. These formats which are general to the specific steps but can easily be applied to specific ones, are for the lower level managers who must keep track of specific functions. The reports can be scaled to control for the level of volume, thus allowing managers to have standardized costs across volumes.

Software Quality Assurance

For any software certain tests should be performed to ensure the performance of the software. Some of these tests are manual and some are automatic, using different types of data. Appendix C presents a matrix of software testing techniques with their advantages and disadvantages. The list is exhaustive, and not all tests should necessarily be used. It depends on the type of software and its purpose. Also, there is a trade-off between the increased accuracy of a test and its cost.

For the Pell application software, extensive testing should be done on the computing algorithm for accuracy and efficiency for large volumes of data. Also the edit checks must be thoroughly tested to ensure they produce the correct edit for the correct condition. ED managers should decide with tests are the most cost-effective and give the desired results.

Productivity

The Pell application processing system contains several manual processes that require significant amounts of labor. Since labor costs are generally higher relative to other types of costs in a processing system, they must be closely monitored.

The manual processes must be efficient, in terms of not creating bottlenecks in the system, and be accurate. For monitoring purposes, the productivity measures can follow the structure of the cost control measures, since labor costs are major costs in the steps in which they occur.

In the Pell application processing system, four possible areas may be amenable to productivity measurement. In the information receipt step, applications must be taken out of envelopes and put into homogeneous groups for further processing. Also, applicants who have problems or want to check on the status of their applications may telephone the processor. In the SAR production step, SARs automatically generated must be put into envelopes along with the other information sheets. Finally, if corrections require a letter or some other type of special handling, people must be used to generate the type of responses that should be sent back to the applicant.

QC measures and standards for productivity reports should track the number of person-hours required to complete each step, the accuracy of their work, and the number of transactions they handle. Statistics can be generated using productivity and fiscal measures that produce standardized measures of labor costs relative to other costs in the system. They can also reveal how quickly the manual process is performed. Appendix D presents sample report formats for monitoring productivity.

Measures by steps should include the number of people involved in the process by hours or cost and how many transactions take place during a specified period. This should be a regularly reported statistic in the final report. Second, accuracy of the processes should be measured on a sample basis to ensure that the process utilizes the labor component efficiently without sacrificing accuracy.

QC Guidelines

This section suggests specific guidelines for the Quality Control component of the Pell processor contract. Two types of guidelines are considered:

- Guidelines for QC measures and standards for the Pell processor control
- Guidelines for the contract management system for the Pell processor contract

The above discussion of measures and standards relates specifically to the first issue. It is possible to develop a set of guidelines for a QC measurement system for the Pell processor contract. It is essential that the processing function have a QC system and a system of measurement for:

- Production control
- Fiscal control
- Software quality assurance
- Productivity

While the contractor should be given an opportunity to develop such a QC system, OSFA should identify specific guidelines or requirements for such a system. The discussion just given and the technical appendices provide a general background for specifying the types of measures the contractor should develop as part of the QC system. Appendix E displays the minimum requirement OSFA should require for effective monitoring of the Pell contract.

Another aspect of QC for the Pell processor contract is the task scheduling and cost control system used as part of the project management plan. Extremely large production contracts, like the Pell processing contract, benefit from a systematic approach to these issues. Specifically, the areas of production control, fiscal control, and productivity can be improved through the use of a cost scheduling system. The requirements for such a system should include the following capabilities:

- A cost control Gantt chart for each phase of the process or function that displays the schedule status of activities to be accomplished within the Baseline Cost Estimate (BCE) funds available
- A cost status report that lists fixed and variable costs with associated activities
- A resource analysis report which describes, in dollars, the status of funds (budgeted or actual) within each cost center of the BCE
- A cost-versus-time plot of budget-versus-obligated funds for each cost center of the BCE
- A critical path of the activities management network that routinely reports planned and actual achievement of planned project activities

The outputs would fully describe for the OSFA Project Director the status of the processor schedule and budgeted vs. actual (obligated) funds. The expenditures, obligation, and reallocation of BCE funds by the contractor should be stored in the data base for such a system, enabling the contractor or OSFA manager reviewing the project to call it up for a review, analysis, or update of project status. This type of task and cost scheduling system is widely utilized by the Department of Defense contractors are easily adapted to the processor function for Pell.

The purpose of this chapter is to apply the general framework developed earlier in the report to the Pell application processing function. This chapter identifies specific data necessary to effectively manage the contract and to ensure the contractor is performing to efficiency. Appendices A, B, and D contain sample reports for each of the critical areas in the processor function. In order to provide a coherent picture of how these reports can be useful in monitoring the Pell processing contract, an example of a package of the sample reports for a sample cost center is presented in Appendix F. The information receipt cost center has been used, but this set of forms can be adopted to other cost centers.

This example shows what kind of information a manager would receive from a particular cost center. The package of reports on the cost center would be included in a larger package of production and cost data on the entire processing function. In the package of statistics on the cost center are the following kinds of reports:

- Production control statistics--These would give an overall indication of the activity level of the cost center. In addition, the accuracy of the particular step is displayed as an indication of how efficient this step is in comparison to other steps.

- Fiscal control statistics--This would give a breakdown of particular kinds of costs incurred in the cost center. Also, the different costs are standardized by a volume indicator.
- Productivity statistics--This would given an indication of the efficiency of the production step and the accuracy of the step.
- Cost control statistics--These would provide a temporal setting for the flow of costs throughout the processing year. By having indicators for how much of the total budgeted costs should be spent by a particular point in time, should give an indication of how the actual spending flow is proceeding.

QC SAMPLE

There are several areas of the processing function where a sample of applicants would be useful in monitoring the integrity of the system. Current efforts in this regard represent, however, only a start in the wide variety of uses for a sample. Every 500th record is now being pulled and tracked through the system. While this method may be sufficient to satisfy some QC information requirements it does not go very far in the potential uses of the sample.

Currently, most of the information needed about any aspect of the application processing system is obtained by accessing the entire application data base. Applicant profile statistics, management reports, and corrective action reports are done by the processor who writes a statistical program that reads every record in the applicant universe. The tables currently produced are, by and large, specified at the beginning of the contract and programmed in as part of the system. Accessing the entire programmed in as part of the system. Accessing the entire applicant population has the following disadvantages. Such a process is:

- Expensive--The cost of producing a table is directly related to the number of records read by the computer.
- Inflexible--The policy process often changes during the middle of the processing year. If a specific table is desired in the middle of the year, a negotiation with the processor is necessary to specially program the table.
- Unnecessaily Detailed--Using the entire applicant population can give detail about the applicants down to any specified level. Much of the detail may not be absolutely necessary for the purposes of the ED managers.

For ED managers, using the applicant population seems to be an unnecessary expense for the gains of added detail and automatic production. Instead, a statistically valid sample of applicants could be used to provide the necessary statistics at a reasonable cost.

A sample (or samples) of applicants can easily be used to perform the following functions:

- Applicant statistics
- Corrective actions analysis
- Management reports

The current set of applicant profile statistics produced quarterly by the processor, provide a wealth of data about the characteristics of the applicant population. The tables are useful in their exhaustive detail on all aspects of applicants. However, at times the appropriate table does not exist. The formats of the tables are specified at the beginning of the year and are difficult to change. Statistics be estimated from the existing tables. If a sample of applicants were available to ED staff, the appropriate statistics could be produced with a reasonable degree of accuracy and in a timely fashion. The sample could not be used for every request, but it could satisfy a large number of the questions that arise throughout the year. The sample could be drawn at the same time the quarterly tables are produced to provide a compatible set of data.

Corrective action analysis requires information about small groups of individuals who have specific characteristics. In-depth analysis of their characteristics and their transactions within the system require a data base containing the correct data elements. A specialized sample of applicants stratified by the desired characteristics would provide ED with the necessary data to perform the analyses. The sampling procedure should be made part of the system and be as flexible as possible to allow ED staff to choose a particular sample of applicants to analyze.

Specific management reports could be produced by sample for short turnaround uses. Since the management reports now are specified early in the process, changes are difficult to produce in a short timeframe and at minimal expense. Instead, a sample of applicants could be used to produce the reports that, although they would be samples, represent the entire population with a reasonable degree of accuracy.

Uses of a Sample

To properly monitor the Pell Grant application process, data that can be used to assess the performance of the system are required. This information includes:

- Turnaround time
- Data entry error
- Effectiveness of edits and validation

Much of this information is either unavailable or extremely costly and difficult to obtain on a program-wide basis. A sample (or samples) can be used to select cases on which to perform more detailed analysis. From the analysis done on the sample, inferences concerning turnaround time, data entry error, effectiveness of validation and edits, etc., for the entire program can then be drawn.

In contrast to the analysis samples described previously, sampling techniques can be used to generate descriptive information about the applicant population and subpopulations. Currently, this information is generated by passing the entire applicant file through various frequency table-producing programs. Much of this data could, however, be generated more efficiently, and with a high degree of accuracy, using a statistical sample. The information which could be obtained using a profile sample includes:

- Total number of applicants, transactions, eligibles, ineligibles, and rejections
- Average number of transactions per student
- Number of transactions by number of eligible/ineligible
- Number of applications per state
- Application statistics by state
- Number of transactions for validated students
- Number of eligible/ineligible students by validation status

Drawing the Sample

With any sample comes a trade-off between accuracy and cost. Increasing the sample size increases the level of accuracy and cost, while decreasing the sample size has the opposite effect. Depending upon the purposes of the sample, the optimal trade-off between accuracy and cost will occur at different sample sizes.

Profile samples can be large and therefore more accurate because the marginal cost of increasing the sample size is small. In fact, in many instances is preferable to use the entire universe if the need for accuracy is great and the cost is slight. Alternatively, in analysis the sample's accuracy must be sacrificed somewhat because of the large cost of obtaining the data and analyzing them. For example, measuring data entry error is a costly and tedious process and should only be done on a small sample of cases.

The exact size of a sample is determined by the expected value of the characteristics being estimated and the desired level of confidence. For profile samples the characteristic being estimated is the cell. (A cell is any category on a table. For example, in a table of applicants by state, one cell would be the number of applicants from Illinois). If the smallest cell to be estimated is less than .1 percent of the population and a 95 percent confidence level is desired, then the sample size necessary approaches the entire population. Therefore, if a large number of categories is being estimated (for example, the number of farmers per state), a sample should not be used. For analysis samples, the characteristic refers to the variable being measured (for example, turnaround time). Figure 3 presents more technical detail for calculating sample size.

To provide statistics during the program year, the profile sample must be selected at least once before all the applications have been received. One plan would be to sample the population twice, once in June and again in January. This would correspond to the generally bimodel distribution of applications received. A random sample would contain the broadest range of information and therefore would probably be most useful for program monitoring. The actual selection procedure is, first, to find the size and divide that by the population size to get the sample interval. Next, a random start case is chosen. Finally, every ith case starting with the random start case is pulled,

CHART OF SAMPLE SIZES FOR DIFFERENT VALUES OF P

Let p = Probability of characteristic of interest

Vp = Variance of p + .025 for a two-failed 95% level of confidence

n = Sample size

Formula used:

$$n = \frac{(1-p)}{p} \bullet \frac{1}{Vp^2}$$

p	n
.0001	15,998,400
.0005	3,198,400
.001	1,598,400
.005	318,400
.01	158,400
.05	30,400
.10	14,400
.20	6,400
.30	3,733
.40	2,400
.50	1,600

*For a profile sample, p is the expected size of the least frequent cell divided by the total population. For an analysis sample, p is the expected percent figure of the variable being measured.

FIGURE 3

where *i* is the sample interval. The second sample may be selected in the same way but using a different starting case.

The timing of the analysis sample depends upon whether the sample is being used to provide information on the application process for the current year or recommendations for future years. If the sample is used for recommendations for future years then one sample should be drawn as late in the year as possible. If the sample is used to provide information for the current year, then the sample will have to be drawn during the year, and more than one sample will probably be desired. One possibility would be to draw the analysis sample from the profile sample (since the profile sample will be larger). A statistical random sample, stratified to allow for proportional representation of the characteristics being studied, would be the best type of sample to use. Possible stratification variables would be MDE processor type and validation status.

In conclusion, a sample or samples could be extremely useful in providing the information required for vendor/processor quality control. Profile samples could be used to generate descriptive information on the applicant population and subpopulations at a reduced cost. Similarly, analysis samples may provide the capability to measure the variables necessary to monitor the system in a cost-efficient manner. An additional benefit which comes with sampling is that ED would have ready access to samples for any quick, ad hoc statistics desired in the course of monitoring the program.

APPENDIX A

SAMPLE PRODUCTION CONTROL REPORT FOR THE PELL APPLICATION PROCESS

(INFORMATION RECEIPT)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Applications Received				
Number of Applications Processed				
Number of Applications Rejected by cursory edit checks				
Number of Applications Going to Key Entry				
Number of Applications Backlogged				
Processing Time (Receipt to Edit Resolution or Key Entry)				
Applications to Key Entry				
0-2 days				
2-4 days				
4+ days				
Applications to Edit Resolution				
0-2 days				
2-4 days				
4+ days				
Accuracy of Processing				
Sample Size				

(INFORMATION RECEIPT) (Cont.)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Errors				
Percent of Errors				
Types of Errors				
A				
B				
C				
Number of Phone Calls Received				
Number of Phone Calls Completed				
Ratio of Calls to Applications				
Accuracy of Process				
Sample Size				
Number of Errors				
Percent of Errors				

APPENDIX A (Cont.)

SAMPLE PRODUCTION CONTROL REPORT
FOR THE PELL APPLICATION PROCESS

(KEY ENTRY)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Applications Entered				
Accuracy of Processing				
Sample Size				
Number of Keystroke Errors				
Percent of Errors				
Number of Data Element Errors				
Percent of Errors				
Number of Form Errors				
Percent of Errors				
Number of Applications Backlogged				

APPENDIX A (Cont.)

SAMPLE PRODUCTION CONTROL REPORT FOR THE PELL APPLICATION PROCESS

(COMPUTE)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Applications Processed (transactions)				
Number of Applications with SAIs				
Number Eligible				
Number Ineligible				
Number Rejected (no SAI)				
Number of Transactions Per Applicant (percent)				
One Transaction				
Two Transactions				
Three Transactions				
Four or More Transactions				
Number of Applications with Errors				
Number with 1-3 Errors				
Number with 4+ Errors				
Types of Errors				
A				
B				
C				
D				
.				
.				
.				

APPENDIX A (Cont.)

SAMPLE PRODUCTION CONTROL REPORT
FOR THE PELL APPLICATION PROCESS

(SAR PRODUCTION)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of SARs Produced				
Number of SARs Mailed				
Accuracy of Processing				
Sample size				
Number with error				
Percent with error				
Types of error				
A				
B				
C				
.				
.				
.				
Processing Time				
Sample Size				
Time of Processing				
0-10 days				
10-15 days				
15-20 days				
20-25 days				
25-30 days				
30-40 days				
40+ days				

APPENDIX A (Cont.)

SAMPLE PRODUCTION CONTROL REPORT
FOR THE PELL APPLICATION PROCESS

(CORRECTIONS PROCEDURES)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Applications with Corrections				
Percent of Applications with Corrections				
Processing Time				
Corrections processed				
0-5 days				
5-10 days				
10-15 days				
15-20 days				
20+ days				
Number of Corrections				
Transactions Per Applicant				
1-3				
2-4				
4+				
Accuracy of Process				
Sample Size				
Number with Errors				
Percent with Errors				
Number of Corrections Backlogged				

APPENDIX B

APPLICATION OF FISCAL CONTROLS TO THE PELL PROCESSOR CONTRACT

(STEP 1)

STEP	KEY ISSUES	COMMENTS
(Before Process Starts)	• Type of contract	If not CPFF, the level of detail described below may not be appropriate.
Identify Major "Cost Centers" (Where)	• Which parts of contract need fiscal monitoring	• Include all "cost centers" that have proven difficult to control in current contract and those which project to exceed 5 percent of total cost. • Probably includes "SER production", "data entry," correspondence," etc.
Identify Specific Costs (What)	• Which costs incurred need fiscal monitoring ?	• Since the major costs in this contract are labor and computer time, these should be the only costs monitored.
Determine Methodology (How)	• Most efficient method of fiscal monitoring	• Use "loaded" labor costs and direct computer time costs.
Establishment of Tolerance Levels (How Much)	• Level must produce effective "early warning system".	• 10 percent to be applied on a cost center level.
Specify Guidelines and Require Contractor Response	• Obtaining contractor response	• Specify no response to fiscal control system will make "technically nonresponsive."

B-1

APPENDIX B (CONT.)

APPLICATION OF FISCAL CONTROLS TO THE PELL PROCESSOR CONTRACT

STEP	KEY ISSUES	COMMENTS
Evaluate Responses	• Ability of contractor to implement fiscal control system for contract	• Evaluate based on: - responsiveness to guidelines - experience on other contracts - innovative suggestions
Modify Guidelines (If Applicable)		At this stage consider innovative suggestions and modify guidelines jointly with selected contractor.

APPENDIX B (CONT.)

APPLICATION OF FISCAL CONTROL TO THE PELL PROCESSOR CONTRACT

(STEP 2)

STEP	KEY ISSUES	COMMENTS
Develop Flexible Budget Based on Volume	• Segregating "fixed" and "variable" costs • Selecting appropriate volume indicators	• Should be done carefully on a joint basis with contractor during orientation • Assuming new contractor should be modified within six months based on experience
Reporting Mechanisms	• Capturing accurate data on a timely basis • Capturing data in appropriate format for user	• See copies of proposed reports included in B-4 and B-5 • Should be done biweekly (or semi-monthly) based on contractor's payroll process to accurately capture labor costs • Cost center detail reports to on-site monitor. • Management reports to OSFA Project Officer.
Specific Agreement on Guidelines with Winning Contractor	N/A	N/A

OSFA Monitoring System Guidelines (to be developed in subsequent deliverable)

OSFA CONTRACTOR FISCAL CONTROL

(SAMPLE REPORT) (EXCEPTION REPORT)
PERIOD ENDING 10/15/82

	CURRENT PERIOD		PRIOR PERIOD	
	BUDGET	ACTUAL	BUDGET	ACTUAL
Variable Budget Volume Indicator SARs Produced	9999	9999	9999	9999
Variable Costs Computer Time	99999	99999	99999	99999
Labor Cost Data Entry	99999	99999	99999	99999
TOTAL VARIABLE COSTS	999999	999999	999999	999999
Fixed Costs				
Labor Costs: Data Entry Supervisors	99999	99999	99999	99999
TOTAL FIXED COSTS	99999	99999	99999	99999
TOTAL COST CENTERS	99999	99999	99999	99999

B-4

Comments:

- A detailed report for each cost center with costs in excess of budget by greater than 10 percent should be sent to the OSFA project officer along with the management report.
- The contractor Project Manager should followup with a manual explanatory report within one week (copied to on-site monitor, also whether expected or reoccur).
- This report should flag individual line items out of range.

OSFA CONTRACTOR FISCAL CONTROL

(Sample Report) (Exception Report)
Period Ending 10/15/82

	CURRENT PERIOD		PRIOR PERIOD		CUMULATIVE	
	BUDGET	ACTUAL	BUDGET	ACTUAL	BUDGET	ACTUAL
Variable Budget Volume Indicator Computer Time	9999	9999	9999	9999	99999	99999
Labor Cost Data Entry	99999	99999	99999	99999	999999	999999
TOTAL VARIABLE COSTS	999999	999999	999999	999999	9999999	9999999
Fixed Costs						
Labor Costs: Data Entry Supervisors	99999	99999	99999	99999	999999	999999
TOTAL FIXED COSTS	99999	99999	99999	99999	999999	999999
TOTAL COST CENTERS	99999	99999	99999	99999	999999	999999

Comments:

- For small cost centers (or small contracts) costs should be captured on an individual employee basis.
- This report should be furnished within one week of the end of the period to on-site monitor.
- This format enables OSFA to quickly compare actual costs to budget and prior months
- Use of variable budget indicator presents a key to possible cost variances. No costs vary directly to indicator but follow trend.

OSFA CONTRACTOR FISCAL CONTROL

(SAMPLE REPORT) (MANAGEMENT LEVEL)
Period Ending 10/15/82

	CURRENT PERIOD		PRIOR PERIOD		CUMULATIVE	
	Budget	Actual	Budget	Actual	Budget	Actual
Correspondence	9999	9999	9999	9999	9999	9999
SAR Production	99999	99999	99999	99999	999999	999999
TOTAL CONTRACT	99999	99999	99999	99999	999999	999999

B-6

Comments:

- This report should be furnished within one week to the OSFA Project Officer.
- Two of these reports (for each month) should be easily reconciled to the monthly invoice.
- A flag could be inserted where tolerance level is exceeded denoting exception report to follow.
- The OSFA Project Officer should summarize information to OSFA management.

APPENDIX C

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Drivers	Superfluous code needed to perform unit testing and lower levels of integration in bottom-up software development effort	1) Testing of critical components can be emphasized. 2) I/O functions are most often provided early in software development, and these can easily be handled with driver programs.	1) Cost of development of of drivers which are usually discarded at end of testing. 2) Errors in drivers may impede testing. 3) Drivers usually written by same programmers who write components being tested, and so may contain same invalid assumptions.
Test Data Bases	Collection of data stored on computer peripheral device which closely matches "real" data base	1) Real data base is protected. 2) Testing can proceed faster with less confusion.	1) High cost 2) May not contain adequate data types or sufficient volume of data
Design Verification	Examination or inspection of a software specification for purpose of finding design errors	1) Error rework cost decreased doe to early error detection. 2) Quality of product is improved.	1) Often considered tedious and boring 2) Some errors thus found might be more easily found by compiler after coding

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Execution Analysis	Automated monitoring of computer-based software testing activities, collecting dta from this testing, analyzing data manually, and then predicting duration and cost of testing and quality of software product	1) Automating control and monitoring test activities 2) Aid in enforcing programming and system development standards	1) High cost
Automated Network or Path Analysis	Examination of source code to determine mi imum set of paths which exercise all logical branches of a program	1) Automatic determination of optimal paths to be tested 2) Aid in enforcing programming and control structure standards	1) Large number of iterations required may be excessive for contain types of software. 2) Need for user interactive to identify incompatible branch expressions
Statistical Prediction	Computation of a confidence factor which indicates effectiveness of programming	1) Will let programmers know with some certainty that an error exists	1) Difficult to determine type or number of errors to be inserted

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Functional Testing	Execution of independent tests designed to demonstrate a specific functional capability of a program or software system	1) Testing is visible and oriented to user evaluation. 2) Functions completed are measurable. 3) Testing of functions applies to all phases of test activities. 4) Revision and control of test specification is simplified.	1) All decision points of a program not necessarily tested 2) Dependent upon good original functional specifications
Design Validation	Examination or inspection of the functional requirements and the design of a software system for the purpose of finding errors	1) Error rework cost is decreased due to early error detection. 2) Quality of product is improved. 3) Increase in programmer productivity is due to positive psychological effect.	1) Often considered tedious and boring

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Matrix Analysis and Problem Statement Languages	Use of a forms-oriented language or a formaly syntax language to communicate needs of the user to the analyst	1) Gives complete and unambiguous data structure definitions 2) Provides precise module dependency interface definitions 3) Assurance of proper control logic to sequence software tasks correctly for all input combinations 4) Assures that each task is functionally complete and unambigously defimed	1) No efficient means of analyzing problem definitions 2) High cost

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Limit Checks	A series of compare instructors stating set conditions and keyed to a table within memory containing high and low parameters of the limit	1) Reduces impact of errors 2) Provides simplified technique to control extensive or complex exceptions 3) Focuses only on exceptions 4) Easy to implement and understand	1) Allows errors to be undetected 2) Requires frequent table changes in a dynamic environment 3) May hide out-of-balance condition 4) Provides less control as the range of acceptable values is expanded 5) Unscheduled changes can cause majority of transactions to be rejected. 6) Functional value is dependent upon the correction and reinput procedures for rejected data
Record Counts	Automated count of records or documents	1) Economical 2) Easy to design and implement	1) Does not identify lost documents 2) Does not indicate processing accuracy

C-5

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
		3) Isolates problem area(s) 4) Provides quick check for docuiment/record loss	3) Requires manual reconciliation and corrective actions 4) Reconciliations are difficult. 5) Does not ensure locating missing documents
Batch Totals and Counts	Counting of number of batches and records within a batch, a batch being a group of documents/records of same type compiled into processing sequence and assigned a unique batch number	1) Indicates processing accuracy 2) Establishes a record-value correlation 3) Simplifies reconciliations,	1) Not effective with high volumes 2) Time consuming to prepare aned reconcile 3) Requires frequent adjustments for errors 4) Cumbersome with online processes 5) Decreased value in distributive systems context

C-6

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
Control Totals	A total of significant data, computed either manually or by machine, from document/records to be processed	1) Indicates processing accuracy 2) Indicates relative value of errors 3) Created as a byprodu t of processing	1) Usually requires manual preparation 2) Difficult to maintain 3) Does not identify causes of error 4) Does not indicate number of errors 5) Difficult to apply to online processing 6) Cumbersome, costly, and complex in distributive systems
Hash Totals	A total computed on insignificant data (like SSN) used to control document loss	1) Indicates loss 2) May identify lost document 3) May indicate errors in input preparations 4) Easy to create	1) Requires manual intervention 2) Does not identify error significance 3) Difficult to reconcile if numerous errors occur. 4) Awkwardly handled by online processing 5) Difficult to implement in shared data bases and

APPENDIX C (Cont.)

SOFTWARE QUALITY CONTROL TECHNIQUE COMPARISON MATRIX

SOFTWARE VERIFICATION TECHNIQUES

TECHNIQUE	DESCRIPTION/PURPOSE	ADVANTAGES	DISADVANTAGES
File Labels	Used to identify data/ records contained on tape or disk	1) Positive file identification 2) Inhibits accidental filel purges or updates 3) Provides documentation of files used	1) May beignored or bypassed 2) Not geared to online data bases 3) Requires human intervention to enter identification information

APPENDIX C (Cont.)

USE OR POTENTIAL USE OF VERIFICATION AND VALIDATION TECHNIQUES

VERIFICATION AND VALIDATION TECHNIQUES	SOFTWARE DEVELOPMENT PHASES			
	DEFINITION	DESIGN	IMPLEMENTATION	EVALUATION
Drivers			X	
Test Data Bases			X	X
Design Verification		X	X	
Execution Analysis			X	X
Automated Network or Path Analysis			X	
Statistical Prediction		X	X	X
Functional Testing			X	X
Design Validation	X	X		
Matrix Analysis and Problem Statement Languages	X	X	X	
Top-Down Programming			X	

APPENDIX D

SAMPLE PRODUCTIVITY REPORTS FOR THE PELL APPLICATION PROCESS (TIME PERIOD)

(APPLICATION RECEIPT)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE
Number of Applications Processed			
Number of Hours Worked			
Number of Personnel			
Type 1			
Type 2			
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Total Labor Cost			
Unit Time Cost (Hour/App)			
Unit Labor Cost ($/App)			
Accuracy of Processing			
Sample Size			
Number with Errors			
Percent with Errors			
Type of Errors			
A			
B			
C			
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Peak Backlog			

APPENDIX D (Cont.)

SAMPLE PRODUCTIVITY REPORTS FOR THE PELL APPLICATION PROCESS (TIME PERIOD)

(APPLICATION RECEIPT)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE
Number of Telephone Calls			
Number of Hours Worked			
Number of Personnel			
Type 1			
Type 2			
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Number of Calls Completed			
Total Labor Cost			
Unit Labor Cost ($/call)			
Accuracy of Processing			
Sample size			
Number of Errors			
Percent of Errors			
Number of Phone Calls per Transaction			
Peak Backlog			

APPENDIX D (Cont.)

SAMPLE PRODUCTIVITY REPORTS FOR THE PELL APPLICATION PROCESS (TIME PERIOD)

(APPLICATION RECEIPT)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE
Number of SARs Produced			
Number of SARs Mailed			
Number of Hours Worked			
Number of Personnel			
Type 1			
Type 2			
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Total Labor Cost			
Unit Labor Cost ($/SAR)			
Unit Time Cost (hour/SAR)			
Accuracy of Processing			
Sample size			
Number of Errors			
Percent of Errors			
Number of SARs per Transaction			
Peak Backlog			

APPENDIX D (Cont.)

SAMPLE PRODUCTIVITY REPORTS FOR THE PELL APPLICATION PROCESS (TIME PERIOD)

(APPLICATION RECEIPT)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE
Number of Corrections Processed			
Type A			
Type B			
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Number of Hours Worked			
Number of Personnel			
Type 1			
Type 2			
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Total Labor Cost			
Unit Labor Cost ($/correction)			
Unit Time Cost (hour/correction)			
Accuracy of Processing			
Type A			
Sample Size			
Number of Errors			
Percent of Errors			
Type B			
Sample Size			
.			
.			
.			
Corrections per Transaction			
Peak Backlog			

120

APPENDIX E

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
Production Control		
Information Receipt	• Count	The number of applications need to be counted at the starting point in the process to use as a control total for reconciling other steps of the process.
	• Backlog	Since this is a time-consuming and labor intensive process this measure would give an indication of the efficiency of the production step.
Cursory Edit	• Count	The applications must be segregated by the type of treatment so a count of the applications that are flagged by an edit must be made to keep track of the application.
	• Count (edits)	The number of times a particular edit is used provides information on the application form data items.
	• Accuracy	The segregation of applications into their proper group must be done accurately to avoid rework and bottlenecking in the system. Preparing the application for entry into the system is important to the efficient functioning of the system.

APPENDIX E (Cont.)

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
Key entry	• Count	This is the point where data are entered into the system and processed. A count at this point is needed to act as a control on the automatic processing step.
	• Accuracy	This is a major measurement to make because the inaccuracy of the data in the system requires rework and a loss of integrity of the entire delivery system.
	• Backlog	This step is a potential bottleneck since data are entered manually. The backlog is a measure of the efficiency of the step and the use of labor in the step.
Compute	• Count	Another control total is taken at this step to ensure that there is no loss of applications.
	• Count (edit)	The number of times an edit is used must be kept. Track of order to evaluate the quality of the data in the system. Corrective action analysis can be done from this infortion.

E-2

APPENDIX E (Cont.)

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
SAR Production	• Count	This provides a control total on the processing system and another count of the number of envelopes being mailed out as a control total on the whole system.
	• Accuracy	The information on the SAR goes back to the applicant and must reflect the data coming into the system.
	• Timeliness	This point is where the process ends. Total turnaround time of the process is measured at this point.
Corrections	• Count	The types of corrections being received should be tracked to evaluate the quality of the data.
	• Accuracy	The entering of the data must be done accurately to ensure smooth and timely processing.

E-3

APPENDIX E (Cont.)

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
Software		
	• Component Accuracy	Each component should be tested to ensure that it works internally.
	• Subsystem accuracy	The components that fit together must work together in order to produce the correct results.
	• System accuracy	The subsystems must be put together into a total operating system that produces the correct result.
	• Efficiency	The system must produce the desired results in an efficient manner in order to keep down costs and minimize backlog.
	• Test data	As a part of accuracy and efficiency, test data must be used to check all parts of the system to see if the correct results are being produced and the system can process large amounts of data.

APPENDIX E (Cont.)

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
Fiscal Control		
	• Cost centers	The cost centers of the contract must be identified and a method for monitoring costs within the center developed.
	• Methodology	Development of a method for what costs should be measured and how they should be measured.
	• Tolerances	Tolerance ranges for types of costs should be determined in order to produce an early warning system for monitoring.
	• Volume indicators	The costs vary with volume, and so the unit of volume should be determined to standardize the cost levels.
	• Fixed/Variable Costs	The categorization of costs needs to be done to determine the level of costs by levels of volume.
	• Reporting mechanism	Costs should be reported in similar ways for similar functions. The same cost categories and the same levels at which costs are accumulated should be reported similarly.

APPENDIX E (Cont.)

MINIMUM REQUIREMENTS FOR A PROCESSOR QC SYSTEM

AREA	MEASURE/STANDARD	EXPLANATION
Productivity		
	• Level of effort	The level of effort in number of hours or people should be a measure of the efficiency of the system. This measure can be broken out by labor categories and costs assigned to them to get labor costs by cost centers.
	• Volume indicator	This is used in the determination of the efficiency of the production step by standardizing costs.
	• Accuracy	The efficiency of the step is measured in part by the accuracy of the work performed. Building this measure into the productivity measure will evaluate the net efficiency of the step.

APPENDIX F

SAMPLE FISCAL CONTROL REPORT FOR THE PELL APPLICATION PROCESS (INFORMATION RECEIPT)
(period ending __________)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Applications Received				
Number of Applications Processed				
Number of Applications Rejected Cursory Edit Checks				
Number of Applications Going to Key Entry				
Number of Applications Backlogged				
Processing Time (Receipt to Edit Resolution or Key Entry)				
Applications to Key Entry				
0-2 days				
2-4 days				
4 days				
Applications to Edit Resolution				
0-2 days				
2-4 days				
4+ days				
Accuracy of Processing				
Sample Size				

	THIS PERIOD	LAST PERIOD	YEAR TO DATE	THIS PERIOD LAST YEAR
Number of Errors				
Percent of Errors				
Types of Errors				
A				
B				
C				
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.				

SAMPLE FISCAL CONTROL REPORT
FOR THE PELL APPLICATION PROCESS
(INFORMATION RECEIPT)
(period ending ________)

	CURRENT PERIOD		PRIOR PERIOD	
	BUDGET	ACTUAL	BUDGET	ACTUAL
VARIABLE COSTS				
Automated Costs				
Labor Costs				
Total Variable Costs				
FIXED COSTS				
Plant, Materials				
Labor Costs				
Total Fixed Costs				
Total Cost				
Number of Applications Processed				
Unit Variable Cost ($/app)				
Unit Labor Cost ($/app)				
Unit Fixed Cost ($/app)				
Unit Total Cost ($/app)				

APPENDIX F (Cont.)

SAMPLE FISCAL CONTROL REPORT
FOR THE PELL APPLICATION PROCESS
(INFORMATION RECEIPT)
(period ending ________)

Cost Category	Budget	Actual	% of Total Budget Amount Should be Spent	% of Total Budget Amount Actually Spent
Total Variable Cost				
Total Labor Costs				
Total Fixed Cost				
Total Cost				

APPENDIX F (Cont.)

SAMPLE FISCAL CONTROL REPORT
FOR THE PELL APPLICATION PROCESS
(INFORMATION RECEIPT)
(period ending ________)

	THIS PERIOD	LAST PERIOD	YEAR TO DATE
Number of Applications Processed			
Number of Hours Worked			
Number of Personnel			
Type 1			
Type 2			
.			
.			
.			
Total Labor Cost			
Unit Time Cost (Hour/App)			
Unit Labor Cost ($/App)			
Accuracy of Processing			
Sample Size			
Number with Errors			
Percent with Errors			
Type of Errors			
A			
B			
C			
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Peak Backlog			