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ABSTRACT

The way that the U.S. Department of Education's Office of Student Financial Assistance (OSFA) should conduct its quality assurance function of monitoring a processing contractor is described. For the following quality assurance procedures, information is provided on the goal of the procedure, activities to be measured, measures, and the role of quality assurance: production control, information receipt, data entry, data edit, computation, document production and mailing, corrections, fiscal control, software quality assurance, productivity control, telephone service, correspondence, reporting process, and corrective action process. Also included is a summary checklist of quality assurance procedures that monitors can use to assure they have completed all quality assurance tasks. Appended are: a summary of the division of responsibility between the contractor and OSFA for maintaining the quality of software; a monitor's checklist for reviewing the software developed by the processing contractor; an example of a signoff form to notify OSFA of proposed changes in the system or system software; an example of an OSFA internal reporting form that summarizes key processing measures and exceptions; and an example of OSFA internal reporting summary form (section 1) tailored to Pell Grant processing. (SW)

QUALITY ASSURANCE FOR VENDOR/PROCESSOR CONTRACTS

Submitted to

Division of Quality Assurance
Office of Student Financial Assistance
U.S. Department of Education

Contract No.: 300-80-0952

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TABLE OF CONTENTS

PREFACE

The Office of Student Financial Assistance (OSFA) of the Department of Education has contracted with Advanced Technology, Inc., of McLean Virginia, and its subcontractor, Westat, Inc., of Rockville, Maryland, to conduct a three-year quality control project (Contract No.: 300-80-0952). The focus of the project is the Pell Grant Program, the largest of the student grant programs administered by OSFA. The objective of Stage Two (Part One) of the project is to design a quality control system to measure and analyze program performance. The reports completed to date under Stage Two (Part One) include:

Quality Control (QC) System Development for the Pell Grant Programs: A Conceptual Framework	March, 1982
Action Plan for Quality Control System Design: A Working Paper	May, 1982
A Comparison of Title IV Student Assistance Delivery Systems	June, 1982
Preliminary Quality Control System Design for the Pell Grant Program	June, 1982
A Framework for a Quality Control System for Vendor/Processor Contracts	September, 1982
Technical Specifications for Conducting An Annual Assessment of Overall Payment Error in the Pell Grant Program	February, 1982
A Study of Quality Control Enhancement for the Goals and Objectives System of the Office of Student Financial Aid	October, 1982
Corrective Action Framework for the Office of Student Financial Assistance	December, 1982

1.0 INTRODUCTION

The processing of student assistance applications is a complex endeavor. It is imperative that each step in the processing procedure be carried out in an accurate and timely manner. To ensure such accuracy and timeliness, the processing procedure must be monitored on an ongoing basis. This function is shared by the contractor performing the processing and OSFA. The process by which the contractor establishes and maintains procedures for monitoring its own activities is called **quality control.** The process by which OSFA monitors the quality of contract performance is called **quality assurance.**

This report describes how OSFA should carry out its quality assurance function of monitoring a processing contractor. It is a companion piece to an earlier volume, **"A Framework for a Quality Control System for Vendor/Processor Contracts"** (Advanced Technology, Inc., September, 1982), which detailed the critical quality control activities that should be performed by the contractor. Quality control procedures are a requirement in all large processing contracts.

The two reports are organized in a similar manner. They both break down the respective contractor quality control and OSFA quality assurance roles into six categories:

- Production control
- Fiscal control
- Software quality assurance
- Productivity control
- Reporting process
- Corrective action process.

The first four categories comprise the components of the processing system that must be monitored for accuracy and efficiency. The reporting process and corrective action process represent functions that interface with the other components of the processing system.

Since production control is particularly crucial to the integrity of the processing system, this category is further separated into six discrete steps:

- Information receipt
- Data entry
- Data edit
- Compute
- Document production and mailing
- Corrections procedures.

Also, productivity control is broken out into:

- Telephone service
- Correspondence service
- Information receipt
- Data entry
- Document production and mailing
- Corrections receipt.

These discrete processing steps are also discussed in the earlier quality control report.

Although similar in categorical content, the companion reports are formatted in different manners. The quality control report is a narrative explaining in detail the various steps in the quality control process. This quality assurance report provides an abstract of key issues in a summary format. This format was chosen because the principal purpose of the report is to serve as a reference source for quality assurance monitors. The report should serve as a handbook that distinctly highlights the various quality assurance responsibilities of OSFA.

The information in this report is intended to meet the needs of quality assurance monitors working on various processing contracts. To accomplish this, generic categories typical of student assistance processing are used whenever possible. For example, the various quality assurance roles (production control, fiscal control, software quality assurance, productivity control, reporting, corrective action) and production steps (information receipt, data entry, data edit, compute, document production and mailing, corrections) described in this report are components of most processing contracts.

Not all quality assurance roles and processing steps will be relevant to all contracts, however. A student information telephone service which is a part of productivity control, and a principal ancillary service in the Pell Grant processing contract, is not relevant in the GSL or Campus-Based programs. Therefore, monitors should use this handbook as a model or guide and adapt relevant sections to help them fulfill their quality assurance responsibilities.

In addition, it is possible that some processing functions that are unique to a particular area may not be addressed in the report. The functions that are included are based on an analysis of the Pell processing contract, since it is the largest student assistance program. Again, it must be stressed that this handbook is a model for quality assurance monitors and in some instances should be used selectively.

1.1 Organization of the Report

Following this introduction, Section 2.0 of the report is a narrative explanation of the role of quality assurance. The balance of the report utilizes the summary format. Section 3.0 describes specific quality assurance procedures for the following categories and subcategories:

- Production control
- Information receipt
- Data entry
- Data edit
- Compute

- Document production and handling
- Corrections
- Fiscal control
- Software quality assurance
- Productivity control
- Telephone service
- Correspondence service
- Reporting process
- Corrective action process.

Section 4.0 presents general, ongoing quality assurance procedures. Section 5.0 is a summary checklist tear-out sheet of quality assurance procedures that monitors can use to assure they have completed all selected quality assurance tasks.

The report also includes a series of appendices. Appendix A summarizes the division of responsibility between the contractor and OSFA for maintaining the quality of software. Appendix B is a monitor's checklist for reviewing the software developed by the processing contractor. Appendix C is an example of a signoff form to notify OSFA of proposed changes in the system or system software. Appendix D is an example of an OSFA internal reporting form that summarizes key processing measures and exceptions. Appendix E shows how Section 1 of the OSFA internal reporting summary form can be tailored to a specific contract, in this case Pell Grant processing.

2.0 THE ROLE OF QUALITY ASSURANCE

The student aid delivery system is composed of various components ranging from planning to account reconciliation. Perhaps the most complex component is the processing function. This function includes the receipt and processing of student aid applications and the production of an output, such as a Student Aid Report (SAR) in the case of the Pell Grant Program. One or more steps in the processing function is usually automated. The complexity of the function is attributable to the large number of steps involved in the process, the mix of automated and manual procedures, and the great volume of documents to be processed. In order to maintain maximum efficiency from this complex function, effective management is mandatory on a continuing basis.

Management of the processing function comes from two sources--the contractor selected by OSFA to run the processing system and OSFA itself. The contractor is responsible for monitoring the everyday functioning of the processing operation and ensuring that maximum efficiency is being maintained. This contractor role is called **quality control.** OSFA is responsible for establishing independent performance standards that must be met by the contractor and monitoring whether system performance actually meets these standards. This contracting agency role is called **quality assurance.**

A quality control plan serves several purposes. Quality control can help ensure:

- Timely and accurate products
- Cost-effective performance by the contractor
- Fiscal integrity of the project
- Quality service to students, parents, institutions, and lenders
- Timely and accurate information to OSFA
- Credibility of the entire student assistance delivery system.

Each of these characteristics is discussed in turn. First, timely and accurate products are important since the principal role of the processing function is to

produce an output document. That is, the processing function accepts a great deal of data, processes the data, transforms the data, and produces an output document. The primary output of the Pell Grant processing function, for example, is the SAR. It is imperative that this document be computed correctly and mailed to the student in a timely manner. Other output documents, also requiring timely and accurate production, may include applicant rosters and data tapes for institutions and state agencies. Quality control procedures can monitor the production process, measure the timeliness and accuracy of output, compare the measures to established standards, and prescribe corrective actions when necessary.

Second, it is imperative that production be carried out in a cost-effective manner by the processor. Given the high volume of applications and the dependencies of processing procedures on previous steps, even small production inefficiencies can snowball into major cost problems. Quality control methods can provide information on the quantity of output and the levels of input (including labor hours, computer time, and dollars) used to generate that output so that cost effectiveness can be continually monitored and corrective actions instituted if measures fall below standards.

A third role of quality control can be to protect the fiscal integrity of the project by keeping spending within program budget. A large production process is prone to cost overruns. Quality control procedures can monitor actual costs and compare these costs to budgeted costs for each cost center as well as for the contract as a whole. Statistics can be generated for each reporting period and for the contract period to date.

Fourth, quality control methods can also help maximize the quality of service to students, parents, institutions, and lenders. For example, ancillary services, such as telephone banks, can be monitored to ensure that questions from users receive accurate and helpful responses from courteous operators. Also, information on an institutional roster can be rechecked for accuracy and reported in a format that meets the needs of institutions.

Fifth, it is important that timely and accurate reports and statistics on the processing function result from the quality control procedure and are made available

to OSFA management. These reports and statistics should compare performance to standards, provide frequency distributions as well as averages since the latter may hide significant trends, and include a visual device to flag data falling outside of tolerance levels. All statistics and reports should be at a level of specificity, and formatted so that they are most responsive to OSFA's management needs.

Finally, the processing function is only one of several parts of a student aid system. Other major parts may include policy determination, budget formulation, awarding of aid, and fiscal reconciliation. The delivery of student assistance is dependent upon the efficient interaction of all these parts. The various system functions can run either sequentially or simultaneously. If two functions are sequential, information from one part is needed before another part can begin operation. If the parts run simultaneously, they follow different tracks at the same time but may have several common points between them where information is passed from one function to another. In either case, the system must run smoothly to deliver the programs effectively. If a particular decision is delayed, for instance, the other functions may not be able to perform their tasks. If information passed from one function to another is inaccurate, the error will be compounded by subsequent parts of the delivery system. Therefore, a well-designed quality control plan does not just ensure accurate and timely processing, but maintains the credibility of the entire delivery system.

While quality control procedures are essential to the efficient operation of a processing system, they are not sufficient from a management perspective. OSFA cannot rely exclusively on the reports and statistics generated by the contractor as proof of processing efficiency. In some cases, if processing problems exist, the contractor may not make evident all problems, or the full extent of the problems, known to OSFA. Therefore, OSFA must perform its own checks on system performance.

It is important to note that OSFA does not have the resources to implement a quality assurance system that is as comprehensive as the quality control process designed by the contractor; nor is it in OSFA's best interests, to create a comprehensive quality assurance system that merely duplicates the procedures performed by the contractor. An effective quality assurance program should be

complementary to the quality control function. OSFA should utilize extensively the reports and statistics produced by the quality control process. To be sure that this information is accurate, OSFA's primary quality assurance task should be to validate these data. Validation can be accomplished by:

- Monitoring the contractor's quality control procedures
- Conducting independent checks on system performance.

Monitoring the contractor's quality control procedures entails verifying the processes used to produce the quality control statistics and reports. Specifically, the monitor should:

- Review the contractor's quality control plan including the type of quality control procedures used, the frequency of these procedures, and particular measures of performance
- Note problems and/or deficiencies in the system based on observation of the production process
- Compare performance of the system based on observation to the information in the quality control reports
- Review the contractor's plan to implement corrective actions in the event of system problems
- Review the contractor's quality control reports with an emphasis on comparing measures with standards, the timeliness of the reports, the responsiveness of the reports, and the use of clear visual cues to identify problem areas
- Ensure that the contractor is analyzing processing trends so that potential problems are identified before they become serious problems
- Ensure that the contractor is not solely concerned with maintaining the status quo, but is also looking to make system breakthroughs that will increase overall efficiency.

These latter three points require elaboration. First, the contractor's reports provide a critical source of information to the quality assurance monitor. It is important that the time between generation of data and submission of reports to OSFA be minimized to ensure the availability of timely data. In addition, to be most responsive to OSFA's needs, the reports must tailor their level of detail to different management levels. High-level managers should only be presented

summary data such as information on selected key measures and exceptions. Middle and low-level management require increasingly more detail and a greater number of performance measures. Further, the reports should include a clear system alarm capability to flag performance that is outside of established tolerance levels.

Second, a contractor or quality assurance monitor should not rely solely on a system alarm capability to flag problems. Trend data (e.g., data on performance for this reporting period, prior reporting periods, and the year to date) should be carefully analyzed to identify potential problem areas before they exist.

Third, the quality assurance monitor should not solely require the contractor to maintain acceptable minimum operating procedures. Instead, the monitor should encourage system simplification and the development of new system options that can increase production efficiency.

Conducting independent checks on the processing system's performance is OSFA's assurance that the system is functioning efficiently and accurately. These checks may take two forms:

- Reverification of quality control procedures
- Totally new checks at various system points using new data.

Reverification assesses the performance of a system step that was previously measured by the contractor using different data or different test cases. The data used by the OSFA monitor may be independently collected (or generated) or represent a different sample of actual cases than that selected by the contractor. Independently collected (or generated) data are more costly than using a new sample of the data maintained by the contractor. Therefore, they should be used judiciously.

New independent checks represent different measures of system performance than those used by the contractor in the quality control plan. As is the case when reverifying procedures, new independent checks may also be made with either independently collected (or generated) data or a subset of the contractor's data base. Independent quality assurance checks can either be performed on:

- A regularly scheduled basis
- An ad hoc basis at the discretion of the monitor.

This decision will vary based on the type and cost of the check.

Since a major function of the quality assurance process is to monitor the quality control process, these two systems should be parallel in design and, to the extent possible, developed simultaneously. Therefore, OSFA should carefully evaluate the contractor's proposed quality control plan. In developing its parallel quality assurance plan, OSFA should specify the following:

- Items on the quality control reports that should be reviewed as part of the quality assurance plan
- The role that an on-site monitor and/or site vists will play in quality assurance procedures
- Parts of the quality control procedures that should be independently checked by the quality assurance procedures
- Types of instruments to be used for independent quality assurance checks and for evaluating quality control procedures.

3.0 SPECIFIC QUALITY ASSURANCE PROCEDURES

In a companion report to this document, Advanced Technology, Inc. described the critical quality control procedures that should be required of a contractor processing student aid applications. In this section, a series of specific quality assurance procedures are detailed that parallel the contractor's quality control requirements. These procedures, as were those in the earlier quality control report, are broken down into the four major components of the processing system and two major functions that interface with these four components. The major processing components are:

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

Where appropriate, these components are broken down into subcomponents. The two component interfaces are:

- Reporting process
- Corrective action process.

In order to meet the needs of OSFA monitors for a detailed, yet concise, resource on specific quality assurance roles, each component, subcomponent, and component interface is discussed in a non-narrative, summary format. This format divides each individual description into similar sections:

- Definition of the processing procedure
- Goal of the processing procedure
- Activities to be measured
- Quality control measures
- Role of quality assurance.

The latter section, the role of quality assurance, discusses the specific functions that can be carried out by OSFA monitors to oversee the quality control process and to ensure the quality of the processing system. The list of quality assurance roles is not necessarily exhaustive. It is meant to guide the monitor through his or her duties by providing a variety of major quality assurance responsibilities. The monitor can, and should be encouraged to, build on this initial catalogue of roles. This list is not meant to limit the monitor in the execution of his or her responsibilities.

Further, not all items on the list of quality assurance roles will be executed in all processing contracts or during all phases of particular processing contracts. The monitor and the appropriate supervisor should work together to select the roles that are appropriate to a particular situation.

3.1 PRODUCTION CONTROL:

Process of monitoring the production system for efficiency and accuracy.

Goal:

Ensure that applications move from one production step to the next in the least amount of time without sacrificing quality, and that products (such as Student Aid Reports [SARs] and correction requests in Pell) are generated accurately.

Activities to be Measured:

Information receipt (see Section 3.1.1)
Data entry (see Section 3.1.2)
Data edit (see Section 3.1.3)
Compute (see Section 3.1.4)
Document production and mailing (see Section 3.1.5)
Corrections procedures (see Section 3.1.6)

Quality Control Measures:

See separate listing for each "Activity to be Measured" on the following pages

Role of Quality Assurance:

See separate lising for each "Activity to be Measured" on the following pages.

3.1.1 INFORMATION RECEIPT:

The point where the initial application, correction, telephone call, or data tape from a Multiple Data Entry (MDE) site comes into the system.

Goal:

Receive information and transform it into a form that can be used in the processing stream.

Activities to be Measured:

Amount of incoming information
Timeliness of preparing information for further processing
Accuracy of sorting information by type
Accuracy of cursory edit for completeness of application

Quality Control Measures:

Count of applications received
Backlog of applications
Processing time from receipt to data entry
Count of applications flagged by cursory edit
Count of the number of times a particular edit is used
Percent of errors in sorting applications by type

Role of Quality Assurance:

- Take an independent sample from each grouping of incoming documents (applications, correspondence, corrections, etc.), assign an identifying number, and record the date and time of entry into the system. Each document can then be monitored throughout the processing stream. At each production step, the date and time of processing should be recorded. This will allow assessment of the timeliness and accuracy of the production process.

- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

- Monitor the contractor's receipt control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

3.1.1 INFORMATION RECEIPT (Continued):

- Compare counts of incoming applications to counts at various production steps. This can assess whether a signficant proportion of applications are being lost during processing.

- Obtain from the contractor information on the backlog of applications, the accuracy of any information sorts, the number of applications flagged by the cursory edits, and the number of times a particular edit is used.

3.1.2 DATA ENTRY:

Process by which new data, usually from paper forms, are manually key entered into the computer system. Information from MDE sites will be submitted on magnetic tape, rather than paper forms.

Goal:

Accurately enter data items into the processing stream so that subsequent processing steps utilize correct information.

Activities to be Measured:

Amount of data being entered into the system
Accuracy of data entry
Timeliness of data entry

Quality Control Measures:

Count of applications entered into the system compared with counts at various automatic processing steps
Count and percentage of errors by keystroke, data element, and entire form
Backlog of applications
Processing time from acceptance of data by keypunch to completion of data entry

Role of Quality Assurance:

- Take an independent sample of various data input documents and compare transformed data to original documents for accuracy. Since a large number of forms and data items are involved, this is potentially an error-prone area. Also, because this is the first step in using specific data needed to run the processing system, accuracy is particularly important. If data entry is inaccurate, subsequent production steps will be inaccurate.

- Measure timeliness of data entry by monitoring the processing time from data arrival at keypunch to transmission of data to data edit staff.

- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

3.1.2 DATA ENTRY (Continued):

- Monitor the contractor's data entry quality control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

- Compare the counts of applications entered into the system with counts at various automatic processing steps taken by the contractor. This can assess whether a significant proportion of applications are being lost during or after data entry.

- Obtain from the contractor a count of the number of applications backlogged at the data entry point. The backlog is a measure of the efficiency and timeliness of data entry. Efficiency and timeliness are particularly important because data entry is a potential processing bottleneck since most data are entered manually. Backlogs should be measured during various intervals in the processing cycle.

3.1.3 DATA EDIT:

Process by which data from forms entered into the system are checked for accuracy and consistency. Edits occur at various points in the production process and may be manual or automatic.

Goal:

Identify, and subsequently correct, inaccurate or inconsistent data prior to computing a Student Aid Index (SAI).

Activities to be Measured:

Frequency of errors identified by edits
Accuracy of edits
Accuracy of responses sent to applicants resulting from an error identified by the edit procedure
Timeliness of the edit/response process

Quality Control Measures:

Count of the number of times an edit identifies an error
Count of transactions per applicant
Count and percent of applications with errors identified by edit procedures
Percent of edit-identified errors that are actual errors
Percent of error responses that are appropriate to the type of errors detected
Percent of applicants submitting corrections
Percent of applicants submitting validation of rejected data

Role of Quality Assurance:

- Run an independent sample of documents through the edit procedures and compare results with those of a separate manual edit. This will test whether only actual errors are being flagged. Alternatively, develop several test cases, some with errors and some without. Assess treatment of test cases by edit procedures.

- Take an independent sample of responses sent to applicants as a result of errors identified by the edit procedures. Be sure responses accurately match the type of error.

- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

3.1.3 DATA EDIT (Continued):

- Monitor the contractor's data edit quality control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

- Obtain from the contractor counts of the number of times an edit identifies an error by type of edit. Edit procedures rejecting an unusually high percentage of cases may require corrective action.

- Obtain from the contractor counts of transactions per applicant. This indicates the potential of edits to reject acceptable data.

- Obtain from the contractor the percentage of applications with errors. A percentage of error higher than that established may suggest the need for corrective action in application design.

- Using documents assigned an identifying number at the information receipt stage, measure turnaround time between edit and response to edit. If only a few such documents are flagged by edits, take a separate sample from documents awaiting edit.

- Obtain from the contractor the percentage of applicants submitting corrections and the percentage submitting validation of rejected data.

3.1.4 COMPUTE:

Automated process by which input data are transformed and the required output data (for example, a Student Aid Index [SAI] in Pell or the funding level in Campus-Based) is calculated.

Goal:

Accurate computation of output data.

Activities to be Measured:

Accuracy of the compute step

Quality Control Measures:

Percent of output data computed accurately

Role of Quality Assurance:

- Take an independent sample of applications and manually replicate computation of output. Compare results of compute step and manual replication. Accuracy of computes should be measured for various volumes of applications.
- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.
- Monitor the contractor's compute step quality control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

3.1.5 DOCUMENT PRODUCTION AND MAILING:

Process of producing an output document such as a Student Aid Report (SAR), corrections request, letter, or other document and mailing it to the correct applicant.

Goal:

Produce a document containing accurate information and mail SAR or other document and appropriate supporting materials to the correct applicant.

Activities to be Measured:

Number of output documents produced
Number of output documents mailed
Accuracy of output documents
Timeliness of output document production and mailing
Legibility of all output documents

Quality Control Measures:

Count of documents produced compared to count of documents mailed
Count of documents mailed compared to count of applications at other production points
Percent of documents with inaccurate or missing information
Percent of documents mailed with incorrect accompanying materials
Processing time from compute procedure to document mailing
Percent of documents illegible

Role of Quality Assurance:

- Take an independent sample of specific output documents right before mailing. Check to see that information on the document is complete and legible, and that the appropriate supplemental material accompanies it. Repeat process for all categories of documents produced.

- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

- Monitor the contractor's production and mailing quality control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

3.1.5 DOCUMENT PRODUCTION AND MAILING (Continued):

- Using documents assigned an identifying number at the information receipt stage, measure total turnaround time from information receipt to mailing. Since mailing marks the end of the production control process, this measures total production efficiency.

- Obtain from the contractor counts of output documents produced and output documents mailed by various categories (e.g., SARs, corrections requests, letters). A comparison of these counts provides a control total for the whole system. These counts should be compared to those of other production points to ensure that nothing is being lost.

3.1.6 CORRECTIONS:

Process of accepting new data sent in response to a corrections request, updating individual records, recomputing information, and producing new output documents. As suggested, corrections occur at various points in the processing system.

Goal:

When a correction request is sent out, process the correction in an efficient manner.

Activities to be Measured:

Amount of corrections received
Timeliness of reentering corrected data into the system
Accuracy of processing corrected data

Quality Control Measures:

Count of corrections received
Count of types of corrections received
Backlog of corrections
Processing time from corrections receipt to data entry
Number of times an applicant's record must be corrected
Percent of error in reentering corrected data

Role of Quality Assurance:

- The independent sampling process used during the information receipt stage should be repeated at the corrections stage. This will allow monitoring of corrected data throughout the processing stream and assessment of the timeliness and accuracy of processing corrected data. Accuracy of entering corrected data will be measured by a sample of documents obtained at the data entry stage.

- Compare results of the quality assurance sample to the quality control sample. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

- Monitor the contractor's corrections quality control sampling process. Be sure that an independent and objective quality control team is performing the sampling.

3.1.6 CORRECTIONS (Continued):

- Information on counts by the types of corrections received should be obtained from the contractor. This will help identify the need for corrective action in such areas as application format.

- Information on counts of corrections received, backlog of corrections, and number of times an applicant's record must be corrected should be obtained from the contractor.

3.2 FISCAL CONTROL:

Process of monitoring actual processing costs against budgeted costs.

Goal:

Execute processing procedures in a cost-effective manner without sacrificing quality.

Activities to be Measured:

Total processing costs
Processing costs by major cost center
Processing costs per unit of volume

Quality Control Measures:

Actual versus budgeted costs by period of performance
Actual versus budgeted costs by cost center
Actual unit costs versus budgeted unit costs

Role of Quality Assurance:

- Monitoring role varies depending on the type of contract award. For a cost plus fixed fee contract, ongoing fiscal monitoring is mandatory to avoid large cost overruns. For fixed cost contracts, the contractor typically will not submit actual costs to the monitor on an ongoing basis.
- For a cost plus fixed fee contract, obtain from the contractor actual costs of performance to date and compare them to budgeted costs. Significant cost overruns should be flagged immediately.
- Cost trends across periods of performance should be analyzed carefully. Since the volume of processing varies over the course of a year, these figures will not be stable. Costs for a particular period of performance that exceed the budget should be flagged immediately.
- Costs for each performance period should also be calculated by cost center. It is possible that a cost overrun may be isolated to one cost center. This type of analysis will allow corrective action in this cost center.

3.2 FISCAL CONTROL (Continued):

- Unit costs must be obtained from the contractor. This is important because volume varies over the year and processing costs vary with volume.
- Costs should be categorized as fixed or variable to help determine the level of costs by level of volume.

3.3 SOFTWARE QUALITY ASSURANCE:

Process of ensuring, within reasonable limits, that all software is accurate and efficient.

Goal:

Continual monitoring of software so that unnecessary delays and expenses resulting from discovering software problems after considerable production has been completed are avoided.

Activities to be Measured:

Accuracy of software on a day to day basis
Reliability of software on a day to day basis
Impact of minor software modifications on system performance

Quality Control Measures:

Accuracy of software components as determined by test data, validation, and verification techniques
Accuracy of software subsystems (components working together to produce a result) as determined by test data, validation, and verification techniques
Accuracy of system software (subsystems working together to produce a result) as determined by test data, validation, and verification techniques
Count of the number of software failures per processing period
Backlog of applications due to software failures

Role of Quality Assurance:

- Exercise direct oversight on a variety of software quality control activities. Software quality assurance is particularly important because minor software errors can cause major problems in the normal processing cycle. For example, minor software errors can cause output documents such as SARs to be distributed with false information, possibly causing incorrect awards. In addition, 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. Therefore, quality assurance monitors should be involved in

assessing the adequacy and reliability of software during both development and operational stages. A recommended division of responsibility between OSFA and the contractor for software quality assurance is shown in Appendix A.

- Verify that contractor developed software meets OSFA specifications during software design or modifications.

- Oversee product evaluation, during which both the program code and system documentation are examined at the software implementation stage.

- Oversee the development by the contractor of test data bases during software implementation. Ensure that these data are of high quality, and not merely of large volume, and test as many conditions and ranges as possible. A large variety of both invalid and valid data should be used. Contractors often go to extremes to create repetitious invalid data while neglecting valid data which tests all the complexities of valid processing.

- Monitor various contractor performed internal control techniques on system performance during the software implementation stage such as record counts, batch totals, control totals, and limit checks. The internal counting of records and the review of record 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. 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 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. 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 the contractor. Appropriate corrective action must be taken to remedy the problems.

3.3 SOFTWARE QUALITY ASSURANCE (Continued):

- Oversee formal software testing procedures, including subsystem integration testing, prototype testing, system testing, and acceptance testing. This role ensures that no serious errors go undiscovered. Subsystem integration testing checks the way system modules are connected and assures that a subsystem can receive and pass data between individual modules. Prototype testing is used to check the correctness of the basic design of program modules or subsystems. It can often give early insight into design problems which can then be remedied, making for less rework in the final system. System testing is performed on detailed output. 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 subsystem where errors have occurred. 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.

- Obtain from the contractor a count of the number of software failures and their impact in terms of backlog of applications.

- Use checklist for software quality assurance (Appendix B) to monitor contractor's quality control procedures.

- Require Project Manager to personally sign off on any software modifications using the System/Software Modification Signoff Sheet (see Appendix C). This will ensure that OSFA is aware of all impending major software modifications.

3.4 PRODUCTIVITY CONTROL:

Process of efficiently carrying out all manual tasks in the processing system.

Goal:

Maintain an efficient balance between automated and manual functions so that the overall production process is productive.

Activities to be Measured:

Telephone service (see Section 3.4.1)
Correspondence service (see Section 3.4.2)
Information receipt (see Section 3.1.1)
Data entry (see Section 3.1.2)
Document production and mailing (see Section 3.1.5)
Corrections receipt (see Section 3.1.6)

Quality Control Measures:

See separate listing of each "Activity to be Measured"

Role of Quality Assurance:

- Monitor the overall productivity (output per unit of input) of each manual task. The contractor's quality control plan will also monitor the productivity of each staff person to assure that overall productivity is maximized. OSFA is not interested in individual staff productivity.
- OSFA should sign off on productivity standards in the contractor's quality control plan and assure that standards are being met.

3.4.1 TELEPHONE SERVICE:

Process of responding to the questions of prospective applicants phoned in to a telephone bank.

Goal:

Respond efficiently to inquiries about the application process and the status of individual applications.

Activities to be Measured:

Amount of telephone inquiries
Timeliness of answering applicant questions
Accuracy of answering applicant questions

Quality Control Measures:

Count of telephone calls received
Percentage of incoming calls placed on hold
Average length of time calls are placed on hold
Count of the number of calls per application
Accuracy of answering applicant questions determined by monitoring of telephone operators

Role of Quality Assurance:

- Independently monitor operators on the telephone service to assess accuracy. Concern is with overall accuracy and courtesy of the service, not the accuracy and courtesy of individual operators. The latter is a quality control concern for the contractor only.
- Prepare a list of typical questions asked by callers, as well as appropriate responses. Have OSFA staff phone in these questions to the telephone bank and record the accuracy of responses, courtesy of the operator, length of time the call was placed on hold, and length of the entire phone conversation. Concern is with overall accuracy and courtesy of the service, not accuracy and courtesy of individual operators. Therefore, results must be aggregated to the overall service level.
- Compare results of the quality assurance monitoring to the quality control monitoring. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.

3.4.1 TELEPHONE SERVICE (Continued):

- Monitor the contractor's telephone service quality control process. Be sure that an independent and objective quality control team is performing the quality control monitoring.

- Obtain from the contractor a count of the number of telephone calls received, the percentage of calls placed on hold, the average number of calls placed on hold, and the number of calls received per application. The latter statistic will help indicate how well the overall processing system works and how understandable procedures are to the applicant.

3.4.2 CORRESPONDENCE SERVICE:

Process of responding to the questions of prospective applicants mailed to a correspondence bank.

Goal:

Respond efficiently to inquiries about the application process and the status of individual applications.

Activities to be Measured:

Amount of letter inquiries
Timeliness of answering applicant questions
Accuracy of answering applicant questions

Quality Control Measures:

Count of letters received
Count of responses to letters
Average number of days before a response is mailed
Accuracy of answering applicant questions determined by writing sample letters and monitoring responses

Role of Quality Assurance:

- Write sample letters that represent the diverse types of questions applicants may have about application procedures and the status of their applications.
- Monitor responses to sample letters for accuracy and timeliness of responses.
- Compare results of the quality assurance monitoring to the quality control monitoring. If major disparities exist, have the contractor's quality control manager justify the contractor's results in a written report.
- Monitor the contractor's correspondence service quality control process. Be sure that an independent and objective quality control team is performing the quality control monitoring.

3.4.2 CORRESPONDENCE SERVICE (Continued):

- Obtain from the contractor a count of the number of letters received, number of responses mailed, and the average number of days before a response is mailed.

3.5 REPORTING PROCESS:

Process of indicating to OSFA that measures of the quality and efficiency of production fall within established standards.

Goals

Convey to OSFA pertinent information about the processing system in a timely and accurate manner without overburdening managers with useless statistics.

Activities to be Measured:

Responsiveness of reports
Timeliness of reports
Clarity of information presented in reports

Quality Control Measures:

Qualitative assessment of whether reports meet OSFA needs
Elapsed time between quality control measurement and report to OSFA
Qualitative assessment of whether reports sufficiently flag processing problems

Role of Quality Assurance:

- Establish "tickler file" which lists all reports and other deliverables due from the contractor and their delivery dates to OSFA.
- Send follow-up correspondence each day to contractor if deliverable or report is past due according to "tickler file." This should help reduce time lags between production of data and reporting.
- Analyze all reports as to whether they are directed to the proper manager and contain an appropriate level of statistical aggregation. Managers should not have to wade through excessive information to find the data they are interested in. Top level managers should be sent only summary reports or reports on special processing problems. Lower level managers who monitor relatively small, well defined parts of the processing system should receive more detailed information.

3.5 REPORTING PROCESS (Continued):

- Assess whether reports include trend data as well as cumulative statistics. Comparisons of trends are an important source of identifying potential processing problem areas. Further, statistics should include both averages and frequency distributions since the former may hide trends for outlying cases.

- Assess whether a clear "system alarm" capability is used in reports. Clear visual cues should be used to alert managers to system problems. A method for highlighting data that are well beyond established standards should be provided. Such data should be flagged using a visual device such as an asterisk or bold type or should be put in an exceptions report. Also, graphics should be used showing linear boundaries for expected behaviors. In addition to visual cues, explanatory material must be provided for all out-of-range data and data that are progressively approaching minimum performance standard levels.

3.6 CORRECTIVE ACTIONS PROCESS:

Formal procedures to modify the processing system in order to eliminate program error.

Goal:

Efficiently assess alternative program modifications, select the preferred alternative, and implement modifications in a timely manner.

Activities to be Measured:

Timeliness of implementing program modifications

Quality Control Measures:

Elapsed time from identification of program error to implementation of system modification

Role of Quality Assurance:

- Oversee corrective action process in order to assure that modifications are made in a timely manner and in a way acceptable to OSFA. Proposed corrective actions should be reported to OSFA for review in the system/software modification signoff sheet shown in Appendix C.
- Establish standards for deciding when corrective actions should be initiated by the contractor and by OSFA.
- Establish criteria for the approval process of corrective actions. Under different situations, corrective action proposals may be implemented without OSFA review, with review by the OSFA monitor only, or with additional OSFA review.

4.0 GENERAL/ONGOING QUALITY ASSURANCE PROCEDURES

There are a series of quality assurance roles that are either general in nature, ongoing, or interface with several processing functions. They are summarized in this separate section.

Additional Quality Assurance Roles:

- Provide input into the design of the contractor's quality control plan. This will facilitate the development of a quality assurance process that parallels the quality control process.
- Independently establish performance standards for each processing function. These standards should be challenging, yet realistic, and based upon historical data on processing efficiency.
- Monitor the contractor's quality control procedures to verify the processes used to produce quality control statistics and reports.
- Observe the production process on a regular basis in order to identify potential problems and/or deficiencies. Compare system performance based on this observation to information in the quality control reports.
- Identify parts of the quality control process that should be independently checked by quality assurance procedures.
- Identify types of instruments to be used for independent quality assurance checks and for evaluating quality control procedures.
- Conduct independent quality assurance checks on system performance. Data from these checks should be compared to quality control data.
- Compare production measures from the quality control process and quality assurance checks to established standards. If performance is outside of tolerable range, report this information promptly to the appropriate OSFA manager.
- Set up table shells and appropriate graphics to report quality control/quality assurance findings to Director, Division of Quality Assurance.
- Prepare and submit test application cases on major application forms. Responses to these test cases (for example, corrections requests and receipt of SARs in Pell) should be monitored and the accuracy and timeliness of responses should be recorded.
- For test application cases returned for corrections, prepare revisions. Responses to these revisions should be monitored and the accuracy and timeliness of responses should be recorded.

- Set up network of quality assurance field volunteers (appproximately 10-12 people) made up of students and staff from financial aid offices, the National Association of Student Financial Aid Administrators (NASFAA), the National Association of State Scholarship and Grant Programs (NASSGP), and the National Council of Higher Education Loan Programs (NCHELP). Have volunteers send in test application cases and monitor responses.

- Conduct random survey of applicants' responses to the quality of the processing system. A postcard survey could be designed and sent to applicants in various stages of processing. Clearance will be necessary prior to implementing the survey.

5.0 SUMMARY CHECKLIST/TEAR-OUT SHEET OF QUALITY ASSURANCE PROCEDURES

Activity	Responsible Staff	Check When Completed
Input to design of contractors' QC plan	Team members	_____
Establish independent performance standards	Team members	_____
List deliverables, due dates for each	Team leader	_____
Establish "tickler file" listing reports, deliverables, and due dates	Team members	_____
Send follow-up correspondence for deliverables/reports past due according to "tickler file"	Team members	_____
Monitor contractor's QC procedures	Team members	_____
Review QC reports	Team members	_____
Observe production process	Team members	_____
Compare observed system performance to QC reports	Team members	_____
Compare measures from QC reports to standards	Team members	_____
Assess timeliness and responsiveness of reports	Team members	_____
Assess whether reports are directed to proper manager and contain correct level of statistical aggregation	Team members	_____

5.0 SUMMARY CHECKLIST/TEAR-OUT SHEET (Continued)

Activity	Responsible Staff	Check When Completed
Assess whether reports include clear visual cues and "system alarm" capability	Team members	_____
Identify parts of QC system for independent QA checks	Team leader	_____
Identify types of instruments for independent QA checks	Team leader	_____
Reverify QC procedures	Team members	_____
Set up table shells for internal QC/QA reports to Director, DQA	Team leader	_____
Initiate new QA checks on system performance and compare with QC data	Team members	_____
Compare QC and QA data to standards; report problems to Director, DQA	Team members	_____
Prepare/submit test application forms	Team members	_____
Prepare/submit test letters	Team members	_____
Prepare test questions for phone bank	Team members	_____
Phone in test questions; monitor responses	Team members	_____
Monitor regular operations of telephone bank	Team members	_____
Prepare/submit revisions for test applications returned for corrections request	Team members	_____

5.0 SUMMARY CHECKLIST/TEAR-OUT SHEET (Continued)

Activity	Responsible Staff	Check When Completed
Set up QA field volunteer network	Team leader	_____
Prepare/conduct applicant satisfaction survey	Team members	_____
Sample incoming documents; assign ID number; record time in	Team members	_____
Monitor sampled incoming documents through each production step	Team members	_____
Compare QA monitoring results to QC monitoring results at each production step	Team members	_____
Monitor contractor's QC sampling process at each production step	Team members	_____
Obtain from contractor necessary counts, percentages, backlogs, measures of accuracy, and measures of timeliness at each production step	Team members	_____
Take sample of documents at data entry stage and measure accuracy of process	Team members	_____
Run test data through edit procedures and assess accuracy	Team members	_____
Take sample of responses sent to applicants as a result of edits	Team members	_____
Take sample of applications and manually replicate output data computation	Team members	_____
Take sample of output documents before mailing; check if information is complete and legible	Team members	_____

5.0 SUMMARY CHECKLIST/TEAR-OUT SHEET (Continued)

Activity	Responsible Staff	Check When Completed
Sample responses to correction requests; assign ID number; record time in	Team members	_____
Monitor sampled responses to correction requests through each production step	Team members	_____
For CPFF contracts, compare actual costs to budgeted costs	Team members	_____
Use "Checklist for Reviewing Software" to monitor software performance	Team members	_____
Assure corrective actions are made in timely manner	Team members	_____
Establish standards for deciding when corrective actions should be initiated by contractor and OSFA	Team members	_____
Establish criteria for approving corrective action requests	Team members	_____
When appropriate, request contractor's System/Software Modification Signoff Sheet	Team leader	_____
Prepare internal OSFA QA reports for Director, DQA	Team leader	_____

APPENDIX A

DIVISION OF RESPONSIBILITY BETWEEN CONTRACTOR AND OSFA FOR SOFTWARE QUALITY CONTROL/QUALITY ASSURANCE

ACTIVITY	PRIMARY RESPONSIBILITY OF: CONTRACTOR	OSFA
Software Design Stage		
Design Verification	X	X
Design Validation	X	
Software Implementation Stage		
Product Evaluation	X	X
Structural Programming		
Technology	X	
Use of Drivers	X	
Test Data Bases	X	X
Internal Control Techniques	X	X
Record Counts		X
Batch Totals		X
Control Totals		X
Limit Checks	X	X
Hash Totals	X	
Software Testing Stage		
Informal Testing	X	
Formal Testing	X	X
Subsystem Testing	X	X
Prototype Testing	X	X
System Testing	X	
Acceptance Testing		X

APPENDIX B

MONITOR'S CHECKLIST FOR REVIEWING SOFTWARE DEVELOPED BY CONTRACTOR

SOFTWARE REVIEW CHECKLIST

Code Examination	Check When Requirement Is Satisfied
• Naming conventions used	_____
• Modular structure	_____
• Proper indentation	_____
• Well commented	_____
• Appropriate edit and limit checks	_____
• Internal controls used (record counts, batch totals, control totals, hash totals)	_____
• Routines for error handling	_____
• No inexecutable code	_____
• No gross inefficiencies	_____
• Meaningful data and procedure names where no conventions apply	_____
• Logical data definition organization	_____

SOFTWARE REVIEW CHECKLIST (CONTINUED)

Documentation Review	Check When Requirement Is Satisfied
• All inputs documented	_____
• All outputs documented	_____
• All main programs documented	_____
• All subroutines documented	_____
• All online screens and displays documented	_____
• All abnormal termination and restart procedures documented	_____
• All error messages documented	_____
• All batch jobs documented	_____
• All utility software documented	_____
• All proprietary software documented	_____
• All required system libraries documented	_____
• Operations procedures documented	_____
• Cross-reference provided	_____
• Output disposition documented	_____
• All run-time parameters documented	_____
• All files documented	_____
• All record formats documented	_____
• All data elements documented	_____
• Interfaces with other systems documented	_____
• System overviews provided	_____

APPENDIX C

SYSTEM /SOFTWARE MODIFICATION SIGNOFF SHEET

SYSTEM/SOFTWARE MODIFICATION SIGNOFF SHEET

SYSTEM/SOFTWARE PROBLEM:

Date Problem Identified:

RECOMMENDED CORRECTIVE ACTION:

Scheduled Implementation Date:

SIGNATURE OF CONTRACTOR'S PROJECT MANAGER:

Date:

SIGNATURE OF OSFA's PROJECT MONITOR:

Date:

APPENDIX D

OSFA INTERNAL REPORTING SUMMARY FORM

Monitor's Name _____ Today's Date _____

Reporting Period: From _____
To _____

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION I - KEY MEASURES

KEY MEASURE	KEY ACTIVITY #1			KEY ACTIVITY #2			KEY ACTIVITY #3			KEY ACTIVITY # 4		
	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date
Volume Information												
In												
Out												
Time (Average Processing/ Response Time)												
Cost Information												
Baseline Estimate												
Actual Cost												
Error Rate												
Standard												
Actual												

Other Key Measures	Standard	This Period	Last Period	Year to Date

D-2

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION 2 - EXCEPTIONS

PROCESSING FUNCTION	MEASURE OUTSIDE TOLERANCE	STANDARD	ACTUAL
1. PRODUCTION CONTROL:			
A. Information Receipt			
B. Data Entry			
C. Data Edit			

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION 2 - EXCEPTIONS (CONTINUED)

PROCESSING FUNCTION	MEASURE OUTSIDE TOLERANCE	STANDARD	ACTUAL
1. PRODUCTION CONTROL (CONTINUED):			
D. Compute			
E. Document Production and Mailing			
F. Corrections			

D-4

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION 2 – EXCEPTIONS (CONTINUED)

PROCESSING FUNCTION	MEASURE OUTSIDE TOLERANCE	STANDARD	ACTUAL
2. FISCAL CONTROL			
3. SOFTWARE QUALITY ASSURANCE			

D-5

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION 2 - EXCEPTIONS (CONTINUED)

PROCESSING FUNCTION	MEASURE OUTSIDE TOLERANCE	STANDARD	ACTUAL
4. PRODUCTIVITY CONTROL			
Manual Procedure A			
Manual Procedure B			
Manual Procedure C			
Manual Procedure D			

OSFA INTERNAL REPORTING SUMMARY FORM

SECTION 2 - EXCEPTIONS (CONTINUED)

PROCESSING FUNCTION	MEASURE OUTSIDE TOLERANCE	STANDARD	ACTUAL
5. REPORTING PROCESS			
6. CORRECTIVE ACTION PROCESS			

APPENDIX E:

EXAMPLE OF OSFA INTERNAL REPORTING SUMMARY FORM (SECTION 1) TAILORED TO PELL GRANT PROCESSING

Monitor's Name _____ Today's Date _____

Reporting Period: From _____
To _____

OSFA INTERNAL REPORTING SUMMARY FORM: PELL PROCESSING

SECTION I - KEY MEASURES

KEY MEASURE	KEY ACTIVITY #1 Applications Processing			KEY ACTIVITY #2 Corrections Processing			KEY ACTIVITY #3 Correspondence Service			KEY ACTIVITY # 4 Telephone Service		
	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date	This Period	Last Period	Year to Date
Volume Information												
In	____	____	____	____	____	____	____	____	____	____	____	____
Out	____	____	____	____	____	____	____	____	____	NA	NA	NA
Time (Average Processing/ Response Time)	____	____	____	____	____	____	____	____	____	NA	NA	NA
Cost Information												
Baseline Estimate	____	____	____	____	____	____	____	____	____	____	____	____
Actual Cost	____	____	____	____	____	____	____	____	____	____	____	____
Error Rate												
Standard	____	____	____	____	____	____	____	____	____	____	____	____
Actual	____	____	____	____	____	____	____	____	____	____	____	____

Other Key Measures	Standard	This Period	Last Period	Year to Date
Number of applications in system more than 20 days	_____	_____	_____	_____
Number of corrections in system more than 10 days	_____	_____	_____	_____
Percent of applications with more than 1 transaction	_____	_____	_____	_____
Percent of edit identified errors that are real errors	_____	_____	_____	_____