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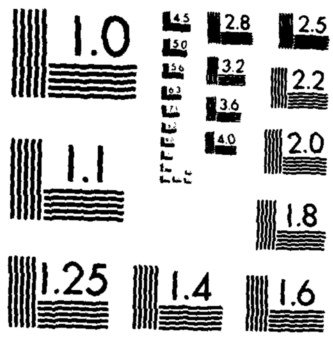

MICROCOPY RESOLUTION TEST CHART
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DCASR DATA INPUT WORKLOAD CAPACITY STUDY

EPARTMENT OF DEFENSE

DEFENSE
OGISTICS
AGENCY

Cameron Station,
xandria, Virginia 22304-6100

Operations Research and Economic Analysis Office

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DCASR Data Input Workload Capacity Study

January 1986

Captain Lance M. Roark, USAF
Operations Research and Economic Analysis Office
Headquarters, Defense Logistics Agency
Ca.eron Station, Alexandria, Virginia

A-1

DEFENSE LOGISTICS AGENCY
HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

DLA-LO

FOREWORD

Each DCASR headquarters is responsible for the Mechanization of Contract Administration Services (MOCAS). This is an automated data system which provides management and operational data on delivery schedules, shipments, contractual changes and disbursements to contractors. At each DCASR, information is extracted from contractual documents by data input clerks and entered into the MOCAS system. One recent enhancement of MOCAS is the development of an on-line capability for data input, which is replacing a batch method of data input. This on-line capability was the subject of this study, which was sponsored by the DLA Office of Telecommunications and Information Systems and performed by the DLA Operations Research and Economic Analysis Office.

The first purpose of this study was to develop standards or threshold values for system response times for the on-line input of contractual documents. Such standards would be the maximum allowable values of response times which would permit the backlog of documents awaiting input to be kept within an acceptable range. By establishing standards for response time, it is then possible for the DLA Systems Automation Center to determine the level of ADP capacity necessary to meet the needs of the functional users of the new on-line system. This is far preferable to sizing ADP requirements based on, for example, an arbitrary level of CPU utilization.

The second purpose of this study was to measure the data input productivity improvement associated with the new on-line system. It is the conclusion of the study that the number of documents per day that an input clerk can process on-line will increase by roughly 15 percent over the batch input method. This productivity improvement can be used to reduce personnel requirements while maintaining backlog performance, or else it can be used to reduce backlog size if personnel requirements are kept at their present levels.

Roger C. Roy

R. C. ROY
Acting Assistant Director
Office of Policy and Plans

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I. INTRODUCTION

A. Contract Administration Services

One of the most important missions of the Defense Logistics Agency (DLA) is the administration of defense contracts for the military services, DLA, and NASA. This function is performed by DLA's Defense Contract Administration Services (DCAS). The United States has been divided into nine geographic regions, with each region having a headquarters office (DCASR). Assignment of a contract to a DCASR is determined by the geographic location of the contractor involved.

Each DCASR headquarters is responsible for the Mechanization of Contract Administration Services (MOCAS). This is an automated data system which provides management and operational data on delivery schedules, shipments, contractual changes and disbursements to contractors. The military services, other agencies, and contractors are continually sending contractual and delivery documents to the DCASR. Contractual documents include new contracts and contract modifications; delivery documents are called DD250s. In addition, corrections to the contractual and delivery documents are also continually required. At each DCASR, then, information is extracted from each of these documents by data input clerks and entered into the MOCAS system.

MOCAS has been and will continue to be upgraded under a phased program. One recent enhancement is the development of an on-line capability for the data input of contractual and delivery documents. This on-line capability replaces an earlier batch operation and provides for (1) on-line input and validation of data, (2) immediate updating of the MOCAS data base, and (3) immediate access of contract and delivery status and information to the buying organization and other managers through on-line queries.

DCASR-Atlanta was selected as the first site for the on-line enhancement to MOCAS (known as MOCAS Phase II). Atlanta was selected as the prototype installation because it is a relatively small DCASR (in terms of number of contracts managed). DCASR-Cleveland, being a "medium" size DCASR, was selected as the second site for MOCAS Phase II. As of this writing, Atlanta and Cleveland have already been equipped with Phase II; the largest DCASRs (Los Angeles, Boston and Philadelphia) will be equipped last due to concern about sufficient ADP capacity to accommodate the new system.

B. MOCAS Data Input

The actual process of data input is somewhat complex. Basically, the hardcopy documents are sent to the DCASR by mail, and mail clerks then collect and sort the documents. Contractual documents are then given to control clerks who enter the documents into the daily backlogs of new contracts and contract modifications. The documents then are further sorted and given to the data input clerks. The input clerks collect pertinent information from these documents and enter this information into the MOCAS Data Base Management System (DBMS). This is a menu-driven system, and the input of a document requires the selection of several screens. Moreover, the input clerks must typically input the appropriate information at each screen and then wait for the system to respond (this is called a screen-to-screen response) and display the next screen. After all information from the document is input into the system, the last step is a system validation and update (called a summary edit) of the MOCAS data base. This last step involves a somewhat longer system response time. At this point, the document is removed from the daily backlog of documents awaiting data input.

The input clerks must also make corrections to the contract data in the MOCAS data base. A correction does not involve a legal change to the contract like a contract modification, but rather is simply a fix to an identified mistake or typographical error. Corrections still require several screens of input followed by a summary edit and make up a significant portion of the input clerks' workload.

The new contract and contract modification processing also include documents that are sent by electronic transmission from the buying organization directly into the MOCAS data base. This process is known as the Military Standard Contract Administration Procedures (MILSCAP). This electronic transmission does not include all of the needed information, and the buying organization must therefore send a follow-up hardcopy of the MILSCAP contract or modification to the DCASR. When the follow-up hardcopy arrives at the DCASR, data input clerks then enter the remaining information from the document into the system using correction mode. In the case of Atlanta, separate MILSCAP clerks are used for this data input; in Cleveland, the hardcopy data input clerks also enter the MILSCAP corrections. In either case, the MILSCAP correction must also be included in the input clerks' workload.

C. Study Objectives

In June of 1984, the DLA Headquarters Office of Telecommunications and Information Systems (DLA-Z) requested that the DLA Operations Research and Economic Analysis Office (DLA-LO) perform a study on data input for MOCAS Phase II. The study would serve two distinct but related purposes. The first purpose of the study would be to establish standards or threshold values for system response times (both screen-to-screen and summary edit). The standards for system response times, if achieved, would mean that the size of the backlog of documents awaiting input would not be unacceptably high. This provided DLA-Z the criteria to determine the level of ADP capacity necessary to meet the needs of the functional users of the new MOCAS Phase II system. This is far preferable to sizing ADP requirements based on, for example, an arbitrary level of CPU utilization. The second purpose of the study would be to measure the benefits of the new on-line (Phase II) system, in terms of lower document backlogs and/or reduced requirements for data input clerks, relative to the old batch (Phase I) system. This report documents the final results of the analysis completed for Atlanta, Cleveland, and the large DCASRs.

D. Scope

This study includes a preliminary assessment of staffing levels for data input clerks under MOCAS Phase II. This assessment is only for the purpose of measuring the data input productivity improvement of Phase II relative to the previous Phase I system. The actual and official staffing level will be determined by each regional Office of Comptroller and will be reviewed by the DLA Headquarters Office of Comptroller.

II. TECHNICAL APPROACH

A. General Methodology

The general approach in this study was to develop a simulation model of the data input process. It was necessary to resort to simulation due to the extreme complexity and variability of the process. The number of documents that arrive on any given day is quite variable, as is the number of transactions (i.e., screen inputs) for each document, the clerk input time for each transaction, and the system response time after each transaction. Each of these factors is modeled by probability distributions; the model uses random numbers and Monte Carlo techniques to simulate the data input of contractual documents. This model was developed in the SLAM simulation language.

In essence, data input is modeled as a queueing situation, where the documents are waiting for input into the system, causing a backlog of new contracts and contract modifications. The DCASRs do not enter contract corrections into the daily backlogs but rather simply input the corrections directly into the data base. For this reason, the simulation model does not keep track of the number of corrections awaiting input. However, the workload associated with corrections is included in the simulation model. The inputs to the model include parameter values (e.g., mean and standard deviation) for the number of documents per day for each document type, the transactions (screens) per document for each document type, the number of data input clerks, the clerk input time per transaction, the screen-to-screen response time, and the summary edit response time. The outputs of the model include the average backlog size for new contracts and contract modifications.

The simulation model is restricted in scope to the data input of hardcopy documents. There is no explicit modeling of the MILSCAP process in the simulation model. However, the MILSCAP corrections are included in the data input workload like the other corrections.

B. Data Collection

Considerable effort went into the data collection used to develop factors for the simulation model. This effort was accomplished in Atlanta and Cleveland by reviewing local procedure documents on data input, by interviewing the input clerks and their management, by personal observation of the data input process, and by use of on-line queries into the MOCAS data base. This was done to develop the general structure of the model, as well as the detailed factors. In addition, chi-square goodness of fit tests were used to determine the best probability distributions to model the various tasks and steps in the data input process.

To obtain workload information on each DCASR, the DLA Systems Automation Center developed a program to extract actual Phase I experience and convert it to a detailed projection of Phase II workload. This program not only provides top-level workload information like new contracts per day, but also provides very detailed information such as the average number of line items per new contract. This detailed information was necessary to calculate the number of screen inputs associated with each document.

Finally, the current staffing levels for input clerks at each DCASR were obtained from each region. This included a count of both authorized positions and actual clerks on hand. The regions also provided information on the size of document backlogs under the current MOCAS Phase I system.

C. Simulation Model Description

The model simulates the daily data input process (weekends are excluded). Each simulated day begins with the arrival of contractual documents to the mailroom. For each day, the model simulates the number of new contracts, contract modifications, and corrections. Although there is no backlog criteria for corrections, they are an important part of the daily workload for the input clerks. In the model, the documents are then delayed for 4 hours to account for the time until the documents are given to the control clerks. Following that, the new contracts and modifications are delayed an additional 2.5 hours to account for the control clerk tasks of reviewing the documents and entering them into the MOCAS backlog. Also, in the model, there are two possible snags that can possibly hold up the input of documents to the system. The first problem might occur when contracts are being transferred in from another DCASR. If the document is not provided with the proper certification of funds, then the document will (in certain circumstances) simply have to wait in backlog until the proper certification can be obtained. The other possible problem occurs when there is some internal inconsistency in the contract or modification. This must be resolved by further clarification from the buying organization; this problem is called a 1716 discrepancy. Either of these two problems will impact the average backlog size and the average processing time since the final input into the system is delayed (perhaps for several weeks) until the problem is resolved. In any event, the model assumes that after the control clerk review, assuming no problems, the actual data input will not start until the following morning.

The data input clerks are treated as constrained resources in the simulation model. Current staffing levels were used as inputs to the model, except that they were reduced by 18% to account for leave, illness, etcetera. Clerks are assumed to be available for on-line input for 6.5 hours per day. For each document, the model simulates the clerk input time for each transaction (screen). Nine representative clerks in DCASR-Atlanta (3 above average, 3 average, and 3 below average) were used to develop a sample of clerk input times; this sample was used to develop the factors used to simulate clerk input time. After each clerk transaction, the model simulates the screen-to-screen response time.

Finally, the model simulates the last clerk input time, followed by the summary edit response time.

The model also simulates whether or not the summary edit process detects any inconsistencies in the data that are input from the document. If a document receives an unsuccessful summary edit message, then the input clerk must make an additional transaction to adjust the data. After this adjustment is made, the summary edit process continues until a successful summary edit message is eventually received. At this point the document is removed from the backlog of documents awaiting data input.

The model assumes that after the successful summary edit response, the clerk will read and study the next document awaiting input. In the case of modifications, it may also be necessary to review the information currently in the MOCAS data base through the use of on-line inquiries. When the review of the next document is complete, the clerk starts the input of the document, and the cycle of clerk input times and response times starts all over.

The most important output of the simulation model is the size of the document backlog. This backlog size is the critical factor for the remainder of this report. The backlog size is usually measured in days' receipts and not as an absolute number of documents. For example, if a DCASR typically received 200 documents per day, then a backlog of 400 documents would be described as two days' receipts.

D. Simulation Model Validation

A significant part of this study was spent on adjusting and fine-tuning the simulation model until the simulation model output compared favorably with actual operational experience for MOCAS Phase II. This was accomplished primarily with backlog experience at DCASR-Atlanta since (at the time of this analysis) only Atlanta had sufficient experience with the new system for the input clerks to achieve a reasonable (mature) level of proficiency. A comparison of simulated backlog experience with actual backlog experience is shown in Table 1. The backlog includes both hardcopy contracts and modifications; the backlog size is shown in both number of documents and also in days' receipts.

Both simulated and actual backlog experience are quite high due to an insufficient number of input clerks. DCASR-Atlanta has a total of 18 authorized positions for data input clerks (this includes hardcopy input clerks and MILSCAP clerks but excludes review clerks, lead clerks and supervisors). However, the actual number of on-board clerks during May and June 1985 was only 11. The 7 vacancies were due to high turnover of personnel and problems in filling vacancies. The simulation model was also used to project what would happen to backlog size with an arbitrary increase of 3 additional clerks; the result is shown in the last entry in Table 1 and is labeled "Get Well."

TABLE 1

Backlog of Hardcopy Contracts and Modifications

DCASR-ATLANTA

	Documents	Days' Receipts
Simulated		
Mean	843	4.7
Standard Deviation	186	1.0
Actual (May-June 1985)		
Mean	868	4.8
Standard Deviation	168	0.9
Simulated ("Get Well")		
Mean	355	2.0
Standard Deviation	162	0.9

E. Integration with DSAC Modeling

The first major task of the project was to establish response time goals for MOCAS Phase II. In the case of Atlanta, the system was already operational when the study was initiated. The major accomplishment of the study was to verify that the current response times were adequate, and to attribute the high backlogs to an insufficient number of input clerks. In the case of Cleveland, response time goals were established for the initial environmental testing of the new system. Problems with high response times during this testing led to the decision to upgrade the processor at Cleveland from an Amdahl V7C to a V8.

In the case of the larger DCASRs, the project sponsor (DLA-Z) needed to determine response time goals (and associated computer hardware requirements) much earlier than any actual environmental testing. This was because of the possibility that the larger DCASRs might require totally new processors (like an Amdahl 5850 class mainframe) instead of upgrades to their current processors. A requirement to obtain new processors would have considerable impact on the Phase II implementation schedule due to the lengthy lead-times. To meet this need, it became necessary to integrate the functional data input modeling being performed by DLA-LO with the computer resource modeling being performed by the DLA Systems Automation Center (DSAC). The DSAC modeling deals with transaction (enter-key depression) volumes and CPU time per transaction, and provides a projection of what CPU utilization and response times will be at each DCASR. By integrating the two modeling efforts, it then became possible for DLA-LO to use its simulation model to establish response time goals for the large DCASRs and then provide these goals to DSAC to determine the computer hardware required to achieve them.

This communication between the two models also helped in measuring the productivity improvement of MOCAS Phase II, which was the second major task of this project. Specifically, once DSAC determined the computer hardware, the DSAC model could then be used to project what the response times would actually be at a given DCASR. The DSAC projected response times, of course, would always be less than the response time standards established in the first part of this project. These projected response times, in turn, were used as inputs to the DLA-LO simulation model to predict the impact of Phase II on backlog size and personnel requirements. The specific results for both aspects of this study are described in the next two sections.

III. RESPONSE TIME GOALS FOR MOCAS PHASE II

A. Criteria for Document Backlogs

The first major task of this project was to establish standards or threshold values for system response time. The approach taken in this study was to define the standards for response times as the maximum allowable values consistent with document backlogs being within an acceptable range. It therefore became necessary to define specific limits on backlog size.

The only official standard for data input processing is found in the DLA Accounting and Finance Manual (DLAM 7000.1), which states that new contracts should be processed within 2 days, and that modifications should be processed within 4 days. Actual practice on the regions, however, is to track the size of the document backlogs rather than to track the actual processing time of the individual documents. Most regions also track the size of the combined backlog of hardcopy contracts and modifications as opposed to tracking the size of the contract backlog and the modification backlog. The specific local management goals on backlog size varies between regions, but most DCASRs try to keep document backlogs between 2 to 3 days' receipts. The approach taken in this study was to assume the following:

1. Backlogs would be tracked for hardcopy contracts and modifications combined.

2. Backlogs would be tracked on a weekly basis.

3. The average size of the document backlog should be no more than 2 days' receipts.

4. The weekly backlog should be no more than 3 days' receipts at least 90% of the time.

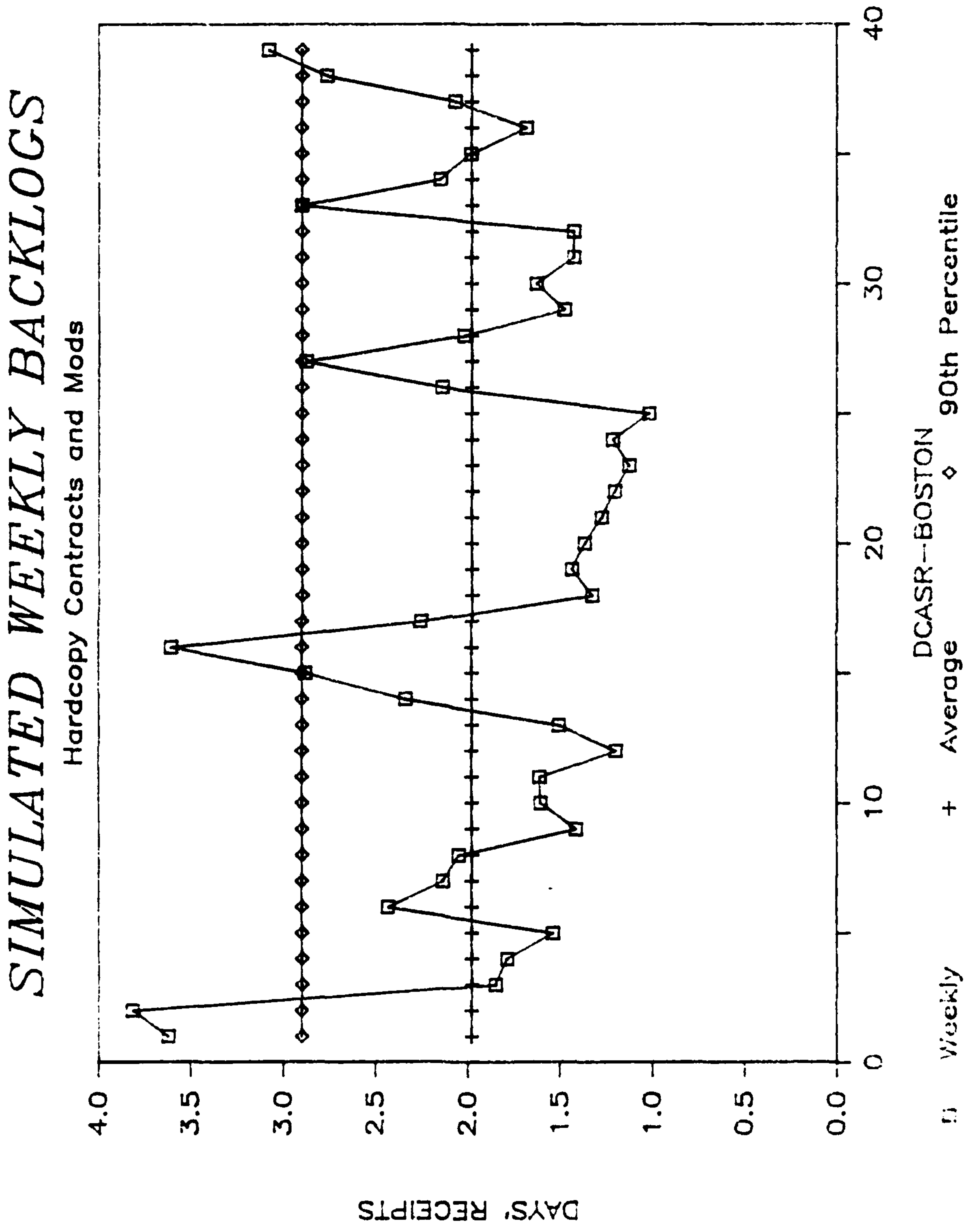
This was a very conservative approach, since most regions run slightly higher than this under Phase I.

B. Analysis for the Large DCASRs

The basic approach taken in this study was to use current operational experience at Cleveland for the baseline values of system response time, both screen-to-screen and summary edit. Cleveland was chosen because it was a closer approximation to the larger DCASRs since it has an Amdahl V8. The response times (model inputs) were then increased proportionally (by the same ratio) until the size of the combined document backlog (model output) just barely met the backlog criteria described above. The resulting response times then became the upper limit standards, or threshold values, for system response times.

The results of this evaluation for DCASR-Boston were found to be 6.0 seconds for screen-to-screen response times, and 68 seconds for summary edit response time. Achieving these threshold values means that the projected backlog will average no more than 2 days' receipts, and will fall within 3 days' receipts at least 90% of the time. This can be seen graphically in Figure 1, which shows the simulated weekly backlog over a period of 39 weeks at the threshold values of response times. The horizontal axis represents time measured in weeks of data input. The simulated weekly backlog size is shown by each data point, and can be measured in days' receipts on the vertical axis. The weekly plot shows considerable "peaks and valleys" in backlog size due to the inherent variability in the data input process as discussed earlier. The overall average, however, over the 39 week period is 2.0 days' receipts, and is shown by the straight horizontal line labeled "Average." Also, the weekly backlog falls within 2.9 days' receipts for 90% of the time;

FIGURE 1


SIMULATED WEEKLY BACKLOGS
Hardcopy Contracts and Mods
DAYS' RECEIPTS
4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
0 10 20 30 40
DCASR—BOSTON
□ Weekly + Average ◇ 90th Percentile

therefore, the 90th percentile is 2.9 days' receipts and is shown by the straight horizontal line labeled "90th Percentile."

Similar results were derived for Los Angeles and Philadelphia. The threshold values for system response times were also found to be 6.0 seconds (screen-to-screen) and 68 seconds (summary edit) for both regions. The only difference in the results was that in Boston's case the 2 days' receipts average criteria was exceeded first with increasing response time, but for Los Angeles and Philadelphia the 3 days' receipts 90% limit was exceeded first. In any case, the range of acceptable response times provided to DSAC were 3.1 to 6.0 seconds for screen-to-screen, and 35 to 68 seconds for summary edit. The lower value for each range is actual current experience at DCASR-Cleveland and was provided simply for perspective.

C. Results of DSAC Modeling

With these response time goals established, the DSAC model described earlier was run for each of the large DCASRs. The most recent results (as of the time of this writing) indicate that DCASR-Boston can accommodate MOCAS Phase II on an Amdahl V8, but that DCASR-Philadelphia will require an Amdahl 5850 class computer, and that DCASR-Los Angeles will require an Amdahl 5860 class computer. These results, however, only apply to the short-run implementation of Phase II; it is probable, with the addition of other future on-line systems and with growth in the number of contracts administered by the DCASRs, that all large DCASRs may eventually require even more powerful processors.

After determining the hardware requirements for each DCASR, DSAC also provided to DLA-LO specific estimates of what system response times will be at each region. These estimates were used in the second task of this project, which was to model the impact of MOCAS Phase II on backlog size and personnel requirements. These results are described in the next section.

IV. DCASR DATA INPUT WORKLOAD ANALYSIS

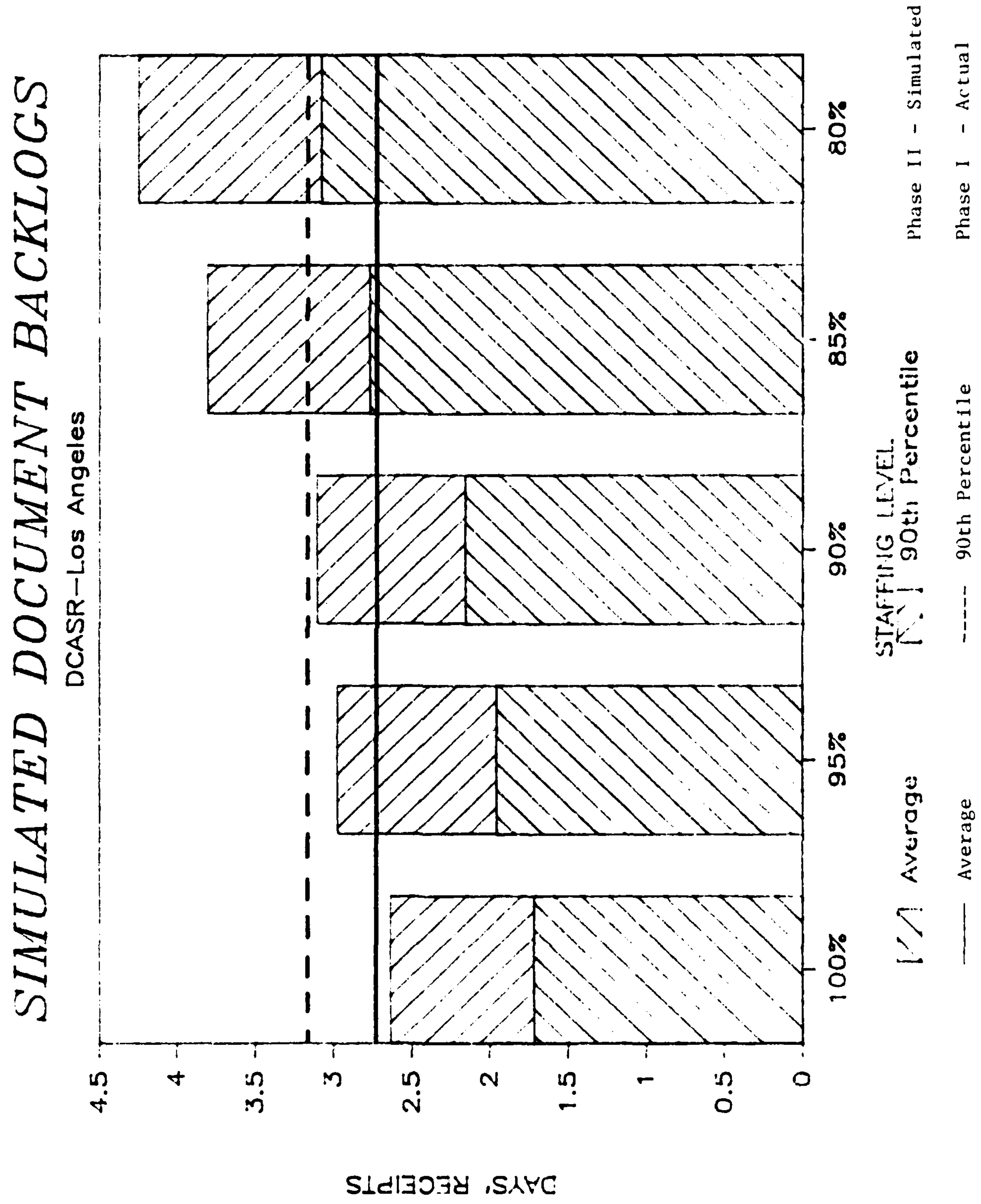
A. Measuring Data Input Productivity

In establishing response time standards as described earlier, the number of input clerks was kept fixed at current levels while response times were increased until backlog size reached specified criteria. For measuring the improved productivity associated with MOCAS Phase II, the simulation model was used in a somewhat different way. System response times were kept fixed at the DSAC projections for each region, and the simulation model was run with decreasing numbers of input clerks. Also, rather than using the 2 days' receipts (average) and 3 days' receipts (90th percentile) criteria, the simulated backlog size was compared to the actual Phase I backlog experience for each of the large DCASRs.

B. Results for DCASR-Los Angeles

The results of this analysis for Los Angeles can be seen in the "stacked-bar" chart in Figure 2, which graphically portrays the size of

FIGURE 2



SIMULATED DOCUMENT BACKLOGS
DCASR—Los Angeles
DAYS' RECEIPTS
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
100%
95%
90%
85%
80%
STAFFING LEVEL
Average
90th Percentile
Phase II - Simulated
Average
90th Percentile
Phase I - Actual

the combined document backlog as a function of the number of input clerks. Each bar represents a simulation with a different number of data input clerks. The bar on the far left, for example, is labeled 100%, meaning 100% of the current Phase I staffing level at Los Angeles. This is relative to the actual number of clerks on-hand and not positions authorized. This was done to make a valid comparison between the simulated backlog size and the actual Phase I backlog experience being achieved by the clerks on-hand.

The lower level of each stacked bar represents the average size of the simulated document backlog. The upper level of each stacked bar represents the 90th percentile of the simulated backlogs. Also, the simulated backlog performance can also be compared to the actual Phase I backlog performance at Los Angeles. The actual Phase I average backlog size is 2.7 days' receipts, which is represented in the figure by the solid line. The actual 90th percentile of the Phase I backlogs is 3.2 days' receipts, which is represented in the figure by the dashed line.

The conclusion drawn from this analysis indicates the implementation of MOCAS Phase II will provide roughly a 15% productivity improvement which can be channeled in one of two directions. Phase II has a potential to reduce the data input staff by 15% and maintain backlog performance roughly at present levels, or else to reduce the average backlog size by 1 days' receipts if the staffing level is maintained at the current number of input clerks.

C. Summary of Results for the Large DCASRs

Similar results were obtained for Boston, Philadelphia and also Cleveland, by decreasing the number of input clerks until the simulated backlog size reached roughly the same level as the actual Phase I backlogs. This occurred in all cases at an 85% staffing level, meaning a reduction of 15%.

These results are summarized in Table 2, which shows the estimated data input productivity for each of the regions under MOCAS Phase II. The first three columns refer to numbers of input clerks at each region. The first column is the number of authorized positions for data input clerks. These numbers were never used in any of the simulations, but are displayed simply for information. The second column represents the actual number of clerks on-hand, and the third column called "Available" represents the adjusted number of clerks after accounting for leave and illness by an 18% reduction. It is this third number which was actually used in the simulation model. All cases are shown for two staffing levels. "100% Staffing" refers to present Phase I levels, and " 85% Staffing" refers to a 15% reduction in input clerks. This represents the point where backlog performance is maintained roughly at Phase I levels. The fourth column is the number of hardcopy documents (contracts and modifications) received by each region per day, which of course is independent of the staffing level for input clerks. The fifth column shows the documents processed by available clerk per days for each staffing level. For the case of "100% Staffing" the number represents the data input productivity under Phase II should the region elect to use the productivity improvement to reduce backlogs and not

TABLE 2

SIMULATED PHASE II DATA INPUT WORKLOAD CAPACITY

	Number of data input clerks			Documents per	Documents per Available
	Authorized	On-Hand	Available	Region per Day	Clerk per Day
Los Angeles				620	
100% Staffing	46.5	37.5	31		20.0
85% Staffing	39.5	32	26		23.8
Boston				441	
100% Staffing	27	27	22		20.0
85% Staffing	23	23	19		23.2
Philadelphia				380	
100% Staffing	23	19	16		23.8
85% Staffing	20	16	13		29.2
Cleveland				223	
100% Staffing	24	22	18		12.4
85% Staffing	20	19	15		14.9

Note: For Los Angeles and Philadelphia, MILSCAP clerks were assumed to perform data input 50% of the day, and were counted as such in the above figures.

personnel requirements. For the case of "85% Staffing", the number represents the data input productivity under Phase II should the regions elect to use the productivity improvement to reduce personnel requirements and not backlogs.

Two additional observations are appropriate about the productivity figures shown in Table 2. First, there are considerable differences between some regions. This is due to differences in the nature of the region workload, such as the average number of screen inputs per document or the number of corrections processed per region per day. Second, the projection under Cleveland for the case of "85% Staffing" shows a productivity of 14.9 documents per available clerk per day. Actual experience at Cleveland has been somewhat less than this until recently. From the period from June until August 1985, shortly after the initial operational activation of Phase II, the data input clerks were only processing 12.7 documents per available clerk per day. This probably is due to an initial "learning curve" effect associated with the new system. During the month of November, roughly six months after the transition to Phase II, the data input clerks were processing 14.5 documents per clerk per day, which is much closer to the 14.9 figure predicted by the simulation model. Therefore, these projections for data input productivity will probably not be experienced during the initial transition to Phase II at the large DCASRs, and it will probably take a period of roughly six months before the input clerks reach the predicted proficiency.

D. Projections for Other DCASRs

When running the simulation model for the large DCASRs, it was found that there were considerable differences between regions in the absolute number of documents processed per clerk per day. However, in the relative comparison of Phase I to Phase II data input, there was a fairly consistent pattern of a 15% improvement for Phase II. This was found in simulations of the large DCASRs and also in actual operational experience at DCASR-Cleveland. If it is reasonable to assume that there would be a similar improvement for the other regions, it is then possible to project their data input capacity under Phase II by applying the 15% improvement factor to their actual Phase I data input productivity. This was done for New York, Dallas, St. Louis, and Chicago. The results are shown in Table 3. The numbers are not available for Atlanta because it was already operational under Phase II well before this project was initiated.

V. CONCLUSIONS

The data input simulation model was used to establish standards for system response times for MOCAS Phase II. Screen-to-screen response time should not exceed 6.0 seconds, and summary edit response time should not exceed 68 seconds. Achieving these standards means that the backlog of documents awaiting data input will be within acceptable limits. The standards were provided to the DLA System Automation Center to determine MOCAS Phase II processor requirements.

TABLE 3

POSTULATED PHASE II DATA INPUT WORKLOAD CAPACITY

	Number of data input clerks Authorized	On-Hand	Available	Documents per Region per Day	Documents per Available Clerk per Day
New York				323	
100% Staffing	21.5	18.5	15		21.5
85% Staffing	18.5	16	13		24.8
Dallas				125	
100% Staffing	12	11	9		13.9
85% Staffing	10	9	7		17.9
St. Louis				184	
100% Staffing	18	18	15		12.3
85% Staffing	15	15	12		15.3
Chicago				162	
100% Staffing	48	38	31		5.2
85% Staffing	40	32	26		6.2

Notes: For New York, MILSCAP clerks were assumed to perform data input 50% of the day, and were counted as such in the above figures.

For Chicago, data input clerks are assigned other duties besides processing contracts and modifications, thus it has a lower capacity per clerk than the other regions.

The data input simulation model was also used to estimate the productivity improvement associated with MOCAS Phase II. The implementation of MOCAS Phase II will provide roughly a 15% productivity improvement for data input. Phase II has a potential to reduce the requirements for input clerks by 15% while maintaining backlog performance at present levels, or else it can reduce backlog size by roughly 1 days' receipts if the number of input clerks is maintained at present levels.

VI. RECOMMENDATIONS

The purpose of this analysis was to estimate the productivity improvement for data input under MOCAS Phase II. This was accomplished, in part, by making a preliminary assessment of staffing levels for data input clerks operating in the new on-line environment. However, each regional Office of Comptroller should wait for a period of at least six months after Phase II implementation prior to taking any action to reduce the number of data input clerks. This is because roughly a six month "learning curve" period is necessary for the data input clerks to achieve full proficiency with the new on-line system. Moreover, by waiting at least six months after implementation, each region will also have a significant measurement of operational data input productivity to further validate the findings of this study (i.e., the 15% productivity improvement). The actual degree of personnel reduction will also depend on each region's priorities between backlog reduction and personnel reduction. Finally, it is noted that any personnel reduction can easily be accommodated on an attrition basis due to the high turnover of data input clerks.

This study has provided significant benefits by integrating the functional modeling (performed by DLA-LO) with the hardware modeling (performed by DSAC). This way, the functional modeling established performance levels to meet the needs of the functional users; the hardware modeling could then determine the level of required ADP capacity to achieve the established performance levels. It is recommended that similar joint efforts be performed for future on-line systems (such as the Financial Redesign or the Contract Management Improvements). Such joint efforts should be initiated early to allow the functional modeling to assist in any design trades and in assessing the costs and benefits of new on-line systems. To support any future efforts, documentation (including the source code and the SLAM network diagram) on the simulation model used in this study will be retained in-house in DLA-LO, although it is probable that the model would require considerable revision before it could be used to model any other on-line system.

END
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