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NBS Special Publication 500-147

Guidance on Requirements Analysis for Office Automation Systems (Update: NBS SP 500-72)

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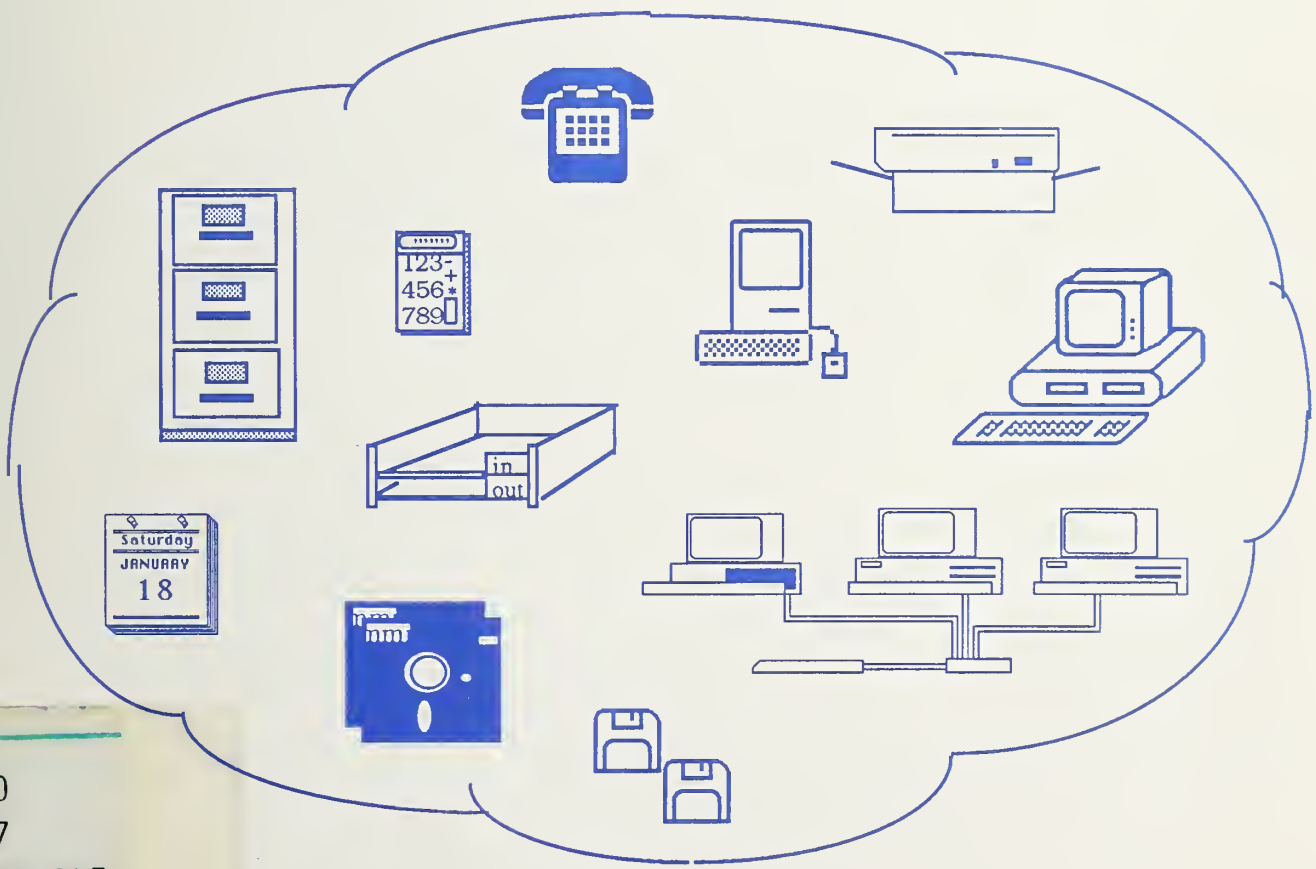

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Computer Science
and Technology

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Guidance on Requirements Analysis for Office Automation Systems

(Update: NBS SP 500-72)

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EXECUTIVE SUMMARY

Organizations in both government and private industry have become concerned with the promise of office automation, a promise to improve productivity in the office environment. With the ever increasing investment for new and improved office automation systems, this concern becomes crucial. Organizations must establish programs whose goal is to maximize the benefits that can be achieved through the application of office automation technologies.

A requirements analysis is one way organizations can identify technology solutions which can improve the quality, efficiency, or effectiveness of the organization's products or services. The key to this systematic planning method is to understand the work people do, identify opportunities for improvement, and match the technology to the most significant opportunities.

This guideline has been developed to assist organizations in performing a requirements analysis. The requirements analysis study may be initiated in response to a need for installing automated systems in a non-automated office or enhancing an already existing automated office environment. The study contains seven phases which must be performed in sequence since data gathered and/or derived from one phase serves as the basis for later phases. The seven phases are:

Preliminary Study Activities The first phase in performing a requirements analysis is planning the study. Activities in this phase include the designation of the organizational unit to be studied, selection of the study team, and the team's specification of milestones and resources needed to conduct the study.

Data Collection The second phase is the collection of data to understand how the target organizational unit conducts its business. This phase is also known as office baseline determination. Data is collected on two areas: the key products and general office work that does not contribute directly to the key products. Baseline data for both areas are obtained from the professional and support staff by interviews, questionnaires, and direct observation.

Office Baseline Analysis The third phase is the examination and evaluation of the collected data. The analysis reflects both the quantitative and qualitative aspects of product preparation by examining the level of effort to produce the product as well as the quality of the work. From the analysis, an understanding of the workload, work patterns and work flow (information flow) for each product is gained. This understanding is the basis for identifying the key

products and general office work which will benefit most from the implementation or enhancement of an office automation system.

Designing the Office Automation System The fourth phase consists of two steps: developing system requirements and developing a macro level system design model. The set of system requirements are statements of design intent and reflect the goals to be achieved by the office automation system. These requirements become the basis for developing the system design model. The system design model consists of a set of organizational, procedural, and technological changes to the key products and general office work. To maximize benefits, these changes should make it possible to expand the scope of work and/or handle diversity, and not just accelerate the tempo of current activities.

Developing Specifications for the Office Automation System The fifth phase is the development of the functional specifications for each system incorporated in the system design model. Specifications are statements of required system capabilities or features that address what the system must do. The functional specifications are presented to prospective vendors who are encouraged to offer alternative means for satisfying the specifications. Finally, a representative system configuration is constructed and its implementation cost estimated.

Pre-Implementation Benefit Cost Analysis The sixth phase addresses the economic feasibility of the proposed office automation system. It focuses on the factors and issues that need to be considered in selecting and applying a benefit cost analysis methodology. Both cost and benefit data are identified and evaluation methods are presented. The system justification should contain an overview of the justification process, the actual benefit cost analysis, and the results of the analysis. The results of the benefit cost analysis provide management with information on which to make an informed decision regarding implementation of the proposed system.

Post-Implementation Review The final phase is performed after the system is operational for a significant period of time. The objective of this phase is to compare the anticipated improvements in the target office with the actual improvements achieved through system implementation. The result is a recommendation to management for proceeding with ongoing operations, fine tuning the system to achieve desired results or a total redesign. Additionally, the post-implementation review can be used as a basis for planning future office automation efforts.

While this document is not a checklist or cookbook, it does provide a thorough description of the office automation requirements analysis process. When the analysis is completed, the organization will have analyzed the current office environment and identified technology solutions that can improve the way the organization does business.

TABLE OF CONTENTS

APPENDICES:

LIST OF EXHIBITS

1. INTRODUCTION

This report is designed to help managers maximize the benefits to be achieved through the application of office automation technologies. It presents a systematic planning method which will guide the manager to technology solutions which can improve the quality, efficiency, or effectiveness of an organization's products or services. The key to realizing these productivity gains is in understanding the work people do and the way they do that work. Only then can we engineer the most effective office automation systems.

Planning for office automation is accomplished through a requirements analysis study. The study can be initiated in response to installing office automation systems in a non-automated office or acquiring additional systems for an existing automated office environment. It is appropriate for analyzing the requirements of pilot or prototype systems as well as fully implementable systems. The study can be applied to all office automation technologies ranging from individual word processors to fully integrated database systems to video teleconferencing and spanning voice, image, data and text applications.

The purpose of this report is to provide guidance in the overall process of determining requirements for office automation systems. It advocates exploring new ways of performing business (e.g., redesign or simplify work) and not just automating current manual processes. This is accomplished by:

- understanding organizational goals and objectives:
- reviewing all aspects of the current organization: the people, jobs, environment, tools, and information;
- exploring ways to improve the current environment by implementing organizational, procedural, or technological changes; and
- developing an office automation plan that offers the most significant opportunity for major gains in quality, efficiency, and effectiveness.

These guidelines are intended for use by managers and/or staff who believe that there may be a need for some type of office automation support in their organization.

1.1. PRODUCT APPROACH METHODOLOGY

There are a number of different approaches to performing a requirements analysis. This document describes one approach, the "product approach", which focuses on the key products of an

organization. A product can be a document or a service requiring the contribution of one or more individuals and require significant effort to produce. Key products represent that subset of products which are critical to an organization's mission. By examining all aspects of office work, from the input of ideas until the disposition of the final product or service, we can identify the requirements and design automated systems that will provide the greatest return on investments. Because the product approach entails looking at the entire product preparation process, other requirement analysis approaches such as rapid prototyping can be included in the product approach and used to provide additional product and user related information.

The product approach which was originally designed by Booz-Allen and Hamilton has been used by a number of organizations in the public and private sectors. In 1980, the Institute for Computer Sciences and Technology (ICST) contracted to Booz-Allen and Hamilton for the preparation of a guidance document on performing requirements analyses of office environments. This work culminated in the publishing of National Bureau of Standards' Special Publication 500-72, Guidance on Requirements Analysis for Office Automation Systems. This document is an update of that earlier work reflecting newer technologies in the office today and ICST's experience in performing requirements analysis.

1.2. DOCUMENT OVERVIEW

The document is organized into ten chapters with supplemental appendices for additional detail. This introduction is followed by a indepth description of the product approach. The product approach contains seven phases which must be performed in sequence since data gathered and/or derived from one phase serves as the basis for later phases. Chapters two through eight describe these phases, which include:

- structuring the study (Chapter 2),
- determining the current office environment (Chapter 3),
- analyzing the collected data (Chapter 4),
- determining system requirements and developing a system design model (Chapter 5),
- developing functional specification for the proposed system, (Chapter 6),
- performing a benefit cost analysis (Chapter 7), and
- reviewing the post-implementation results (Chapter 8).

Exhibit 1-1 lists the phases by chapter. A general summary of the document is provided in chapter nine, where an outline of the key points discussed in the previous chapters is presented.

While this document is not a checklist or cookbook, it does provide a thorough description of all steps of the office automation requirements analysis process. Examples illustrate the study's concepts and provide sample documentation of each phase of the study. The examples are based on a fictitious office; however, to demonstrate the building block nature of this approach, each example is constructed by applying the study method to the previous example data.

1.3. GUIDE TO USING THIS DOCUMENT

This report presents considerable detail about how to perform a requirements analysis. The method is complete and somewhat formal, and serves as a model. Although all phases are to be performed, it is not expected that the method will be applied exactly as described, but will be tailored to fit the target organization. In particular,

- The size and scope of the study should be commensurate with the size of the office being automated; however, even the smallest study should contain all seven phases of the methodology. For example, the study could be limited to a few key products.

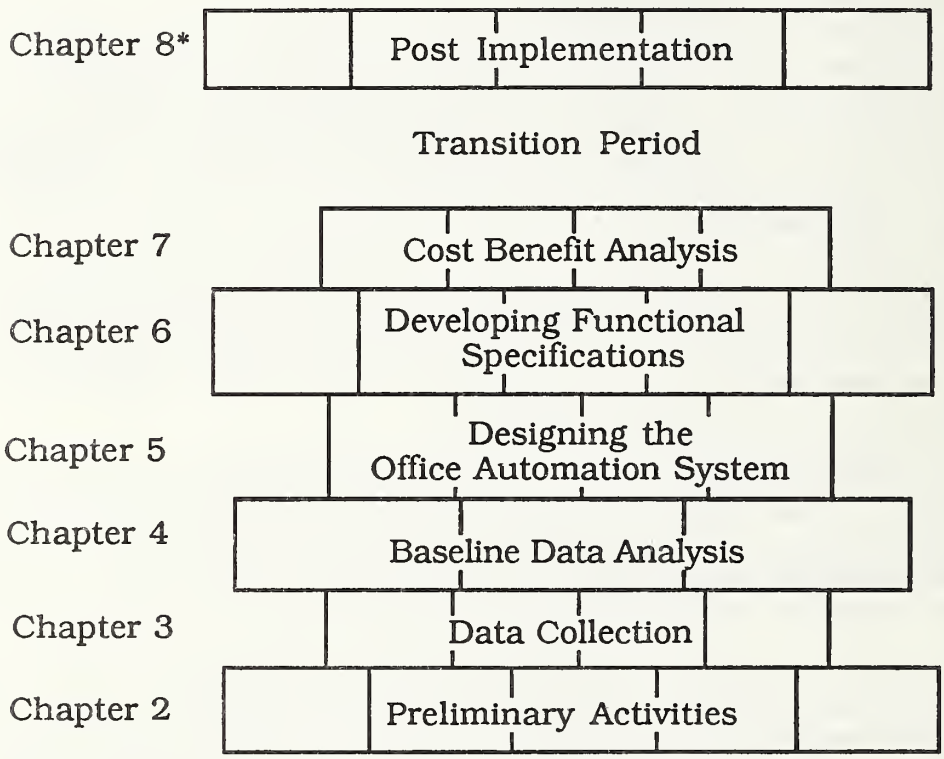
- The rigor of the study should be commensurate with the study size as well as organizational attitudes. For example, use of comparative ratings (e.g., high, low) in place of more definitive measurement values (e.g., dollar amounts) for informal studies.

- Any pre-established organizational procedures may be used to replace the procedures described herein; however, the results should be the same as those for the procedure described by this method. For example, the post-implementation audits may be conducted by methods specified by the organization's internal audit department.

Additionally, at the end of each chapter is a section on how to tailor the activities performed within the chapter. Care should be taken to ensure that the objectives of each chapter are met and all expected "deliverables" are produced. The terms "small" and "large" will be used to denote the relative study size, and is expected to vary among organizations (e.g., what is large for one organization, may be considered small to another). Hence, the application and relevance of these terms should be determined for each organization under study.

The entire report should be thoroughly reviewed and understood prior to tailoring any portion of the method and subsequently, embarking on any activity described herein.

Exhibit 1-1: Seven Phase Product Approach



*Chapter 8 is performed after the system is operational for a significant period of time.

2. PRELIMINARY STUDY ACTIVITIES

The requirements analysis focuses on the key products and general office work activities of the organization. A "key product" is defined as a regularly produced output, either in written form or as a service, and requiring significant amounts of time and cost. General office work contributes indirectly to products and includes such activities as answering the phone, training, and waiting for work. Although key products are the focus of the office automation effort, the general office work can influence the effort and provide candidates for improvement or automation.

The study method is applicable to any size and type of organization and must be structured accordingly. Therefore, the requirements analysis study is initiated by defining and planning the study effort. This entails:

- selecting and establishing a study team to perform the requirements analysis study,
- determining the scope and size of the study,
- notifying the staff of the study effort and its purpose,
- conducting an initial survey of the office, and
- defining the roles and responsibilities of the study participants.

These preliminary activities are essential for an effective requirements analysis.

2.1. SELECTING THE STUDY TEAM

The careful selection of team members is critical to the success of the requirements analysis. The members of the study team should include both professional and support staff, selected for their technical skills, their interest in and knowledge of automation technology as well as their knowledge of how the organization is structured and how it functions. If the professional and support personnel lack the requisite skills or the right mix of skills required of a study team, then assistance should be obtained from outside the organization (e.g., other Federal organizations, or private contractors).

Organizational management selects the study team and informs the members of its purpose, their expected commitments, and the expected completion date for the study. A team manager is selected to serve as the daily coordinator and to direct all study related activities.

2.2. DETERMINING THE STUDY SCOPE AND SIZE

The study team determines the size and scope of the study effort by considering at least the following factors:

- size of the budget likely to be available for office automation,
- number of team members assigned to the study,
- size and complexity of the proposed study area within the organization,
- number and complexity of products within the proposed study area,
- total number of staff members within the proposed study area, including the number of senior managers and key product contributors,
- number of existing system types (equipment and software) to be considered.

Information on many of these factors will be unknown until after the study has begun. Therefore, a preliminary work plan and schedule is prepared, based upon the best estimates of the study team. This plan and schedule is presented to organizational management for approval. If management decides that the time and costs required to perform the study are too great, a decision can be made to limit the scope to a few predetermined key products, a small section within the total organization, and/or to specific product preparation phases. In no case, however, should any of the major study activities be eliminated. To aid management in the scoping decision, it is advisable that the extent of the study effort be related to either the estimated size of the office automation procurement budget or the realistic availability of staff resources to perform the study.

2.3. NOTIFICATION OF THE STUDY

Organizational management informs all employees within the study area of the nature, purpose, and importance of the study. This opportunity is used to convey management commitment to the success of the study effort and to allay any anxieties about potential changes resulting from office automation. Ideally, a meeting is held to explain the purpose of the study and to introduce the team members. However, if this is impractical, a letter/memorandum to all office personnel within the study area is distributed. To help ensure a successful study effort, the staff must understand that their cooperation is required and expected. Additionally, the message must be conveyed that the

study objective is to improve organizational efficiency and effectiveness and make staff work easier.

2.4. INITIAL OFFICE RESEARCH

Organizational management provides the study team with all pertinent policies, directives, in-house standards, and any other information that can aid in understanding the goals, mission, and attitudes of the organization regarding office automation and information handling. In particular, the study team should be aware of in-house standards for equipment and software as well as policies regarding information storage, disposition, and security. Additionally, the study team collects and reviews information on the functions and activities of the proposed study area. The study team uses this information to assist in preparing a preliminary list of the study area's products. Appendix A contains a "Typical List of Products" to help guide the study team in product identification.

Also at this time, the study team identifies those senior managers who will be interviewed during the subsequent study activity. The criteria for interviewee selection includes the manager's involvement in multiple products and an overall understanding of the current methods of product preparation.

2.5. ROLES AND RESPONSIBILITIES

It is essential that the roles and responsibilities of all the participants in the requirements analysis study be clearly defined. There are four groups of participants in this study: organizational management, the study team, senior managers, and the professional and support staff. Exhibit 2-1 outlines the roles and responsibilities of these participants. More specific information on their contributions to the study effort is described throughout the report, in the context of the study activities.

2.6. TAILORING THE PRELIMINARY ACTIVITIES

All preliminary activities must be performed by organizational management and/or the study team. In addition to establishing the study structure, this chapter provides the framework under which the activities in subsequent chapters can be tailored.

Exhibit 2-1: Roles and Responsibilities

Organizational Management	Initiates requirements analysis study Selects the study team/leader Identifies office unit to be studied Reviews/approves study plans, budget, etc. Lists goals/objectives of office automation Provides information on organizational policies and strategic goals Provides guidance/support to team throughout study
Study Team Leader	Coordinates and directs all study team day-to-day activities
Study Team and Team Leader	Outlines the study size and scope Develops preliminary study plans Develops study tools Identifies senior manager interviewees Performs the requirements analysis study
Senior Managers	Provides information to study team to assist in narrowing the number of key products Lists goals/objectives of office automation Provides information on resources (labor, time, dollars) used to produce products Identifies the automation technologies being used in the office
Professional and Support Staff	Describes to team the activities performed to produce the key products Provides team with information on the processing and flow of data in the development of the product Provides team with information on their skills and knowledge of automation technology Assists in the verification of the data

3. DATA COLLECTION

The objective of the data collection effort is to obtain information describing how business is conducted in the current office environment. The focus of this effort is on the key products and general office work of the office. Baseline data is collected from senior managers and professional and support staff through questionnaires and interviews, and through direct observation. Where applicable, office system prototypes and pilot projects are examined to provide additional baseline data. The data is reviewed and analyzed and then presented in summary, table, and diagram form, showing the interrelated processes and activities that take place to produce the products of the office.

The data collection effort is divided into four parts.

1. A set of study tools are developed for use in subsequent parts of this chapter and throughout the study.

2. Senior managers' interviews are conducted to obtain information on the key products and the professional and support staff who are "key contributors" to those products.

3. The key contributors provide detailed information on the office work, the activities performed, the format of the data used in product development, the information flow, and the products created.

4. The data is collated and all data conflicts are resolved.

The results of this collection effort:

- the knowledge the study team has gained about the current office activities and environment,

- the answered questionnaires, and

- the interview results and other study tool results,

will be used throughout the study as a "baseline" for comparison and as input to future processing and analysis activities.

3.1. STUDY TOOLS

Study tools are developed and used to ensure that consistent data is gathered by all study team members. The tools will assist the team in acquiring and presenting information about:

- the key products, beginning with the data that is initially developed or received into the office through

the processing that transforms the data into finished products,

- o the current inventory of automation systems, and
- o prior staff experience with automation.

The study tools to be developed to capture this information will consist of:

- o a dictionary of terms related to office activities,
- o a senior management interview guide,
- o source identification guides,
- o professional and support questionnaires,
- o key product tracking guides,
- o a key product interview guide,
- o key product worksheets, and
- o daily activity logs.

The dictionary of data collection terms is to be used in completing the daily activity logs and to help the key contributors and the study team be consistent in the use of the terminology. Definitions of the tasks and functions performed in product development will be defined in the dictionary. (A sample is presented in Appendix B).

The senior management interview guide is used to obtain data on the overall scheme of the office processes, including products, staff, workflow, and information needs. This information provides the basis for the in-depth interviews of the professional and support staff. (A sample is presented in Appendix C).

The source identification guides identify those individuals who are key contributors to the key products and services of the selected office and their locations. (A sample is presented in Appendix D).

The professional and support questionnaires survey staff perceptions of work performance, support requirements, and the reactions to potential automation. Data will be collected on the time spent by each professional and support staff on identified tasks and functions. (A sample is presented in Appendix E).

The key product tracking guides identify the detailed key product preparation activities from input of the initial data to distribution of the completed product. In addition to noting their own participation, key product contributors list in order, the names, locations, and activities performed for all other key contributors. (A sample is presented in Appendix F).

The key product interview guide is used to collect data that characterizes the tasks and functions identified in the key product interview worksheets. This information will be useful in the design phase. (A sample is presented in Appendix G).

The key product worksheets are used to separate the estimated hours of work for each key product activity into its component tasks and functions. This information will be used to develop estimates of aggregate levels of effort and cost for the preparation of key products. (A sample is presented in Appendix H).

The daily activity logs provide the means to collect time/volume data on professional and support activities. These logs list the tasks included in the key product interview worksheets and any other major identifiable tasks. Contributors will note the time they expend during the day in performing these tasks and will provide other information about the way in which these tasks and functions are performed. The daily activity support logs will list functions such as typing, taking dictation, preparing forms in longhand, using facsimile, composing letters, performing math calculations, and maintaining the office. (A sample is presented in Appendix I).

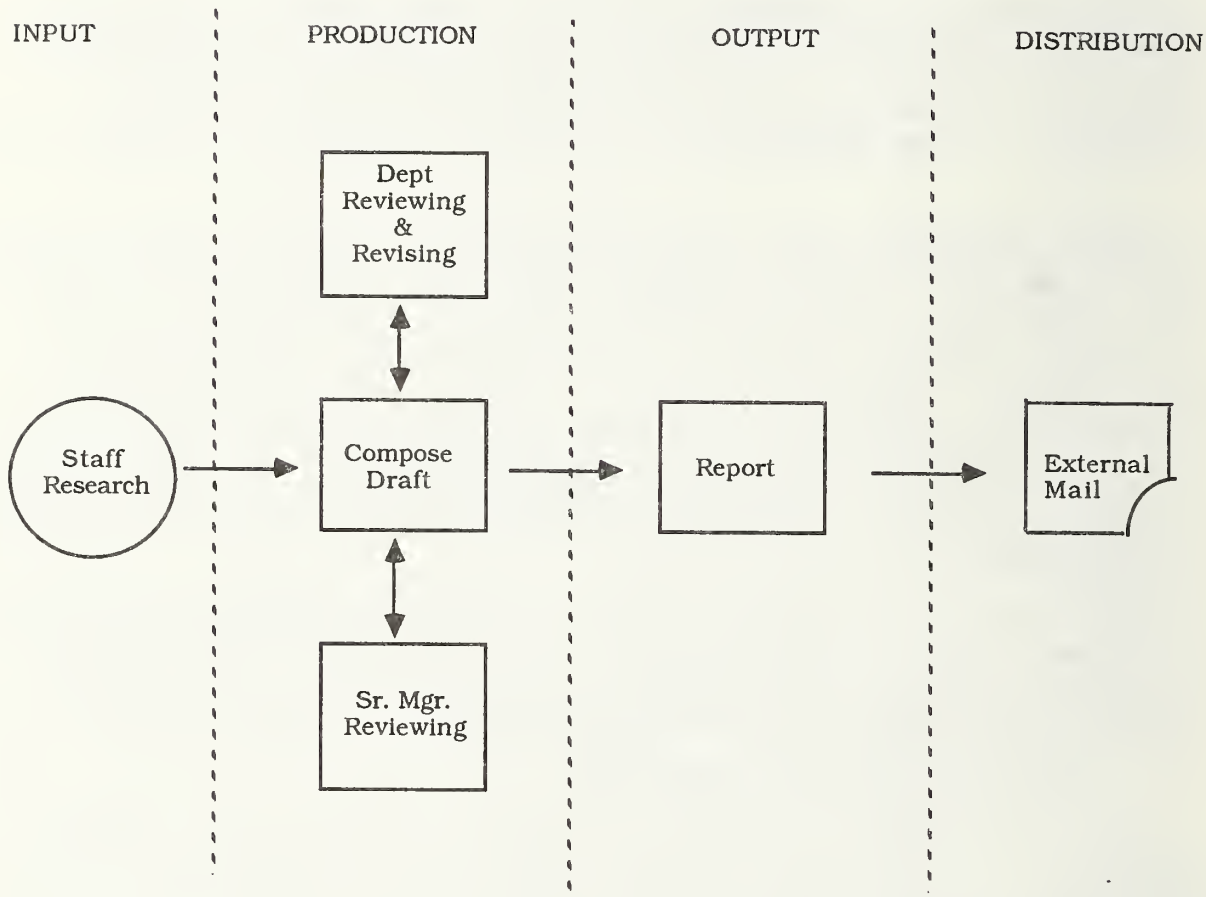
The team should review the tools and understand their purpose and use before beginning the actual data collection. Additionally, the tools should be pretested on a few staff members to insure that the tools are usable and effective.

3.2. SENIOR MANAGEMENT INTERVIEWS

The study team begins data collection by interviewing senior management in the target office. The senior management interview guides provide orientation and direction to the interviews and uniformity of their results.

During the interview, the managers are presented with the preliminary list of the office's products (developed in section 2.4) and asked to identify the highest priority products and/or products which could be improved through modification or automation. These key products will be the subject of the subsequent study activities. To assist the senior managers in narrowing the list of products, the following criteria should be considered:

Exhibit 3-1 Preliminary Key Product Flow Diagram



- lengthy and intensive professional staff preparation time is required to collect, analyze, and reformat data,
- a high percentage of professional time is spent on support type functions,
- a high percentage of support time is spent preparing and revising the product.
- a high percentage of professional time is spent on message, data, and document exchange.

Along with the targeted key products and the names, locations, and activities of the key contributors, the senior managers outline the key product development flow, the processing that the data undergoes, and the distribution of the end products from the office. This data is used to form the source identification guide. The completed guide will be used to locate the key contributors and to supplement as well as cross-reference the data collected during the professional and support staff interviews.

Additionally, the study team solicits information on:

- the technologies currently in use within the office, how much they are used, and the skill levels of the staff using the technologies,
- specific areas or processes that may be prime candidates for improvement or automation,
- specific products that should not be automated,
- manager's concerns regarding each key product and its preparation (e.g., timeliness, responsiveness, appearance),
- anticipated changes to the office, including workloads, staffing, and reorganization, and
- the study effort itself, that is, recommendations and suggestions.

After these interviews are completed, the study team analyzes the results and recommends to organizational management a group of key products for detailed examination. Once the recommendations are approved, a sample of each key product is obtained and preliminary flow diagrams are prepared. These diagrams depict the activities performed to produce each product and the workflow through the phases of input, output, production, and distribution. The preliminary flow diagram presented in Exhibit 3-1 is segmented into these phases.

3.3. KEY CONTRIBUTOR INPUT

In preparation for the in-depth data collection effort, the questionnaires, tracking guide, and daily activity logs are distributed to each key contributor. The study team either meets with the staff or uses a transmittal memorandum to explain how to complete these collection tools.

Interviews with key contributors are scheduled and interview teams formed. The interview team should consist of two people to ensure that all issues are discussed and all comments recorded. The objective of the interviews is to:

- o further define the product preparation process,
- o clarify previously collected information, and
- o obtain suggestions for overall process improvements.

Data on key products and on general office work is collected in two formats to allow for the analysis not only of product development, but also of all the other activities which consume both time and resources in the office. The current functions and tasks engaged in by office staff in preparing the key products provide the product oriented data. The general office work data is obtained through an identification and logging of the daily activities performed by the office staff.

3.3.1. Key Product Data Collection

The key product data collection effort is performed by the study team using the questionnaires, the interview worksheet, the source identification guide, and the key product tracking guide. The product tracking guide, initially compiled during the senior management interviews, is expanded and completed only when enough interviews have been conducted and enough data has been acquired on how the product is prepared. Specific processing steps and specific activities which feed data into the processing or produce data as a result of the processing are examined in detail. Information is gathered on the length of time required to complete the activities, the format of the data used, how it is received and transmitted, and the contributors with whom the data is shared. Additionally, qualitative information is also solicited, for example any inconveniences, difficulties, desires, or special problems related to the key product preparation. An attempt is made to cross reference the information and to find all the major contributors to the products, their levels of effort, and their view of the overall product quality.

The current use and knowledge of technology by the office staff and the attitudes towards the prospect of automation are important elements to ascertain. During the interviews, the

study team observes and notes the presence and use of all existing automated systems. The information gained will be utilized in the analysis phase.

3.3.2. General Office Work Data Collection

Data may be collected on office work activities in a variety of ways. Among the established methods are: direct observation by an outsider or self-recording of the time spent in various types of activities. Disadvantages may be associated with both of these. For example, direct observation may be costly to apply, disrupt office operations, and yield distorted results since people tend to work differently when observed. Alternatively, with self-recording, workers may fail to record their activities. Study tools used in this part of the data collection effort include the daily activity logs and the questionnaires which are used in conjunction with the interviews.

Data should be collected for a period of ten working days[1], under normal working conditions (e.g., not during holiday seasons or an end-of-year rush). If this is not possible, five normal working days[1] is the minimum number of days over which to collect meaningful data.

3.4. COLLATING, VALIDATING, AND SUMMARIZING THE DATA

When the interviews are completed and the questionnaires and logs collected, an assessment should be made to determine whether an adequate number of key contributors has been interviewed and whether the data collected is sufficient and representative of the office processes in order to proceed with the validation of the collected data. If there is insufficient data, the study team should alert organizational management that further interviews are necessary. Approximately seventy percent participation[1] of the staff in the target area should be the goal.

Data from all questionnaires, daily activity logs, interview guides, and key product tracking guides should be merged and collated. In addition, the data is applied to the preliminary flow diagrams to corroborate and supplement the information on the current flow of the data and the development of the products. Insufficient data or incorrect data will give an erroneous picture of the flow of data through the identified office. Data that has been cross-checked and tentatively verified as it is collected is more likely to present a clear picture of the office processes.

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[1] Determined from experience and recognized by experts to be a sufficient time period to capture the necessary data.

If the collected data is sufficient, the study team can proceed to merge, collate and review the data for consistency. If there are discrepancies, some of the key contributors and managers can again assist the team with additional data collection. It is possible for some misunderstandings to occur because of the terms which are used by the staff for the purpose of filling out the questionnaires and the daily activity logs. Any discrepancies should be resolved among the contributors and the study team.

The data collected will be used to determine the overall quality of work performed and to develop aggregate levels of effort and cost required to produce the key products and to carry out general office work activities. A review of the questionnaires will assure that all pertinent questions have been answered regarding the products' development, key contributor activities and the data used to create the products, and that the information is consistent among key contributors.

Finally, the study team decides how to summarize the study data. If the study area is large, the data should first be summarized by work group, department, or similar functional unit, and then summarized by organization. If the area is small, only an organizational summary need be prepared.

With all the collected data collated and validated, and a flow diagram of the processes completed, the study team is now prepared to go to the next stage, the analysis of the data.

3.5. TAILORING THE DATA COLLECTION

All the activities within this chapter must be performed. However, the number of key products selected will affect the size of the data collection effort. For example, reducing the number of key products may reduce the number of key contributors and questionnaires and thus, the time and required to perform the collection effort.

Another dimension of the data collection effort that can be modified, is the number of days office work data is collected. Five consecutive working days, void of holidays, employee absences, and "slow" periods, is an acceptable minimum.

4. OFFICE BASELINE ANALYSIS

The purpose of the office baseline analysis is to examine and evaluate the activities associated with the key products and general office work. The analysis will afford a view of current organizational processes by providing an understanding of the relationships among the key products, between each processing phase within a key product, and between the key products and the general office work. This view is the basis for designing an office automation system that can optimize opportunities for improvement.

The general approach consists of examining and analyzing the collected baseline information with respect to the levels of effort (i.e., staff time) required to prepare a key product and to perform non-product oriented office work. The quality of work performed is also examined and assessed. Subsequently, the study team identifies the voids, redundancies, and "wasted time" associated with completing work, as well as opportunities for consolidation, simplification, or elimination of activities.

Results of this analysis effort yield a "baseline" profile of current key product and office work activities. The profile serves three purposes:

1. a basis for designing automated enhancements as well as identifying organizational and procedural modifications to the existing processes,

2. providing input to the assessment of cost justification for the office automation system, and

3. providing data for the post-implementation audit results.

The actual analyses of the key products and general office work are performed separately, but simultaneously. If additional information is needed to complete the analysis, the study team should conduct follow-up interviews and/or issue additional questionnaires.

4.1. KEY PRODUCT ANALYSIS

During the key product analysis, the product preparation effort is examined through the generic phases of input, production, output, and distribution. The analysis reflects both the quantitative and qualitative aspects of product preparation by examining the level of effort and the quality of work, respectively. Level of effort and quality measurements are primarily derived from the key product tracking information and

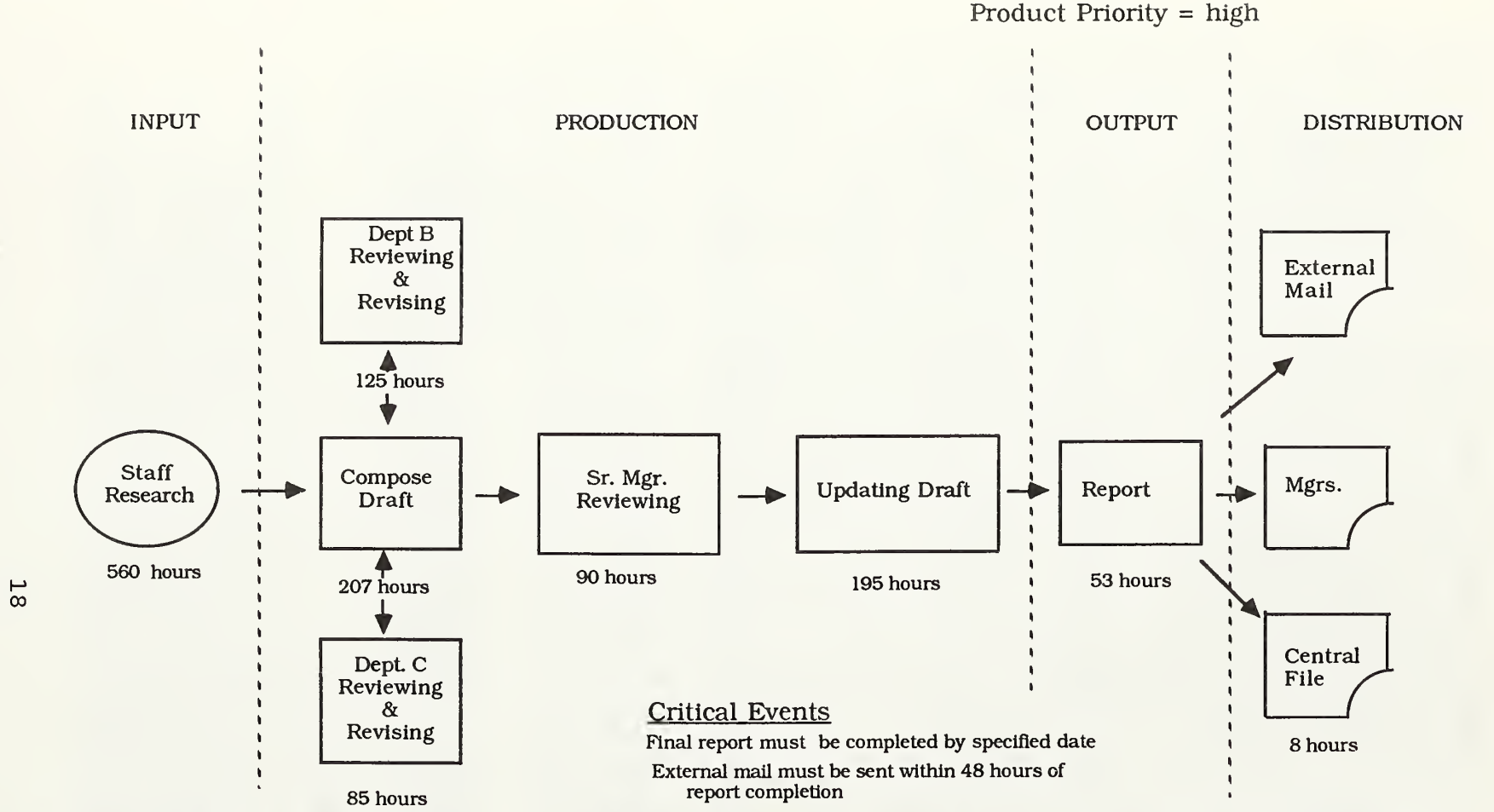


Exhibit 4-1: Summary Key Product Flow Diagram

the completed interview worksheets. However, all other collected baseline information is used to supplement these two key inputs.

The first step in performing the analysis is to develop a summary flow diagram for each key product. Based on the preliminary flow diagrams, the summary diagrams further define the activities performed and information flow for each processing phase. Details of the activities along with other relevant information supplement the flow diagram. Examples of this supplemental information include:

- the importance of the product to the organization (i.e., it's priority level),
- time constraints on activity completion (i.e., critical events), and
- characteristics of the activity, e.g., the tasks and functions that constitute the activity, how often the activity is repeated, number of individuals involved, interrelationship with other activities, current use of automation.

The supplemental information may accompany the summary flow diagram as a separate piece of documentation and/or be integrated into the flow diagram itself. For example, Exhibit 4-1 shows the product priority level, the activities by processing phase, the tasks and functions within an activity, and the critical events. Additional information about each activity is provided separately and can be found in the data collection tools, e.g., the key product tracking guide.

Once the flow diagram is completed, the accumulated data is evaluated. The data may be quantified by either definitive units of measurement (e.g., number, percent, dollar amount) or less tangible units of measurement (e.g., levels of importance, desirability indicator, rankings). Generally, definitive measurement units are derived at a "local" level, that is, assessing each of the key product activities and obtaining exact counts. Assessment of the less tangible measurement units, however, is more reliable at a higher or "global" level. Each key product and its activities are examined in its entirety, ignoring individual variances and inconsistencies. The type of measurement unit chosen is determined by the size and formality of the requirements analysis study and is influenced by such factors as:

- the data's adaptability to being measured,
- the measurement's expected use, and
- the required precision.

Exhibit 4-2: Annual Levels of Effort to Prepare Key Products (Baseline)

KEY PRODUCTS	TOTAL PROFESSIONAL STAFF EFFORT HOURS*	PROFESSIONAL EFFORT PROFESSIONAL WORK HOURS*	PROFESSIONAL EFFORT SUPPORT-TYPE WORK HOURS*	PROFESSIONAL SUPPORT RATIO R_{ps}	TOTAL SUPPORT STAFF EFFORT HOURS*	SUPPORT STAFF RATIO R_s	TOTAL KEY PRODUCT HOURS*	TOTAL BASELINE COSTS
1	288.0	0.0	288.0	1.0	0.0	--	288.0	4,026
2	860.0	640.0	220.0	0.26	463.0	0.35	1323.0	43,600
3	252.0	0.0	252.0	1.0	0.0	--	252.0	3,523
4	12.0	0.0	12.0	1.0	0.0	--	12.0	168
5	42.0	6.0	36.0	0.86	0.0	--	42.0	587
6	164.5	32.1	132.4	0.80	2.0	0.012	166.5	2,318
7	48.0	8.0	40.0	0.83	1.0	0.02	49.0	680
TOTALS	1,666.5	686.1	980.4				2,132.5	54,902

* a person year is defined as 2080 hours in this sample

Each unit of measurement chosen must be evaluated and used consistently throughout the entire requirements analysis study.

4.1.1. Measuring the Level of Effort

Level of effort data for each key product refers to the efficiency of preparing the output. The level of effort is based on the number of hours it takes the key contributors to perform the tasks and functions. Keeping separate the professional and support staff efforts, the number of hours are compiled for each task and function and summarized by activity.

The level of effort data for each key product is next annualized by multiplying the key product activity estimates by the annual volume. The data is arranged in a table to produce the following measures:

- Total key product preparation effort (professional and support staff),
- Total professional staff effort,
- Professional effort expended performing professional work,
- Professional effort expended performing support-type work,
- Total support staff effort,
- Professional Support Ratio (R_{ps}): professional staff effort performing support-type work is compared with total professional staff effort, and
- Support Staff Ratio (R_s): support staff effort is compared with total key product preparation effort.

Exhibit 4-2 presents an example of this table based on Exhibit 4-1. It enables the study team to quickly examine and compare the staff efforts and note any excess levels of effort.

The final entry in the table is the baseline preparation cost for the key product. The cost is constructed using the level of effort data and the average hourly salaries for the professional and support staff. When available, specific agency formulas for determining salaries should be used. Hourly salaries are determined by dividing the average annual salary plus a fixed percentage for overhead by the annual paid working hours.

$$\text{Hourly Salary} = \frac{\text{average annual salary + overhead}}{\text{annual paid working hours}}$$

Exhibit 4-3: Quality of Work Analysis (product 2)

ACTIVITY	QUALITY CRITERIA: Timeliness	Completeness	Accuracy	Data Access-ability	Presentation Quality
Staff Research	S	S*	S	NI*	S
Compose Draft	S	--	NI	NI	NI
Dept. B: Review and Revision	NI!*	AA	--	S	S
Dept. C: Review and Revision	AA*	S	--	S	S
Senior Manager Review	S*	S	--	S	--
Update Draft	NI*	NI	NI*	NI	NI
Report	S*	--	--	--	NI*
External Mail	NI'*	--	--	--	--
Managers' Distribution	S*	--	--	--	--
Central File	NI*	--	--	--	--
OVERALL QUALITY	NI	S	NI	NI	NI
OVERALL PRODUCT QUALITY —- NI					

Degree of Attainment

AA Above Average
S Satisfactory
NI Needs Improvement
-- Not Applicable

* indicated by managers and staff to be of HIGHest importance for this activity

Estimated preparation costs for each key product are determined by multiplying the level of effort by the hourly rates. This information will be used in the cost analysis section of the justification phase.

Prepartion cost = level of effort * hourly salary

4.1.2. Quality of Work

The quality of work being performed refers to the effectiveness of the key product preparation activities. The data is expressed as a comparative rating (e.g., level of improvement needed). The selection and evaluation of the quality criteria are based on the judgment of the study team. However, management should participate in determining those criteria which are important to the organization.

Work quality can be defined by such criteria as timeliness, responsiveness, completeness, accuracy, appearance, and convenience. These criteria are rated for each activity, in terms of their importance to management and professional staff and their degree of attainment. For example, if timeliness is deemed important and an activity is not completed on schedule, then the timeliness rating is low, indicating improvement is needed.

The product activities, quality criteria, and ratings are presented in table form and summarized by an overall quality rating for the key product. Exhibit 4-3 presents a quality of work analysis table for key product 2 in the previous exhibits. It is constructed from information gathered during the key product interviews, questionnaires, summary flow diagrams, and level of effort data. Examples of how the table values were derived are given below.

> Professional staff indicated the importance of data accessibility during the research activity. Moreover, they identified problems associated with accessing the necessary research information. It is evident that the data accessibility rating should be low, indicating improvement is needed.
>
> Organizational management indicated the importance of timeliness, in fact, the final report must be completed by a specific date. From the summary flow diagram and levels of effort data, the study team observes that the Dept. B review was time consuming. Upon closer examination, the study team determined the review was not timely and improvement needed.

This evaluation effort does not attempt to rigidly quantify the quality. Instead, it provides the study team with insight on the

importance of an activity and how well it is performed. The information is to be used in conjunction with the level of effort measures to produce a complete picture of the existing office environment.

4.2. OFFICE WORK ANALYSIS

The office work analysis examines and evaluates background activities which are not directly related to the key products. It provides details on general office work activities and an understanding of the overall working environment. Additionally, it provides comparison data for the key product analysis.

The office work analysis follows the same methodology as the key product analysis. A summary flow diagram is established and the data is evaluated. The data is primarily derived from the daily or weekly activity logs, questionnaires, and interviews. When evaluated, the data can show how individuals work, the time they expend on particular tasks and functions, the value of the work they perform, and their perceptions of the current office environment. Although not directly quantifiable, organizational attitudes (e.g., resistance to automation) and any future organizational changes (e.g., growth rate, relocation) are also noted.

The analyzed data is summarized to produce the measures defined below. Measures which should always be calculated include:

- Professional Support Ratio (R_{ps}): professional effort performing support-type work is compared with total professional staff time, and

- Support Staff Ratio (R_s): support staff effort is compared with total staff time.

Other representative measures which may be calculated include:

- Total hours and related cost for each professional task such as planning, consulting, etc.,

- Total hours and related cost for professional effort performing support-type work, and

- Total hours and related cost for each support function such as typing, filing, etc.

The study team compares the office work analysis with the key product analysis to assure consistency between the two. If significant differences are identified, the reasons behind the variances must be determined and resolved. For example, do there appear to be major discrepancies between the professional support ratios calculated during the key product and office work

analyses? These discrepancies may exist because professionals may not have accurately estimated their time performing functional type work during the key product analysis interviews. If necessary, additional interviews are conducted to gather more information and to resolve the problem.

4.3. EXAMINING THE ANALYSIS RESULTS

From collecting, analyzing, and reviewing the data, the study team has gained an understanding of why an activity takes place, how it is performed, when it is performed, and who performs it. From this understanding, the study team can identify the problem areas and deficiencies in the baseline environment and consequently, the activities most likely to benefit from organizational, procedural, and technological modifications. The flow diagrams and analysis tables provide initial identification of the problem areas as evidenced by:

- lengthy and intensive professional staff preparation time to collect and reformat existing information,
- high degree of professional effort expended performing support-type functions (R_{ps}),
- high degree of support effort to prepare key products (R_s),
- low quality rating for an activity or key product,
- lengthy and intensive effort expended performing low priority activity or key product,
- high degree of duplication of the same or similar work,
- high degree of replication in preparing the key product(s), and
- high degree of demands and bottlenecks during the key product preparation effort and in the routine work environment.

The study team should note that these problems and deficiencies center around information-related issues, such as, how information is accessed, handled, processed, managed, presented, reproduced, and distributed.

A summary report on the analysis results is prepared. It consists of an overview of the current office baseline and includes a description of the workload, work patterns and work flow (information flow) for each key product and the office as a whole. It also provides initial identification of the key products which will benefit most from the implementing or

enhancing an office automation system. For example, the report should highlight those activities which could be consolidated, simplified, eliminated or which would benefit from value-added improvements (e.g., improved presentation quality, analysis, data accessibility). The summary report, including the flow diagrams and tables will be referenced during the subsequent phases of this study.

The study team is now prepared to begin the next phase of the study effort, designing the office automation system.

4.4. TAILORING THE ANALYSIS

To tailor the analysis phase, two aspects of the analysis can be adjusted; the measurement type and the number of activities and quality criteria examined.

The type of measurement chosen influences the effort expended by the study team in performing the analysis activities. Specifically, the measurements used to evaluate the levels of effort data and cost estimates can be expressed either as actual hours or dollars or as a comparative rating. Measurements expressed as comparative ratings are less exact, but easier and less costly to determine (i.e., take less effort to evaluate) than actual hours/dollars. The information provided by comparative ratings may be sufficient for the analysis of a small study.

The analysis effort can be altered by either reducing or increasing the number of activities or quality criteria examined. Clearly the more activities/criteria examined, the more detailed the analysis and the greater the effort expended to perform the analysis.

5. DESIGNING THE OFFICE AUTOMATION SYSTEM

Once the current office environment is analyzed and opportunities for improvement identified, systems can be designed to address those opportunities. This chapter focuses on the methodology for creating macro level design models that illustrate, in general terms, the components of the system.

As a first step in this effort, the baseline analysis information is translated into a set of system requirements. The system requirements are statements of design intent and answer the question, "What is the system required to do?".

Once the requirements have been determined, a system design model is prepared by identifying proposed modifications to the key product preparation activities. These modifications are generally a combination of organizational, procedural, and technological changes. The effect of the modifications on the baseline environment is evaluated and the projected improvements are estimated.

As a result of this effort, the system design model is developed, incorporating those changes which appear to have the best potential for improving the current office environment. This model will be used:

- o in describing the benefits to be achieved from the office automation system,
- o as a basis for developing the functional specifications of the model,
- o in examining alternative technological configurations, and
- o in justifying the office automation system.

5.1. DEVELOPMENT OF SYSTEM REQUIREMENTS

System requirements are narrative statements of user needs and organizational objectives. The requirements usually identify a capability that will improve key product preparation or identify an activity that could benefit from an office automation system. They focus on resolving the shortcomings of current key product activities (automated or manual).

To determine the set of system requirements, the study team

1. determines the key product goals for the office automation system,

Exhibit 5-1: Key Product Goals

MANAGEMENT CONCERNS	DESIRED GOALS
Timeliness	Reduce preparation delays Reduce distribution delays
Responsiveness	Reduce "telephone tag" Improve query response time Reduce float
Convenience	Improve information input/output methods
Efficient use of resources	Increase OA system usage Improve training Reduce user resistance
Organizational effectiveness	Reduce need for reprocessing Reduce duplication of effort Provide access to organizational database
Managerial effectiveness	Improve decision making process Improve quality of presentations
Cost of labor, overhead	Reduce costs, waste, overtime

2. develops a list of possible system requirements, and

3. assigns priorities to the proposed requirements by importance and impact.

5.1.1. Determining the Key Product Goals

As a first step in developing the system requirements, the study team must consider the goals to be achieved by the office automation system. Responses received from the senior management interviews provide the study team with an indication of the managers' concerns regarding each key product and its preparation. This information is translated into possible product goals. Exhibit 5-1 presents a list of possible management concerns and goals. For example, if timeliness was identified as a primary concern for a particular key product, the suggested product goal may be to reduce delays in preparation and distribution of information. If responsiveness was cited as a primary concern, the suggested product goal may be to reduce the amount of "telephone tag" among professionals. The study team uses this information, along with any goals suggested during the key product contributor interviews or derived from the baseline analysis, to prepare a set of composite product goals for all key products.

5.1.2. Determining the System Requirements

The proposed system requirements are determined by comparing the product goals to the baseline data and by examining the improvement opportunities cited in the analysis summary report. Both the comparison and the summary report should reveal the deficiencies and/or inefficiencies in the product preparation activities. These deficiencies/inefficiencies may be mapped to opportunities for improvement.

After the opportunities for improvement are identified, the system requirements are developed. The requirements should address all applicable information-related areas, such as:

- Document production which focuses on the creation/input, revision, edit/proofing, duplication, printing, distribution, and storage/retrieval of information into a document (e.g., word processing requirement);

- Data processing which focuses on the input and storage/retrieval of data from a manual or automated data base/file and the generation of a report from the automated file (e.g., a database management system requirement);

- Decision support which focuses on the assessment and analysis of information (e.g., spreadsheet requirement);

- Telecommunications which focuses on the sending, receiving, and/or distribution of information to offices within or outside the organization or to computer systems within or outside the organization (e.g., electronic messaging system requirement);

- Administrative support which focuses on conducting the general office work and includes information handling, traditional data-processing and desktop tools (e.g., on-line calendar and/or scheduling tools requirement); and

- System administration which focuses on the policies and procedures for managing and administering the automated resources as well as staff training (e.g., guidance on system usage requirement).

There are no specific limits on the number of system requirements that can be proposed. When determining system requirements, the study team considers projected changes to the baseline environment. Will the demand for the organization's products, services, programs, or responses be changing in the near future? If so, such changes may affect the proposed office automation system. To account for these changes, the proposed requirements attempt to reflect the projected organizational status at least several years into the future. The organization's planning

horizon is used to determine the number of years. The requirements look at the degree of expendability and flexibility needed in the proposed office automation system. Data on the projected changes to the baseline environment were previously identified during the baseline collection effort. Exhibit 5-2 lists examples of system requirements for the product goals cited in Exhibit 5-1.

The study team tries to ensure the significance of the proposed requirements by concentrating on those key products identified as benefiting most from the implementation of an office automation system.

5.1.3. Ranking the System Requirements

To ensure that the most important needs are met, the system requirements are assigned priorities by their effect on the key products.
For example, if a requirement will only impact a low priority activity, it is given a low priority ranking. At this point, the system requirements are presented to organizational management for review, approval and/or modification. Once approved, the requirements are used as a basis for constructing a design model of the office automation system.

5.2. CREATION OF A SYSTEM DESIGN MODEL

The system design model is a list of the modifications that can be applied to the office baseline environment to achieve the system requirements previously identified. The design model should explore new ways of producing the key products and performing business and not just automate current manual activities.

The design model is developed from top down, that is, by first looking at all the key products within the office, then at individual key products, and finally, at each phase within the key product. This approach enables the study team to look beyond key product boundaries and develop modifications that can be applied to similar preparation activities of one or more key products.

There are three major steps in creating a system design model:

1. determine the types of changes needed to effect the product goals, and, in turn, satisfy the system requirements,

2. map the changes to the office environment, and

3. evaluate the proposed changes.

Exhibit 5-2: Examples of System Requirements

Ability to produce documents locally
Ability to access/download data from organizational databases
Ability to easily edit and revise documents
Ability to transfer documents among offices within and outside the organization
Ability to perform interactive file queries by office users
Ability to send/receive messages electronically
Ability to produce compound documents (text, spreadsheets, graphics)
Ability to quickly perform "What if" scenarios
Ability for conferencing (via computer, telephone)
Ability to output presentation and letter quality documents
Ability to transfer word processing skills across offices
Ability to send/receive documents via facsimile
Use of electronic calendars and scheduling tools
Integrated, easy to use office automation systems
Training of users to realize full capabilities of systems
Development of policies/procedures for system usage, information storage and disposition, security, system operations
Streamlining of paper handling
Enabling the staff to be responsible for administrative and operational needs of office information resources

5.2.1. Determining the Types of Changes

To effect office improvements and, in turn, satisfy the system requirements, modifications to the baseline environment can be either organizational, procedural, or technological in nature.

An organizational improvement opportunity occurs when one functional area performs an activity that could be accomplished better by a different area. For example, the baseline results indicate that delays in the product input phase occur because contributors from three different work groups are involved even though all information can be obtained from one group. A relocation of responsibility could improve productivity.

A procedural improvement opportunity is characterized by the inefficient use of professional and/or support staff. For example, the baseline data indicate that an inordinate amount of effort is expended by key product contributors in performing support functions. A procedural shift in responsibility could effect improvement.

A technological or automation improvement opportunity is identified when automated support is needed or existing systems are under-utilizated. For example, the baseline results indicate that the professional effort expended on retrieving and reformatting information could be reduced by installing some form of office workstation with access to multiple databases and software tools.

These three types of changes may produce results individually or in combination. For example, to be effective, a technological improvement may require new procedures and even new organizational structures. Changes in procedures and/or organizational structure are sometimes an alternative to new technology.

As changes are proposed and the system design model evolves, the study team ensures that each change will satisfy at least one of the system requirements and that the set of changes will satisfy all the requirements. Additionally, the associated behavioral and staffing impacts are considered; behavioral impact normally take the form of resistance to change and staffing impacts relate to the use of appropriate personnel to perform specific tasks and functions.

The study team uses the following baseline data in reviewing these impacts: key product contributor interview notes, office work analysis questionnaires, and key product analysis results, (e.g., flow diagrams). After this review, the study team is ready to identify the technologies which can support the defined requirements.

ORGANIZATIONAL	PROCEDURAL	TECHNOLOGICAL
Work group A will be responsible for initial compilation of budget data	All budget computations will be performed using spreadsheet software	Personal computers
Work group B will be responsible for researching program data	All intraoffice memos will be sent via electronic mail	Software applications including: word processing, spreadsheet, communication, and database management systems
Work group C will replace work group A in the review of key products relating to grant applications	Key products will be developed on personal computers and electronically transferred to support personnel for final processing	Laser printers and letter quality printers
Professional staff in work group C responsible for budget compilation will be reassigned to work group A	Support staff will be designated as product distributors	Electronic typewriters with OCR fonts
	Final drafts will be microfilmed rather than filed	Minicomputer
	Training classes will be available to all personnel	Microfilm reader-printer
	Policies on usage, information management (including storage and disposition), operation of systems, and security will be updated semiannually	Modems
		Electronic messaging system
		Local area network and software support

Exhibit 5-3: System Design Model

5.2.2. Mapping the Changes to the Office Environment

As a result of this review, the improvements or changes are categorized as being organizational, procedural, or technological. From this set of categorized changes, a system design model for all key products is prepared that incorporates only those organizational, procedural, and/or technological modifications that will potentially provide the most benefit in achieving the system requirements. The set of changes within the design model should work together, compliment each other, and where applicable, be compatible with existing systems. Thus, providing an integrated system, one with the necessary "office tools" to create, process, interchange, manage, and distribute information throughout all processes within the key product, throughout the office, and ideally, throughout the organization. The example presented in Exhibit 5-3 is based on the list of system requirements developed earlier (Exhibit 5-2).

The model may include one or more applicable technologies for each product preparation phase:

Input: information capture technologies which include voice input devices, data scanners, computer workstations, etc.

Processing: information processing technologies which include departmental computers, multi-function workstations, integrated office systems, word/text processing, financial planning, decision support systems, data base management systems, personal information management, etc.

Output: information storage and retrieval technologies which include printers, photocomposers, graphic imaging, floppy disks, optical disks, etc.

Distribution: information interchange and distribution technologies which include smart copiers, facsimile, executive telephones, telecommunication networks, electronic mail, etc.

Definitions for these and other representative office automation technologies are presented in Appendix J, "Technology Assessment".

At this point, the study team maps the technological changes to the office unit that will be affected. For example,

Technological changes: Within the office unit, work groups A and B require personal computer capabilities with data and word processing support. Additionally, work group A requires a local area network to connect the computer systems and an electronic messaging system; whereas, work group B requires telecommunications within and outside the office with a teleconferencing capability.

5.2.3. Evaluating the System Design Model

After the system design model is developed, the study team prepares a new set of key product flow diagrams which show, by preparation phase, the proposed modifications and the projected improvements (i.e., professional and support levels of effort and quality of work). These new flow diagrams specify the organizational, procedural, and/or technological modifications to the baseline preparation processes. All components of the system design model are employed, but not necessarily within each key product flow. For example, not every professional in work group A, described above, will require the same set of software tools (e.g., word processing, financial calculation, information tracking). The type of software required will depend on the amount and type of contribution that the professional makes toward the preparation of each key product.

The amount of projected improvement is now determined for each key product. Using the interview results, the baseline analysis, the new key product flow diagrams, and the data contained in Appendix J, the study team prepares a table estimating the effect of the proposed technological modifications. Estimates of improvements from organizational and procedural modifications are similarly prepared although Appendix J is not used. Instead, the study team examines the baseline analysis data for each key product activity and decides what steps will be eliminated or changed as a result of the modifications. The improvements (in terms of reduced levels of effort or improved quality of work) are then estimated and included in the table. The study team must recognize that it is not always possible to separate the specific degrees of improvements resulting from organizational, procedural, and technological factors, and may have to report the improvement as resulting from the set as a whole. For example, the productivity improvement associated with a procedural change may be dependent on and interrelated with a corresponding technological modification.

Ideally the improvement table should include the following types of information:

Baseline Total Effort to Prepare Key Products:
Level of effort for each key product as presented in the table prepared in Section 4.1.

Projected Total Effort to Prepare Key Products as a Result of Organizational Modifications, Procedural Modifications, and Technological Modifications:
These figures illustrate the impact of each type of modification on each key product.

Projected Total Effort to Prepare Key Products as a Result of the System Design Model:

This figure illustrates the total impact of organizational, procedural, and technological modifications for each key product.

Baseline Overall Quality of Key Products:
The overall quality rating for each key product as presented in the table prepared in Section 4.1.

Projected Improvements to Key Products' Quality as Achieved Through Organizational Modifications, Procedural Modifications, and Technological Modifications:
These figures indicates the expected level of improvement from the implementation of each type of modification.

Projected Improvements to Key Products' Quality as Achieved Through the System Design Model:
This figure indicates the expected level of improvement from the implementation of organizational, procedural, and technological modifications.

Exhibit 5-4 illustrates an improvement table.

The table provides the study team with an initial estimate of the overall improvement to be achieved through implementation of the office automation system represented by the system design model. In particular, it begins to identify the expected benefits of the office automation system.

This information, in addition to the system design model form the basis for the functional specifications, alternative configurations, and system justification to be developed in the following chapters.

5.3. TAILORING THE SYSTEM DESIGN

Previous tailoring phases of the study, will affect the development of the system requirements and the system design model. For example, if the study has concentrated on a limited number of key products, the system requirements and proposed modifications will only address those key products. However, the study team should not try to abbreviate this phase by reducing the number of system requirements identified. Such an attempt could result in an incomplete design model and ultimately, a deficient automated system.

The only activity within this chapter that should be modified is the evaluation of the system design model (Section 5.2.3). A new key product flow diagram should be prepared regardless of the study size. However, for smaller studies, the development of a formal improvement table may be curtailed and the projected improvements estimated and recorded more informally.

Exhibit 5-4: Improvement Table

	EFFORT TO PREPARE KEY PRODUCTS	QUALITY OF KEY PRODUCTS
BASELINE		
TOTAL		
PROJECTED IMPROVEMENT SYSTEM DESIGN MODEL		
Organizational Modifications		
Procedural Modifications		
Technical Modifications		
TOTAL		

6. DEVELOPING SPECIFICATIONS FOR THE OFFICE AUTOMATION SYSTEM

This chapter explains the method for developing functional specifications for the technology component defined in the office system design model. Specifications are statements of required system capabilities and should answer the question, "What must the system do?" In this task of the study, design requirements are further refined to specify the characteristics required to achieve the improvements envisioned by the design model.

Functional specifications consist of support characteristics which specify the performance, features, and/or capabilities required of the system component. Identifying the functional specifications in this manner, enables the study team to examine the feasibility of the specifications and construct a representative configuration of the proposed office system. Moreover, the specifications encourage alternative solutions for achieving the organization's improvement goals and promotes full and open competition between vendors responding to the procurement solicitation.

The steps within this phase of the study include:

- o developing a set of functional specifications for each system component,
- o examining the feasibility of the specifications, and
- o preparing a representative configuration with alternatives for use in the cost analysis phase.

The results of this effort will yield a set of specifications, proposed system configurations, and estimated unit costs for use in the justification phase.

6.1. DEVELOPING FUNCTIONAL SPECIFICATIONS

Functional specifications for office systems are developed from two sources;

1. The system design model and new key product flow diagrams which identify the generic hardware and software tools needed to accomplish the automation objectives.
2. The baseline analysis summary which contains information on types of work, complexity of work, workloads, and work patterns.

Exhibit 6-1: Functional Specifications for Personal Work Station

HARDWARE:

512kb addressable RAM memory
20 megabyte hard disk storage
RS-232 serial interface port
Centronic printer interface

SOFTWARE

UNIX V compatible operating system
Electronic spreadsheet
FORTRAN and C programming language compilers
Communications package

Using these sources, the study team proposes specific support characteristics for each component of the system. There is no limit to the number of support characteristics that can be proposed.

The following example describes how functional specifications are developed from the system design model and baseline analysis.

> Observing that a significant portion of staff time is spent initiating uncompleted telephone calls, the study team determines that a telephone messaging system would improve professional productivity, and incorporates it into the system design model. The study also found that professionals are frequently away from their desks during the normal workday. To allow these professionals to retrieve messages received during their absence, a store and forward messaging feature is required of the telephone system.
>
> A set of functional specifications for a telephone messaging system to satisfy the above requirements might include:
>
> - Accessibility from a touch tone telephone in the office or from a remote site (i.e. home or public phone booth),
> - Capability for "outsiders" to leave messages,
> - Capability for deferred delivery of messages, and
> - Capability of message acknowledgement and response.

Often equipment and supporting system software must be combined to satisfy the required design model component characteristics. The personal computer workstations is one example. The functional specifications shown in Exhibit 6-1 is representative for this type of office automation component. The specifications include capacity requirements, the use of standard interfaces, and commercially available software.

Care should be taken to write functional specifications in broad terms to encourage vendors to propose alternative solutions which may offer improved system performance at lower overall costs. The specifications should take advantage of economies available from existing off-the-shelf systems as offered by the commercial marketplace. Moreover, the specifications should be consistent with organizational policies and compatible with existing office automation systems.

6.2. EXAMINATION OF FUNCTIONAL SPECIFICATIONS FEASIBILITY

Before settling on the final version, an assessment should be made to ensure that the functional specifications conform to applicable Federal or agency standards and are achievable, presently available, and demonstrable from several different vendors. The steps required to confirm that the marketplace can satisfy the functional requirements include:

- Verify that the proposed office system adheres to agency constraints and standards and is in consonance with long range automation plans. Where new technology is being proposed, technical staff which would support training, development, and maintenance functions should be consulted about their capacity to deal with new workloads.

- Survey the marketplace for existing commercial products/services that can satisfy the proposed specifications. The study team validates the feasibility of the specifications by determining probable vendor responses to the specifications. To assist the team in this effort, office automation periodicals and vendor brochures are referenced. The study team also attempts to attend vendor demonstrations of different equipment and arrange visits to organizations presently using similar equipment to that proposed in the design model.

The functional specifications should be generic but also incorporate the requirements of ongoing processing within the organization. All hardware and software references should be checked to make sure that any vendor specific offerings cannot be replaced with a generic equivalent. In addition, consideration should be given as to how this system can be incorporated within any current organizational processing systems and the office environment (e.g., space, furniture, power).

6.3. PREPARING A REPRESENTATIVE CONFIGURATION

The final task of this phase of the study is to determine the estimated acquisition costs of the proposal. This is done by constructing a representative configuration of the proposed office system. Information on the type and location of equipment is combined with workload profiles to determine the actual number of units required. Support services should also be considered and cost estimates collected as part of the recurring expenses of the proposed system. The average purchase cost for these units is calculated from prices in trade journals, GSA equipment schedules, and vendor product lists. Actual purchase costs rather than lease costs should be used for calculations since the terms and conditions of lease contracts vary significantly among vendors. Estimates should include the size of the investment and

recurring operating costs. This estimated cost determines if the proposed system is feasible for the organization.

The study team must be aware that alternative system configurations may satisfy the set of functional specifications, because--

- different types of technologies can accomplish the same function, e.g., word processing: a dedicated word processor versus a personal computer with a word processing software package, or resource sharing: a local area network versus a multiuser computer system, or
- within a technology, there are different configuration levels, e.g., equipment or software which can be upgraded from a baseline configuration to include any number and combination of enhancements.

The study team should develop at least two alternatives to the proposed configuration. In particular, the alternatives should include:

- at least one other way of other way of providing a similar level of services at the proposed approach, and
- a scaled-down approach that is less ambitions than the proposed approach.

The study team looks closely at these alternatives and bases the selection of a preferred configuration on the cost/benefit analysis performed in the subsequent chapter.

At the completion of this phase, the study team can begin the justification phase.

6.4. TAILORING THE FUNCTIONAL SPECIFICATIONS

As in the system design model (Section 5.3), the tailoring of previous phases is reflected in the functional specifications. However, it should be emphasized that the development of functional specifications can be simplified by:

- taking advantage of existing organizational standards and vendor agreements (e.g., contracts) for office automation equipment and software,
- reusing or modifying the functional specifications developed for previous office automation efforts, or
- specifying national/international or commercial standards.

7. BENEFIT COSTS ANALYSIS FOR IMPLEMENTING THE OFFICE AUTOMATION SYSTEM

The objective of the benefit cost analysis is to assess the practicality of implementing the office automation system. It is a tool which provides organization management with the information needed to make an informed decision on whether to proceed with full implementation of the system or to proceed with an alternative approach.

The chapter focuses on the selection and application of a benefit cost analysis method. It provides the study team with an understanding of the factors that need to be considered in determining the appropriate method. Further, it identifies the types of cost and benefit data and measures to be used in the analysis. The chapter does not present a specific method, since there is no single method which can be recommended over another. Each organization will have to select the method which best meets their needs.

As a result of this effort, the study team will be able to determine the data, measurements and procedures needed to analyzed and evaluate the proposed system and alternatives.

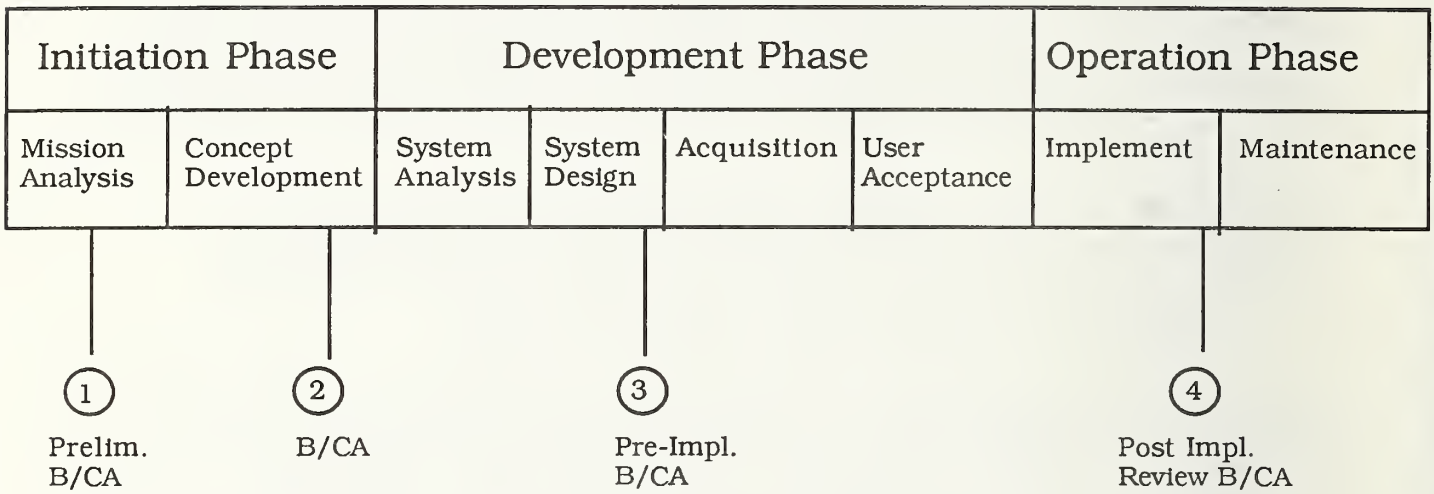
7.1. SELECTING A BENEFIT COST ANALYSIS METHOD

There are many methods of documenting and analyzing the costs and benefits of implementing an office automation system. Each method may provide a different level of detail and rigor and use different analysis techniques. To select an appropriate method the study team should consider the timing, intended audience, and focus of the analysis.

Timing A benefit cost analysis may occur several times during the life cycle of a system, as illustrated in Exhibit 7-1. The benefit cost analysis performed during the requirements analysis is only one of several effort to justify an office system. Its purpose is to provide a pre-implementation justification of the system. For this effort, the study team assembles the costs of maintaining the current environment as well as the expected benefits and costs for the life of the proposed system.

Intended audience The level of detail and rigor required in the benefit cost analysis is influenced by who reviews the analysis. For example, the study team may need to provide greater detail and address specific criteria in an analysis reviewed by an external management organization such as the Office of Management and Budget (OMB) than in an analysis reviewed by the organization's internal management. Similarly, justifying a system to one self would be the least stringent.

Exhitit 7-1: Benefit Cost Analysis Points in the System Life Cycle



1. Prelim. B/CA -- estimates of the cost of Concept Development Stage and the economic cost of developing a system
2. B/CA -- revise and detail previous B/CA and decide if effort should continue.
3. Pre-Implementation B/CA -- performed as part of the requirements analysis.
4. Post Implementation Review, B/CA -- review actual versus planned operation costs and benefits.

Focus A benefit cost analysis may focus on demonstrating cost savings, increased productivity and/or value added. The study team must be aware that attempts to justify the office from only one of these perspectives may misrepresent the actual costs and benefits of the system. For example, benefits to the office worker and organization may not be adequately reflected by measuring cost savings using cost avoidance or cost reduction analysis techniques. In particular, improving the depth of analysis and understanding of information are not represented. Therefore, the study team must understand the focus of the analysis and ensure that it adequately represents the benefits and costs of implementing and operating the office automation system.

Regardless of the benefit cost analysis method selected, it should define what to measure, when to measure, and how to use the measurement data. In particular, it should enable the study team to:

- identify the benefits and costs of the proposed office automation system and alternatives,
- assess the risks associated with implementing the office automation system, and
- identify and recommend a preferred system to organization management.

7.2. IDENTIFYING AND EVALUATING SYSTEM COSTS

As a first step in performing a benefit cost analysis, the study team identifies all one time, recurring, and intangible costs associated with the office automation system.

One time costs are those costs related to the acquisition, development, and implementation of the system. In addition to the initial equipment and hardware application costs, other potential costs include such items as:

- consultant fees,
- office space and furniture,
- site preparation,
- system installation,
- custom developed programs,
- application development (e.g., database set-up),
- running the new system in parallel with the old system,

- media conversion charges, and
- initial training materials and training.

Recurring costs are those costs associated with the continued operation of the system. Recurring costs include two major components:

- periodic costs of professional and support staff efforts required for product preparation (e.g., labor costs), and
- projected expenses associated with on-going use of the system, such as hardware maintenance (including system updates), system support, and supplies.

Intangible costs are those costs which are not incurred directly by the organization or require excessive effort to quantify. Intangible costs include:

- reliability - the probable failure rate of the system,
- flexibility - the relative difficulty of modifying the system to perform unplanned procedures,
- obsolescence - the relative period of time for the system to become obsolete,
- accuracy - the probable error rate of the outputs produced by the system,
- portability - the relative difficulty of moving the system to a new configuration, and
- usability - the difficulty of using the system.

Once all relevant cost items are identified, the study team computes estimates for each, relying on information provided from sources within the organization (e.g., data processing department), vendors, and professional service firms. One time costs and recurring costs are estimated by dollar values, whereas the intangible costs can be described in narrative and/or by a rating (e.g., comparison levels).

7.3. IDENTIFYING AND EVALUATING THE SYSTEM BENEFITS

The primary factors considered in the determination of system benefits are the improvements expected to be achieved as a result of system implementation. From the system design model and new flow diagrams, the study team identifies all possible benefits. Because there may be substantial changes to the office environment, such as shifts in responsibilities and/or the

creation of new work, the study team should examine benefits from an organizational level rather than the individual level. It must be stressed that the benefits do not always appear as single, discernible entries, but rather they are often small gains across many tasks. Further, not all benefits are accrued immediately but may be realized in the longer term.

The benefits are categorized according to their measurability into either tangible, quantitative benefits or less tangible, more subjective, qualitative benefits. Generally, tangible benefits relate to increases in product quantities, time savings, and reduction in costs, whereas intangible benefits relate to quality of products and individual or organizational performance and effectiveness. Exhibit 7-2 lists examples of these types of benefits.

Exhibit 7-2: Benefits of Office Automation Systems

TANGIBLE BENEFITS

Reduction in levels of effort
Increase in demand for products/services
Reduction in labor costs
Increase in workload
Reduction in scheduling time
Reduction in overtime
Increase in profits
Reduction in Travel Costs

INTANGIBLE BENEFITS

Improvement in product quality
Reduction in the number of interruptions
Worker motivation
Improvement in performance
Better understanding of the organization
New insights and learnings
Improvement in staff morale
Changes in the way people work

Tangible benefits are relatively easy to quantify and are translated into dollar values. The values are derived from estimates of expenditures (e.g., labor costs) and future revenues. For example, to compute labor cost savings, the labor rates for professional and support staff are multiplied by the new levels of effort required to prepare the key products.

Intangible benefits are difficult to measure and do not easily lend themselves to dollar equivalencies. They are described in narrative and measured by nonmonetary values when monetary values cannot be generated. These values are derived by examining results, that is, the benefit's effect on the organization or on the product preparation process. If specific values can not be derived, the study team assigns values in terms of estimates, expert consensus, tradeoffs, comparative rankings, or comparative ratings, e.g.:

- o boundary estimates based on "best case" and "worst case" estimates,
- o expert consensus based on the evaluations formed by several knowledgeable people,
- o tradeoffs with tangible benefits where an intangible benefit is gained at the expense of reduced potential tangible benefits,
- o comparative rankings with tangible benefits where an intangible benefit is evaluated with respect to the importance and value of the tangible benefits, and
- o comparative ratings using the current office environment as the baseline for comparison.

The following example illustrates how both specific values and comparative ratings can be used to measure improvement in product quality.

> By examining the proposed product preparation process, the study team can measure in specific terms such items as the expected increases in the number of people involved in the product development, the number of databases searched, and the number of alternative approaches or scenarios analyzed. On the other hand, to measure the effect on the organization and/or management's attitude, the expected improvement in quality is compared to the overall quality of the current product (derived in Section 4.1.2) and a comparative rating is determined that indicates the difference between the two.

Nonmonetary values are subjective and should be consistent with earlier evaluation methods (e.g., the comparative ratings in Section 4.1). They provide the study team with a common basis on

which to judge the qualitative improvements. Although difficult to evaluate, intangible benefits are worth noting since they are legitimate considerations in the justification of the office automation system.

7.4. JUSTIFYING THE OFFICE SYSTEM

An effective justification will contain:

- an overview of the office automation system and analysis process,
- the benefit cost analysis, and
- an evaluation of the analysis results and recommendations.

7.4.1. System Overview

The system overview provides general information about the proposed office automation system and the ensuing analysis. It should contain:

- a summary of the existing office environment,
- a description of the proposed system including its purpose, its configuration (e.g., equipment, hardware), the functions to be supported, and the key product and/or office activity to be affected,
- a predication of the system life,
- an explanation of all assumptions used in the analysis,
- an assessment of the extent to which the costs and benefits are sensitive to changes (e.g., length of system life, volume, mix or pattern of workload, configuration of equipment or software), and
- a list of all related documentation and references.

7.4.2. Performing the Benefit Cost Analysis

As stated earlier, there are a number of approaches for performing a benefit cost analysis. The approaches range from tabular cost justifications which involve life-cycle financial projections comparing the net costs of the office automation system to those associated with retaining the baseline system to a narrative justification which involves descriptive arguments relating the advantage of implementing the office automation system. Whether or not either of these methods are employed, it is essential that the benefit cost analysis:

- identify the goals or desired outcomes of the analysis,

- define the attributes and factors to be measured and how they will be evaluated,

- document the benefits and costs associated with implementing the proposed office automation system and each alternative as well as with continuing with the existing system or environment.

- compare the proposed system to the existing baseline system and assess the changes which will be realized.

The benefits and costs are projected over the entire system life. When developing the projections, the study team factors in any changes to the baseline environment (e.g., workload increases, staff additions) as well as inflation and present value cost.

7.4.3. Evaluating the Analysis Results and Making a Recommendation

From the benefit cost analysis, an evaluation can be made based on cost, ability to fulfill the office's functional requirements, and associated benefits and risks. The office automation system is justified if the total value of the benefits expected over the life cycle exceeds the total cost needed to achieve them by a predetermined margin.

Using the quantifiable costs and benefits, the study team notes one of three results from the benefit cost analysis:

1. If the difference between the total benefits and total costs is positive, then the system is justified.

2. If the difference between the total benefits and total costs is zero, then the system is justified if the workload increases or if there are non-quantifiable benefits.

3. If the difference between the total benefits and total costs is negative, then the system is justified if the non-quantifiable benefits offset the costs. A description of the non-quantifiable benefits should be presented.

It should be noted that a system can be justified exclusively on the basis of the non-quantifiable or intangible benefits. This is strictly a subjective approach, reflecting the judgement of the individuals performing the benefit cost analysis. Caution should be exercised in using this type of benefit cost analysis as the sole basis for justifying the office automation system.

The results of the analysis is presented, summarizing the expected benefits, costs, and savings for the proposed system and each alternative considered. The use of tables or graphs may be helpful for presenting the information.

From this information and the previously defined analysis objectives, the study team generates a recommendation. The recommendation should relate directly to the purpose of the analysis and should clearly and concisely present the recommended course of action. If necessary, alternative recommendations can be offered along with guidance for choosing between them. Subsequently, management reviews the recommendations and decides whether to proceed with a full, incremental, or alternative system implementation.

7.5. TAILORING THE BENEFIT COST ANALYSIS

The benefit cost analysis is influenced by the analysis method selected. For smaller studies, a method requiring fewer details and less rigor may be appropriate. In general, the more detailed and rigorous the chosen method, the greater the effort required to perform the analysis. Tailoring the analysis should not be accomplished by manipulating the costs, benefits, or projection period to alter or bias the analysis results.

8. POST-IMPLEMENTATION REVIEW

This chapter presents the method for performing a post-implementation review of the office automation system. The objectives of the review are to: assess the impact of the office automation system on the organization, learn "what works and what doesn't", and verify that the promised benefits have been achieved. The review provides management with a formal critique of actual system operations and performance.

In general, the post-implementation review consists of gathering data on the current office environment, comparing the data to the system goals stated in the original requirements analysis study, and reporting the differences. The final report should contain an evaluation of the office automation system and a recommendation for either continuing with ongoing operations or modifying the system to achieve the desired results.

This chapter is divided into two sections: the first outlines the planning steps for the review and the second presents the activities performed during the post-implementation review.

Results of periodic post-implementation audits are:

- o management remaining cognizant of changes to the office environment, including new requirements and the realization of additional, unanticipated benefits, and
- o the creation of a database on the improvements realized from the application of office automation. This database can be used to document the office's experience, (i.e, "lessons learned"), and as input to future office automation efforts.

8.1. PLANNING THE REVIEW

A requirement to conduct a post-implementation review is incorporated into the office automation project. As part of this requirement, the organization establishes an ongoing program to measure and report the changes resulting from automation of office processes. The review plan establishes the objectives, timing, and staffing for the post-implementation review.

8.1.1. Review Objectives

Every post-implementation review should satisfy the three major objectives stated above: impact assessment, operational assessment, and verification of benefits. In addition, these reviews must include verifying:

- o that a return on investment has been achieved,
- o that product quality levels have been maintained or improved,
- o the system's reliability, and the adequacy of controls and security measures and,
- o that the risks identified during the original study are properly managed.

Attention should also be given to special management concerns about any organizational or coordination problems arising from the implementation of the office system.

8.1.2. Timing of Reviews

The timing of an audit is an important factor. To achieve meaningful results, the audit should not be performed too soon after implementation. Sufficient time must be allowed after the system is introduced to permit the system to reach a stable state of operation and for users to become proficient with the system. Consequently, the first post-implementation audit should occur after the system has been fully operational for a significant period of time (possibly as long as one year). The following factors should be considered when determining this period:

System Size - Larger systems normally include more staff/machine interfaces than smaller systems. This creates a need for ongoing clarifications of staff duties and equipment capabilities during the initial implementation period.

System Complexity - The degree of change associated with key product preparation, work procedures, and the general office environment normally indicates system complexity. The learning curve is greatest in systems which are more complex.

Number of System Users - The more people needing to learn the system, the longer it will take the system to function effectively.

Other factors such as key product preparation cycles and staff vacations must also be considered by the audit team. The appropriate system break-in period can be determined by reviewing other projects, talking to outside organizations with similar projects or talking to vendors who can provide statistics on average learning curves, user capacity, etc., for their specific equipment. However, vendor information should be used with caution because of possible bias.

A review schedule showing the dates when each office system project will be studied should be promulgated so that line managers can arrange to have staff available to assist the audit team.

8.1.3. Staffing

Review teams will vary depending on the size, complexity, and relative importance management places on the post-implementation review program. To ensure that the review team is as unbiased as possible, members of the review team should not have served on the original study team, have participated in the development of the system, or be currently responsible for the operation of the system.

Post-implementation reviews are typically conducted by the internal audit department or a contractor with expertise in formal project reviews. However, for projects of limited size where an audit staff or contractor review would not be justified, the audits can be performed by the organization's staff, technology support groups, and/or other line organizations.

8.2. ACTIVITIES INVOLVED IN REVIEWING A SYSTEM

The review team uses the procedures and method of the original requirements analysis study whose expectations and system goals form the baseline for comparison.

The objective of the review is to determine if the system has achieved or surpassed the systems goals. Because the system may have been implemented differently from the baseline system design model, not all system goals may have been achieved. Factors to be considered when assessing these differences include:

- o actual, as opposed to intended, use and performance of the office automation system,
- o administrative procedures associated with product preparation,
- o behavior of the staff affected by the system,
- o previously collected baseline office data, and
- o the post-implementation review process itself.

Once the differences have been established, the study team begins to determine the actions which will enable the system to achieve its goals. The general activities for performing the audit review are as follows:

- o preliminary activities,
- o data collection and analysis,
- o comparison of pre-implementation expectations to post-implementation results, and
- o conclusions and recommendations.

8.2.1. Preliminary Activities

Before beginning the actual audit, the review team must familiarize themselves with the study methodology presented in this guideline and all related documentation (e.g., literature and organizational research).

8.2.2. Data Collection and Analysis

The review team focuses on the key products that were previously identified and subsequently, affected by the implemented system. Data on these key products is collected and analyzed in the same manner and format as in the original requirements analysis study. However, there are differences within each stage of the process. Modifications must be made to the data collection tools and analysis techniques. During this data collection and analysis, the review team should consider the following modifications:

- o Obtaining comments from managers regarding: their perception of system benefits and drawbacks resulting from automation, new system goals or revised system requirements, and products which are no longer prepared or have been merged with other products as a result of implementation.
- o Obtaining comments from the key contributors regarding the suitability of the functional specifications used to procure the automated system. Comments should focus on:
  - the adequacy of specifications to facilitate expected results,
  - suggestions for additional specifications to further improve efficiency or effectiveness, and
  - the availability and cost-effectiveness of including suggested specifications in the system.
- o Modifying the original key product flow diagrams to reflect changes caused by system implementation. The diagrams should indicate the processing points, supporting equipment, and procedural/organizational changes resulting from the implementation.

If data collection and analysis produces conflicting results, an office work analysis is performed and used to resolve the conflicts. The office work data collection and analysis procedures are the same as those used during the original study.

8.2.3. Comparison of Pre-implementation Expectations to Post-implementation Results

After the data collection and analysis is completed, the comparison of projected system goals (i.e., pre-implementation expectations) with actual system performance (i.e., post-implementation results) may begin. The comparison reveals whether or not the system goals are being achieved. The steps in this comparison include:

- Prepare a table comparing the projected and actual number of processing steps, overall preparation time, and quality of work for each product affected by the office automation system.

  If the actual levels of effort are significantly greater than projected, additional interviews with key product contributors may explain why. If not, an investigation of both the pre-implementation and post-implementation data is warranted.

- Examine the support requirements which were included as features of the office automation system in terms of their benefits, (i.e., Were the promised benefits realized?).

- Determine the benefits and the available alternatives for increasing them through interviews with key product contributors or an investigation of baseline and audit data.

- Consider staff and equipment performance for each product. Identify areas of concern in achieving the previously determined system requirements. As a result of this exercise, develop a set of alternative strategies for improving the system or establish new system requirements.

- Develop a table comparing the office work analysis data from both the baseline and audit review efforts, if an office work analysis was done for both efforts.

All conclusions reached from the above comparisons form the basis for the review team's report to organizational management.

8.2.4. Conclusions and Recommendations

As a result of these audits, management may decide to take further action towards improving the office automation system. These actions could involve procedural changes pertaining to

Exhibit 8-1: Post - implementation "Mini" Review

REVIEW BY QUESTIONNAIRE:

This type of review consists of questionnaires designed to document achievements, implementation problems, and changes needed. The questionnaires are provided to the line manager and/or key contributor. As part of the questionnaire, the manager or key contributor would be asked to provide a simple narrative description of how the office system is currently being used along with any procedural problems remaining after the implementation phase.

From the questionnaire, the review team produces a report detailing its findings and recommendations. This report would be less formal than the one for large systems and render a more narrative account of the system's progress toward achieving its promised goals

SITE INSPECTIONS:

Periodic walk-through site inspections should be conducted to verify continued operability of the system. These inspections often uncover procedural problems, unused or under-utilized systems, or new uses not originally envisioned during the design phase. Site inspections can also provide a means of verifying the data obtained by other collection methods, e.g., by questionnaire.

system use, acquisition of additional or more enhanced equipment, or implementing the next phase of the system, assuming a partial implementation schedule. The purpose of such actions, in all cases, is to correct existing problems or make an effective system even better.

8.3. TAILORING THE REVIEW

All the review activities should be performed. However, the scope, formality, and depth of the review may vary depending on the importance of the automation project to the organization and/or the size of initial investment and future investments.

The review can be appropriately sized by modifying the steps as described in the section on "tailoring" in each of the previous chapters. Exhibit 8-1 provides an example of how the data collection and analysis activity can be modified to "scale-down" the review. By collecting data via questionnaires and site-inspection, the remainder of the activities are also abbreviated. Conversely, an in-depth review might entail performing a comprehensive review as outlined in this chapter every five years, with a "mini" review performed annually.

Regardless of the review structure, the review team must ensure that the objectives of the audit review are met.

9. SUMMARY ADVICE

This guideline has presented a structured approach for determining the feasibility and practicality of implementing or expanding office automation systems to effect productivity improvements in Federal agencies. The study method describes the performance of seven major phases.

These phases are complex, yet can be successfully accomplished if caution is continually exercised during the course of the study. The following paragraphs are intended for users of this guideline as reminders of the key points discussed in the previous chapters. The paragraphs are organized by chapter/section title so that the reader may refer to the guideline for a more detailed discussion.

PRELIMINARY STUDY ACTIVITIES (Chapter 2)

- Selecting the Study Team (2.1) -- Team member selection is important for a successful study effort. If individuals possessing the necessary experience are not available within the organization, it is advisable to seek outside assistance.

- Determining the Study Scope and Size (2.2) -- The study scope and size should be appropriately defined and relate to the size of the organization, the estimated size of the office automation procurement budget, and to the availability of staff resources.

  The study scope can be limited to a few predetermined key products, a small sector of the organization, and/or to specific product preparation phases.

- Notification of the Study (2.3) -- All employees within the study area are informed of the impending study.

- Initial Office Research (2.4) -- Organizational goals, policies, and standards are reviewed and used as background information.

  A list of all products produced by the organization is prepared and candidates for the senior manager interviews are identified.

- Roles and Responsibilities (2.5) -- The study involves four groups of participants ranging from organizational management to support personnel. The roles and responsibilities of each group should be clearly defined.

- Tailoring the Preliminary Activities (2.6) -- All preliminary activities must be performed since they establish the structure of the report.

DATA COLLECTION (Chapter 3)

- Study Tools (3.1) -- A set of study tools are developed and used to assist the study team in acquiring the necessary information about the current office environment.

- Senior Management Interviews (3.2) -- Senior managers narrow the focus of the study to certain prioritized products labelled "key products".

  General information is obtained on the key product preparation activities, key contributors, workflow and workloads, and office automation expectations as well as suggestions and recommendations to the study effort.

- Key Contributor Interviews (3.3) -- In preparation for the interviews, questionnaires are distributed in advance to the key contributors and the previously collected data on organizational policies, standards, etc. is reviewed.

  The data gathered provides details about the specific activities performed by the key contributors, such as time to complete the activity, format of the product data, and interfaces with external sources and/or other people.

  Current use and knowledge of office automation technologies and attitudes towards the prospect of automation are noted.

  Data related to the general office work, that is, background activities not directly related to the key products, is collected for ten working days.

- Collating, Validating, and Summarizing the Data (3.4) -- Once the data collection period is completed, a decision is made on whether an acceptable percent of response has been received from both professional and support staff. Follow-up interviews are performed when necessary.

  If a significant variance exists between the data collected, additional interviews are performed to resolve the variance.

  The data is either summarized by functional unit and then collected into an organizational summary or compiled directly into an organizational summary.

- Tailoring the Data Collection (3.5) -- The effort to collect data can be reduced by limiting the number of key products and/or the number of days office work is to be collected.

OFFICE BASELINE ANALYSIS (Chapter 4)

- Key Product Analysis (4.1) -- The collected data is examined and analyzed with respect to the levels of effort required to prepare a key product and to the quality of work being performed.

  Level of effort data is based on estimates of the number of hours expended by key contributors to produce the key products. A matrix is prepared that summarizes the analyzed levels of effort for each key product.

  Quality of work is based on subjective evaluations of the effectiveness of key product preparation activities. Work quality can be defined by such measures as timeliness, completeness, responsiveness, and accuracy. A table is prepared that summarizes the levels of quality for each key product.

- Office Work Analysis (4.2) -- General office work activities not directly related to the key products are examined and evaluated.

  Statistics are provided on how individuals work, the time expended on particular activities, and perceptions of the current office environment.

- Examining the Analyses Results (4.3) -- If significant differences exist between the key product and office work analyses, the reasons for the variances must be resolved. An initial identification of the key products which are most likely to benefit from office automation is made.

- Tailoring the Analysis (4.4) -- The effort expended to perform the analysis is influenced by the type of measurement chosen (i.e., definitive or less tangible measurement) and the number of activities and quality criteria examined.

DESIGNING THE OFFICE AUTOMATION SYSTEM (Chapter 5)

- Determining the System Requirements (5.1) -- System requirements are statements of design intent and answer the question "What is the system required to do?"

They are derived by comparing the baseline data to a set of key product goals and from the improvement opportunities identified during the baseline analysis.

They should reflect the projected status of the organization at least two years in the future. Any number of requirements can be proposed.

The proposed requirements are prioritized and presented to organizational management for approval and/or modification.

- Creation of a System Design Model (5.2) -- The system design model is a listing of modifications that can potentially improve the baseline key product preparation processes. The modifications can be achieved through organizational, procedural, and technological changes.

  The behavioral and staffing impacts of the modifications must also be considered.

  A model is prepared that incorporates only those modifications that will significantly affect the achievement of the system requirements.

  The model should be consistent with organizational information resource management strategies and compatible with existing office automation systems.

  A new set of key product flow diagrams are prepared showing the modifications to the baseline preparation processes. All components of the system design model are employed, but not necessarily within each key product flow.

  A table is prepared to indicate the projected improvements to be achieved for each key product.

- Tailoring the System Design (5.3) -- If previous phases of the study have been modified, it naturally follows that this phase will be also. Care should be taken to ensure that the system requirements are not abbreviated so as not to create an incomplete design model.

  For small studies, evaluation of the design model may be less formal.

DEVELOPING FUNCTIONAL SPECIFICATIONS FOR THE OFFICE AUTOMATION SYSTEM (Chapter 6)

- Developing Functional Specifications (6.1) -- Functional specifications describe the performance required of the

system component. This can be expressed in terms as capabilities, degrees of precision, or operating characteristics.

Functional specifications are developed from two sources; the system design model and new key product flow diagrams which identify the generic hardware and software tools needed to accomplish the automation objectives and the baseline analysis summary which contain information on types of work, complexity of work, workloads, and work patterns.

Using these sources, the review team proposes specific performance characteristics for each component of the system.

Specifications are expressed in functional terms to promote full and open competition between responding vendors to the procurement solicitation.

- Examination of Functional Feasibility (6.2) -- An assessment is made to ensure that the functional specifications conform to Federal or Agency standards and are achievable, presently available and demonstrable from several different vendors. The proposed specifications should adhere to Agency standards for connectivity and be in consonance with long range automation plans.

  Caution is continually exercised so as not to narrow available sources to one vendor, when possible.

- Preparing a Representative Configuration (6.3) -- Information regarding the required number of units is derived from the system design model, the new key product flow diagrams, and the baseline productivity profile.

  The estimated average purchase costs for these units are calculated through a review of the previously indicated office automation periodicals, vendor brochures, and the GSA schedule.

  Alternative configurations should be explored to verify that the functional specifications and representative configurations are the best solution to the design model.

- Tailoring the Functional Specifications (6.4) -- The development of functional specifications can be simplified by using existing standards and vendor agreements, and by modifying or reusing previously developed functional specifications.

BENEFIT COST ANALYSIS FOR IMPLEMENTING THE OFFICE AUTOMATION SYSTEM (Chapter 7)

- Selecting a Benefit Cost Analysis Method (7.1) -- There are numerous benefit cost analysis methods, each providing a different level of detail and/or using a different analysis techniques.

  Selecting a method depends on when the analysis is performed, who will review the analysis, and what the focus of the analysis should be.

- Elements of System Costs (7.2) -- The study team identifies all one-time, recurring, and intangible costs associated with implementing the office automation system.

  One-time costs include such items as equipment, implementation analysis, programming, initial training.

  Recurring costs include such items as equipment maintenance, materials and supplies, required key product contributor efforts.

  Intangible costs include such items as reliability, portability, obsolescence, usability.

- Elements of System Benefits (7.3) -- System benefits are classified as either tangible or intangible.

  Tangible benefits relate to quantitative items such as increased workload, reduced levels of effort , reduced operational costs, increased revenues.

  Intangible benefits relate to qualitative items such as improved service, improved customer relations, more timely information, increased job satisfaction.

- Justifying the Office System (7.4) -- The justification should provide general information on the proposed system and analysis process, include the actual benefit cost analysis, and present conclusions and recommendations.

  General information should contain a description of the office environment before and after implementation of the proposed system and a list of all assumptions and related documents.

  The detailed benefit cost analysis is presented for the proposed system and each alternative.

The benefits to be expected form the automated system, the expected cost, and expected savings are summarized and a course of action recommended to management.

- Tailoring the Justification (7.5) -- An analysis method requiring fewer details and less rigor may be appropriate for smaller studies. The costs, benefits, or projection period should not be manipulated to alter or bias the analysis results.

POST-IMPLEMENTATION REVIEW (Chapter 8)

- Planning the Review (8.1) -- Post-implementation reviews should be incorporated into all office automation project plans. As part of this requirement, an ongoing program is established to measure and report the changes resulting from automation of office processes.

  A review team should be established and ideally composed of different individuals than those who participated in the initial requirements study. The size of the teams will vary depending on the size, complexity, and relative importance management places on the post-implementation review program.

  The timing associated with performing an audit is an important factor contributing to valid results; if done too soon after implementation, meaningful results will not be achieved because of inadequate system break-in time.

- Review Activities (8.2) -- The primary audit objective is to determine if the implemented system has achieved or surpassed the system goals.

  The scope of the review should be related to the size of the office automation system, the importance of the system to the organizations, and/or the budget allocated for future office automation investments.

  The procedures employed during the post-implementation audits are similar to those followed during the initial feasibility study, although there are modifications to the data collection forms.

  The comparison between pre-implementation expectations and post-implementation results reveals whether or not the system requirements are being achieved.

  All conclusions reached from these comparisons form the basis of the audit team report to organizational management. The report recommends to either proceed with

ongoing operations, fine-tune the system to achieve the desired results, or totally redesign the system.

New recommendations concerning further improvements to be achieved through office automation are also presented in the audit report.

- Tailoring the Review (8.3) -- All the review activities should be performed, but the scope, formality, and depth may vary.

Each chapter of the guideline should be thoroughly reviewed by the study team before embarking on any activity described herein. Additionally, organizations should approach office automation in a cautious, organized manner, understanding that not all areas of the office are susceptible to automated improvements.

As a final caution, management must recognize that the value of office automation improvements will be optimized only if the newly available time of professional and support staff is directed toward new or additional activities designed to improve organizational effectiveness. This is the challenge to organizations that are deciding to introduce office automation or any other types of improvement measures.

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APPENDIX A

TYPICAL LIST OF PRODUCTS

SAMPLE

1. Correspondence:
   - Letter
   - Memorandum
   - Message

2. Reports:
   - Budget Initiatives
   - Case Study
   - Fiscal
   - Management
   - Material Deficiency
   - Personnel
   - Project Status
   - Technical
   - Trip
   - Weekly Activities

3. Documents:
   - A76 Cost Comparison
   - Action Item List
   - Administrative Notice
   - Change Order
   - Configuration Change Status Report
   - Contract Funds Status Report (CFSR)
   - Contract Management Systems Checklist
   - Cost Estimate
   - Data Management Report
   - Delivery Order
   - Engineering Change Proposal (ECP)
   - Environmental Assessment
   - Independent Cost Analysis (ICA)
   - Invitation for Bid
   - Integrated Logistics Support Plan (ILSP)
   - Life-Cycle Cost Study
   - Military Construction Program Reporting
   - Procurement Directive
   - Procurement Plan
   - Program Management Directive
   - Program Management Plan
   - Quarterly Resources Report
   - Request for Proposal (RFP)
   - Sole Source Justification
   - Staff Meeting Agenda (and Report)
   - Statement of Work (SOW)
   - System Safety Program Plan
   - Technical Evaluation and Report
   - Training Plan

4.	Forms:	Data Item Description Inspection and Acceptance Document Military Order Personnel Action Request Position Description Printing Request Purchase Request Report of Survey Security Classification Guide Time Card Travel Request Work Order Request
5.	Services:	Electronic Bulletin Board Information Tracking Response to Inquery Technical Assistance
6.	Reviews/Briefings:	Business Strategy Panel Meeting Command or Senior Officer Briefing Division Advisory Group (DAG) Review EEO Review Executive Management Review (EMR) Financial Management Board Review Internal Management Review Periodic Program Review Program Management Review (PMR) Quarterly Financial Review Scientific Advisory Board (SAB) Meeting
7.	Audiovisual Aids:	Briefing Board Briefing Text Graphic Aid Vugraph 35mm Slide

APPENDIX B

DEFINITION OF TERMS

Key product preparation activities are composed of both tasks and functions where professional contributions are defined as tasks and support contributions are defined as functions.

Tasks

Planning - Formulating an idea to be expressed in written or graphic form that lays out a method for achieving an end (e.g., scheduling).

Consulting - Giving advice or exchanging opinions with colleagues (superiors, peers, or subordinates) to discuss or consider a wider range of viewpoints. Consulting might be accomplished by telephone, telecommunications (e.g., electronic mail), a meeting, or an individual face-to-face encounter.

Collecting Data - Assembling facts from various sources to use in preparing documents or responses to inquiries.

Evaluating, Sorting, and Analyzing - Examining and judging material to assess its value.

Preparing Drafts - Transferring thoughts from one's mind into another medium (usually paper) either with a writing tool or by use of mechanical or electronic means.

Reviewing and Revising Drafts - Performing a critical evaluation of work (yours or others) with the expected outcome of change in format, grammer, or content.

Coordinating - Circulating a document or response to inquiry for comment as to content or procedure. It is usually accomplished by written annotation, telephone, or electronic transfer of information.

Obtaining Approvals - Requesting approval of a decision maker to proceed with an action, document, or response to inquiry.

Disseminating - Dispensing material to a list of authorized recipients.

Maintaining Records - Assembling and holding materials in some container in an orderly manner that assists in quick recovery. For the professional, it may be a data base management system, desk drawer, notebook, file folder, or small container.

Functions

Typing - Preparing materials through use of a typewriter or computer-based system (e.g., word processor, or personal computer).

Dictating - Speaking for someone else to write down or for recording on some medium.

Transcribing - Copying from one medium to another or producing typed material from dictation.

Filing - Arranging material (usually on paper or computer) into a particular order for future reference.

Duplicating - Making copies through use of a copier or duplicator.

Distributing - Sending or taking materials to authorized recipients and filing areas.

Printing - Producing typed pages of previously input material.

Communicating - Using automated equipment to transmit materials to remote location.

Data Processing - Inputting, processing, and/or outputting material under the control of a stored program.

APPENDIX C

SENIOR MANAGEMENT INTERVIEW GUIDE

SAMPLE

Objective: To narrow the focus of the study and to obtain an overall scheme of the office processes and information needs.

Topics:

1. Major Office Functions
   - o office mission and overall responsibilities
   - o staffing levels
   - o interactions with other organizational units (internal and external to the organization)

2. Key Products
   - o high priority products and reason for importance
   - o products that staff spends most of their time on
   - o product preparation considerations, i.e., turn around time, format, approval cycle, volume/frequency, print quality, timeliness

3. General Workflow
   - o key contributors
   - o key product development path (information flow)
   - o automated systems being used

4. Office Automation Expectations
   - o desired applications for automation
   - o long and short term objectives for automation

3. Automated Systems

   - Automated systems used
     - what extent
     - how useful
   - Knowledge level
     - skills
     - training
   - Attitude
   - Problems

4. Maintenance

   - Files on the product or work performed
     - paper files
     - electronic files
     - who files and maintains them
   - Any follow-up work

5. Interpersonal Communications

   - Meetings
     - schedule
     - travel
     - attend
   - Telephoning
     - initiate call
     - answer
     - return
   - Correspondence
     - answering messages, mail
     - sending messages, mail

6. Summary

   - Suggestions: organizational, procedural, or technological for improvement to product preparation or office.

APPENDIX D

SOURCE IDENTIFICATION GUIDE

SAMPLE

Objective: To obtain structural information about the study area by identifing key contributors and the key product preparation activity they perform.

PRODUCT ____________________

ACTIVITY (list chronologically)	CONTRIBUTOR & POSITION	LOCATION	PHONE
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
:	:	:	:
:	:	:	:

PRODUCT ____________________

ACTIVITY (list chronologically)	CONTRIBUTOR & POSITION	LOCATION	PHONE
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
:	:	:	:
:	:	:	:

PRODUCT ____________________

ACTIVITY (list chronologically)	CONTRIBUTOR & POSITION	LOCATION	PHONE
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
________	____________________	________	________
:	:	:	:
:	:	:	:

APPENDIX E

QUESTIONNAIRES

SAMPLE

Objective: To obtain information on the activities performed, types of automated systems used, and support required.

PROFESSIONAL QUESTIONNAIRE: OFFICE WORK ACTIVITIES

Date: _____

Name _____ Years in Present Position _____

Title _____ Years with Organization _____

Office _____ Full Time _____ Part Time _____ (#hrs___)

JOB CHARACTERISTICS

1. Was your workload during the study period:

   ____ lighter than normal
   ____ normal
   ____ heavier than normal

2. Are you now performing any administrative functions that could be delegated to a secretary if the support were available?

   _____ typing
   _____ proofreading
   _____ photocopying/collating
   _____ filing
   _____ telephone coverage
   _____ mail sorting/delivery
   _____ composing letters, etc.
   _____ taking dictation
   _____ posting information
   _____ preparing forms/longhand
   _____ math calculations
   _____ research
   _____ maintaining office
   _____ business errands
   _____ using facsimile
   _____ other (what? _____)

3. Can you think of any repetitive activities you perform (e.g., recordkeeping, math computations, data analysis, drafting document, etc.) that could be done more effectively using automated tools?
   _____ yes _____ no

   If yes, please describe _____

INFORMATION/DATA SOURCES

4. What percent of the information/data that you need during an average week is produced by:
   _____% your office
   _____% other offices in your organization
   _____% other government agencies (who?_____)
   _____% other sources (who?_____)
   100 %

   In what format do you usually receive this information?
   _____% computer printout
   _____% computer files (on diskette)
   _____% computer files (on-line)
   _____% handwritten
   _____% typed
   _____% other (explain: _____)
   100 %

   How did you receive this information?
   _____% mail
   _____% electronic mail
   _____% accessed computer file
   _____% telephone
   _____% other

5. What percent of the information/data that you need during an average week is existing information in your organization that you must collect and reformat for you own use ___._____%

6. To what extent do you have problems receiving the information in question 5 on a timely basis?

   _____ very often _____ sometimes
   _____ often _____ rarely

   If problems, please describe _____

LEVEL OF SECRETARIAL SUPPORT

7. Who provides most of your secretarial support?
   _____ my personal secretary
   _____ a secretary I share with others
   _____ several secretaries I share with others
   _____ no one, I do my own clerical work (SKIP TO QUESTION 14)

   What is the name(s) of your secretary(ies)?
   _____

8. If you share secretaries, how many other professional do they support (excluding yourself)? _____

9. When the secretary is absent, how do you get your work done?
   _____ wait for secretary to return
   _____ request support elsewhere as favor
   _____ other (explain: _____)

10. When you are out of the office for a full day or more, how does your secretary(ies) usually spend his or her time?
    _____ does work assigned by me
    _____ catches up on work that has backlogged
    _____ does what needs to be done
    _____ works for other people he/she regularly supports
    _____ assigned temporarily to another work group/department
    _____ do not know

11. Does your secretary get assistance when work gets backlogged? _____ yes
    _____ no

    If yes, how: _____

12. How satisfied are you with the level of secretarial support provided:
    _____ very satisfied _____ somewhat satisfied
    _____ satisfied _____ not satisfied

13. What are the five most critical functions the administrative support staff performs for you during an average week?
    _____ typing _____ posting information
    _____ proofreading _____ preparing forms/longhand
    _____ filing _____ research
    _____ telephone coverage _____ maintaining office
    _____ mail sorting/delivery _____ business errands
    _____ composing letters, etc. _____ using facsimile
    _____ taking dictation _____ other (what?_____)

14. How would you describe your need for secretarial support?
    _____ steady _____ peaks and valleys

    If you checked peaks and valleys, when do peaks occur?
    _____ particular time(s) of day (why?_____)
    _____ particular day(s) of week (why?_____)
    _____ particular month(s) (why?_____)
    _____ unpredictable

DICTATION

15. During an average week, do you dictate? _____ yes _____ no
    If yes, you dictate to:
    _____ secretary (who: _____)
    _____ dictation equipment

16. What documents do you dictate?
_____ 1 page
_____ 2-5 pages
_____ 6-10 pages
_____ over 10 pages

17. If you have access to dictation equipment, but do not use it, why?
_____

18. Have you ever received dictation equipment training?
_____ yes, from vendor _____ no
_____ yes, from other source (who?_____)
If yes, was it helpful? _____ yes _____ no

19. Would you like to receive (additional) dictation training?
_____ yes _____ no

20. If you do not currently have access to dictation equipment, would you like to use it? _____ yes _____ no (why?_____)

TYPING REQUIREMENTS

21. What are your total typing requirements during a week?

	typical week	heavy week
1-5 pages	_____	_____
6-10 pages	_____	_____
11-19 pages	_____	_____
20 or more pages	_____	_____

22. What is the average number of typed pages in documents you generate during the week?
_____ 1 _____ 4-9 _____ 20-40
_____ 2-3 _____ 10-19 _____ over 40

23. What percent of the typed work you generate weekly consists of:
_____% original text
_____% standardized text
_____% columns of numbers (statistical)
_____% pre-printed forms fill-ins
_____% graphics/illustrations
_____% mixed text and graphics
_____% mixed text and columns of numbers
_____% other (explain:_____)
100 %

24. How often are documents revised?

How are they corrected and by whom?
_____ use white-out is used
_____ cut and paste corrections on paper
_____ retype entire page
_____ retype corrections on original page
_____ retype corrections using automated system
_____ write corrections by hand
_____ other (explain _____)

25. Is the level of typing support available to you adequate?

	typical week	heavy week
adequate	_____	_____
not adequate	_____	_____

If "not adequate", why? _____

26. What percent of the work you submit for typing during an average week is:
_____% typed by you
_____% written completely in longhand
_____% dictated to a secretary
_____% dictated on equipment
_____% cut and pasted (including some longhand)
_____% computer generated
_____% extracted from previously typed materials
_____% other (explain: _____)
100 %

27. If you type yourself either in draft or final form, why?
_____ personal preference
_____ compose draft as type
_____ hasten turnaround time
_____ secretary not available
_____ other (explain: _____)

28. Do revisions cause problems in meeting typed material deadlines?
_____ very often _____ sometimes
_____ often _____ rarely
If often, why? _____)

29. How satisfied are you with the appearance of documents leaving the office?
_____ very satisfied _____ somewhat satisfied
_____ satisfied _____ not satisfied
If not satisfied, why? _____)

30. For what percent of the work you submit for typing during an average week? Do you assign priorities?

_____% high priority (immediate attention)
_____% standard (a day or less)
_____% low (next several days)
_____% no priority assigned
100 %

Are your priorities usually met?

yes	no	
_____	_____	high priority
_____	_____	standard
_____	_____	low

FILING

31. What files do you regularly access?

_____ active (regularly used by one or more individuals; contains materials relating to on-going activities)
_____ inactive (regularly used by one or more individuals; contains archival records)
_____ other (what? _____)

What form do the file take?

_____ paper _____ electronic

32. Who does the initial filing?

	active files	inactive files
I do	_____	_____
other professionals	_____	_____
my secretary	_____	_____
other secretaries	_____	_____

33. Who usually retrieves and returns materials to the files?

	active files	inactive files
I do	_____	_____
other professionals	_____	_____
my secretary	_____	_____
other secretaries	_____	_____

34. How often do you use file materials during an average week?

	active files	inactive files
several times/day*	_____	_____
once a day	_____	_____
2 or 3 times/week	_____	_____
once a week or less	_____	_____

35. Is file access a problem? _____ yes _____ no
If yes, why? _____

PHOTOCOPYING REQUIREMENTS

36. What percent of your photocopying during an average week is done by:

_____% you
_____% another professional
_____% secretarial staff
_____% duplication/print shop
_____% other (explain: _____)
100 %

37. Approximately how many pages do you copy or have copied for you?

	pages
typical week	_____
heavy week	_____

38. What is the total number of copies you usually make or have made during a typical week? _____ copies

39. How satisfied are you with the quality of photocopies?

_____ very satisfied _____ somewhat satisfied
_____ satisfied _____ not satisfied

DISTRIBUTION

40. How much of your work during an average week is distributed through:

_____% internal mail within building
_____% internal mail outside building
_____% hand-carried inside office
_____% hand-carried outside office
_____% electronic mail
_____% U.S. Mail
_____% facsimile
_____% commercial Air Express
_____% other (how? _____)
100 %

41. On average, how long does it take for you to receive documents via internal mail from others?

_____ less than a half day
_____ one day
_____ two days
_____ other (how long? _____)

42. Is the internal mail system responsive to your needs? _____ yes _____ no
if no, why? _____

If no, how do you compensate?

_____ facsimile
_____ hand-carrying
_____ other (what? _____)

43. What materials do you usually not send via internal mail?
_____ _____
_____ _____

Why?
_____ for review, coordination
_____ for discussion
_____ to hasten processing
_____ other (explain: _____)

TECHNOLOGY ASSESSMENT

44. What type of automated equipment are you using?
_____ word processor _____ minicomputer _____ other
_____ personal computer _____ mainframe _____ none

45. What type of software packages do you use most often?
_____ word processing _____ electronic mail
_____ spreadsheet _____ programming languages
_____ list management _____ graphics
_____ dbms _____ other

46. What type of input/output devices do you use most often?
_____ keyboard _____ laser printer
_____ light pen _____ letter quality printer
_____ mouse _____ plotter
_____ other _____ other

47. Have you had training on these systems? Which _____?

48. How would you describe your experience with automation?
_____ frustrating with minimal results
_____ successful (with satisfying results)
_____ little or no experience

49. Where doe most of the information you use originate?
_____ computer based file
_____ handwritten or typewritten materials
_____ conversations
_____ other

50. Do you use automated files? _____ yes _____no
If yes, where do they exist (on which systems and where) _____

What is the approximate size of these files? _____ huge _____ large
_____ medium _____small.

Do other people need access to these files? _____ yes _____no

Are the reports produced from these files
_____ in a standard form
_____ need to be tailored/report
_____ both

COMMUNICATION

51. Do you use a local area network or other type of network?
_____ yes _____ no
If yes, elaborate _____

52. Do you use the network for
_____ electronic mail/messaging
_____ electronic file transfer
_____ access to software programs
_____ access/store common data files

53. Do you need to share information with others?
_____ no
_____ in the same office
_____ in difference office
_____ outside the organization

54. What is the average length of transmitted documents? _____

If a hardcopy output required? _____
When (which type of document)? _____

55. Must sent documents be received in their exact form? _____ yes _____ no

Can received documents be edited? _____ yes _____no

If yes, what type of documents? _____

56. Do you find contacting staff by phone usually
_____ difficult to reach, no answer
_____ leave message often
_____ make contact at the first call

57. How often do you send/request information to others
_____ within organization
_____ outside organization

THANK YOU FOR YOU HELP.

ADMINISTRATIVE SUPPORT QUESTIONNAIRE

Date _____

Name _____ Years in Present Position _____

Title _____ Years with Organization _____

Office _____ Full Time _____ Part Time _____ (#hrs___)

GENERAL ACTIVITIES

1. Was your workload during the study period:
   _____ lighter than normal
   _____ normal
   _____ heavier than normal

2. How many people do you regularly provide the following support to?
   ___ secretarial/administrative support
   ___ telephone coverage

3. Which of the following functions do you perform on a regular basis? (check all that apply).

   Also, what do you feel are the five most critical functions you perform for the people you regularly support during an average week? (1 = Highest, 5 = Lowest)

   ___ typing
   ___ photocopying/collating
   ___ filing
   ___ telephone coverage
   ___ mail sort/delivery
   ___ composing memos/letters
   ___ taking dictation
   ___ transcribing
   ___ responding to inqueries
   ___ posting information
   ___ preparing forms in longhand
   ___ doing math calculations
   ___ research
   ___ maintaining office
   ___ business errands
   ___ using facsimile
   ___ conference planning
   ___ other (what?_____)

4. Do you use electronic/automated systems to perform any of the functions you checked in question 3? _____yes _____no

   If no, go to question 5. Otherwise, please complete the chart below.

Equipment	List functions	Frequency	Like/dislike? ifused for of usedislike, why
Example:			
CPT Phoenix	wp	often	like, easy to use
IBM PC	spreadsheet (math)	rarely	learning how to use

5. Have you had training on these systems? Which?

6. How would you describe you experience with automation?
   _____frustrating with minimal results
   _____successful (with satisfying results)
   _____little or no experience

OFFICE PROCEDURES

7. What procedures do you follow in the preparation or handling of documents, forms, reports, etc. Please list.

Document/form Report, etc.	Procedure
Example:	
Correspondance	on letterhead, 2 yellow/2 white copies, copies: mailed, to author, filed with secy, reading file
Purchase Order	Form #10, signed by director, numbered, recorded, and a copy filed, then sent to procurement

8. Do you keep a log/file of
   _____ phone messages
   _____ training requests
   _____ contacts (phone #)
   _____ other
   _____ purchase orders
   _____ travel vouchers
   _____ mailing lists

   Are you the only one who accesses these files? If no, indicate which file and who else has/needs access or requests information from the file.

9. Are there documents/forms which you update periodically? Please list.

Document/form	Frequency of update
Example:	
Meeting Schedules	as necessary
Travel Plans	monthly
Calendars	daily and as meetings are scheduled

10. Do you need to periodically check the status of any files, documents, or forms? Please list and indicate (on average) the number of look-ups.

Example:	
Purchase orders	number of look ups fluxuate, depend on order; but track until order recieved
Legislature	5 times/week, usually different legislation
Personnel records	all records - 1/week, but look at a specific record once/day

CALENDAR MAINTENANCE and CONFERENCE PLANNING

11. Do you schedule events, actions or meetings for a single individual and/or a group of people?

    Do you do this with an electronic updateable calendar?
    or telephone all meeting participant to set up a time/date?
    or set up a time/date and send out a memo?

12. Is a calendar of technical events, conferences, meetings, etc. available? maintained?

    Would this function be useful?

13. Meeting Rooms:
    Does one office maintain and control the scheduling of several or all meeting rooms? Which office or who?

    If a meeting room is needed, do you make the arrangements?
    How?

TYPING

14. On what kind of equipment do you now do your typing? (Check all that apply)
    _____ do not type
    _____ typewriter
    _____ typewriter/memory
    _____ personal computer (manufacture & model_____, software package___)
    _____ word processor (manufacture & model _____)

15. What percent of your typing consists of:
    _____% original text
    _____% standardized text ("boiler plate")
    _____% columns of numbers (statistical)
    _____% pre-printed forms fill-ins
    _____% graphics/illustrations
    _____% mixed text and graphics
    _____% mixed text and columns of numbers
    _____% other (explain _____)
    100 %

16. How often in an average is a document revised before it is considered final? _____ revision cycles.

    Are the revisions normally: (check only one)
    _____ light
    _____ moderate (cut/paste, insert/delete sentences)
    _____ heavy (Major document rewrites)

17. When you find typing errors in your work, what usually happens?
    _____ use white-out is used
    _____ retype entire page on typewriter
    _____ retype corrections on original page
    _____ edit on personal computer or wordprocessor
    _____ write corrections by hand
    _____ other (explain _____)

18. What percent of the work you type during an average week is submitted to you:
    _____% written completely in longhand
    _____% dictated to you
    _____% transcribed
    _____% cut and pasted (including some longhand)
    _____% computer generated
    _____% previously typed
    _____% other (explain _____)
    100 %

FILE/INFORMATION STORAGE AND RETRIEVAL

19. Where does most of the information you use originate?
    _____ computer based file
    _____ professionals
    _____ other

20. Do you keep a paper copy of materials stored on cards, cassettes, diskettes, or discs?
    _____ always _____ occasionally
    _____ usually _____ rarely
    If so, why?

21. Do you use automated files? _____ yes _____no
    If yes, where do they exist (on which systems and where) _____

    What is the approximate size of these files? _____ huge _____ large
    _____ medium _____small.

    Do other people need access to these files? _____ yes _____no

    Are the reports produced from these files
    _____ in a standard form
    _____ need to be tailored/report
    _____ both

22. How are files or information requested?
    By author's name?, type of information or file?, date?, office?

23. Are duplicate copies of a file maintained? For example, in other offices?

24. How long will or must the file or information be retained?
    Please indicate files which are considered permanent.

25. Who is responsible for deleting a file?

26. Do any files require special handling? For example, classified files which must be locked up.

27. What files do you regularly access?
_____ active (regularly used by one or more individuals; contains materials relating to on-going activities
_____ inactive (regularly used by one or more individuals; contains archival records)
What form do the files take?
_____ paper _____ electronic

28. Who does the initial filing?

	active files	inactive files
I do	_____	_____
professional(s) I support	_____	_____
other professionals	_____	_____
other secretaries	_____	_____

29. Who usually retrieves and returns materials to the files?

	active files	inactive files
I do	_____	_____
professional(s) I support	_____	_____
other professionals	_____	_____
other secretaries	_____	_____

30. If you obtain and return materials, how often?

	active files	inactive files
several times a day	_____	_____
once a day	_____	_____
2 or 3 times/week	_____	_____
once a week or less	_____	_____

31. Is file access a problem? _____ yes _____ no
If yes, why _____

PHOTOCOPYING

32. Approximately how many pages do you copy?

	pages
typical week	_____
heavy week	_____

33. What is the total number of copies you usually make per document? _____ copies

34. How satisfied are you with the quality of photocopies you make?
_____ very satisfied _____ somewhat satisfied
_____ satisfied _____ not satisfied

35. Typically, do you spend alot of time waiting for the photocopy machine? _____yes _____no

PRESENTATION AIDS

36. Do you prepare presentation aids? If yes, complete the chart below.

Aid	Created by/on	Data presented from
Example:		
vugraphs	typewriter	professional prepares data
	hand drawn	I do artwork
flip charts	hand drawn	professional prepares all data
slides	visual arts	professional prepares data

DISTRIBUTION/COMMUNICATION

37. Do you need to share information with others?
_____ no
_____ in the same office
_____ in difference office
_____ outside the organization

38. Do you send messages/memos to:
_____ one person
_____ 1-5 people
_____ more than 5 people

39. Typically, are these people located
_____in the same building
_____several building, but same geographic location
_____different geographic locations

40. Do you transmit documents electronically? (electronic mail, TELENET)
What is the average length of transmitted documents? _____

Is a hardcopy output also required? _____
When (which type of document)?

41. Will the received documents be edited? _____ yes _____no
If yes, what type of documents? _____

42. Do you find contacting staff by phone usually
_____ difficult to reach, no answer
_____ leave message often
_____ make contact at the first call

43. How often do you send/request information to others
_____ within organization
_____ outside organization

44. How much of your work during an average week is distributed through:
_____% internal mail within building
_____% internal mail outside building
_____% hand-carried inside office
_____% hand-carried outside office
_____% electronic mail
_____% U.S. Mail
_____% facsimile
_____% commercial Air Express
_____% other (how? _____)
100 %

45. On the average, how long are the distribution lists you use?
_____ I do not use distribution lists
_____ 1-6 addresses
_____ 7-10 addresses
_____ over 10 addresses

46. How often do you use your distribution lists?
_____ 3-4 times a week or more
_____ 1 or 2 times a week
_____ once or twice a month
_____ less than once a month

47. Do you hand-carry materials to other offices? _____ yes _____ no
If yes, on the average how often and where? _____

48. Do you use facsimile equipment? _____ yes _____ no
If yes, on the average how many pages do you send and/or receive each week? _____ pages sent ____. pages received

THANK YOU FOR YOU HELP.

APPENDIX F

KEY PRODUCT TRACKING GUIDE

SAMPLE

Objective: To list the key product preparation activities from input of initial data to final product, to show the workflow, and to identify other contributors.

CONTRIBUTOR _____
PRODUCT _____

(list chronologically)

ACTIVITY	RECEIVE FROM	SEND TO	OTHER CONTRIBUTORS (location & activity performed)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
:	:	:	:
:	:	:	:

PRODUCT _____

(list chronologically)

ACTIVITY	RECEIVE FROM	SEND TO	OTHER CONTRIBUTORS (location & activity performed)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
:	:	:	:
:	:	:	:

APPENDIX G

KEY PRODUCT INTERVIEW GUIDE

SAMPLE

Objective: To further define and clarify the data collected via the key product worksheets and questionnaires.

Name _____
Date _____
Product _____

Topics:

1. Task Description

   - o What triggered your involvement
   - o Details of accomplishing task
   - o Information received from other people
     from where?
     how (e.g., mail, telephone, electronically)
   - o Information received from other sources (e.g., data bases, library)
     from where?
     how?
   - o Criticality of information received

2. Processing

   - o Manipulation of information received, so it is useful
     how much
     what type
     ease
   - o What is done to the information received (processing)
   - o Type of output produced
   - o Quality factors
   - o Problems or delays

APPENDIX H

KEY PRODUCT WORKSHET

SAMPLE

Objective: To compile the level of effort data for each key product. (Developed from the daily activity logs.)

Activity: _____

FUNCTIONS

TASKS	PROFESSIONAL PERSON HOURS	BY PROFESSIONAL (type & hours)	BY SUPPORT (type & hours)
Planning			
Consulting/ meetings			
Collecting Data			
Sort & evaluate data			
Preparing draft			
Coordinating			
Obtain Approvals			
Disseminate			
Maintain Records			

SUPPORT TYPE FUNCTIONS

1. Typing
2. Dictating
3. Transcribing
4. Filing
5. Duplicating
6. Distributing
7. Printing
8. Formatting
9. Proofreading

APPENDIX I

DAILY ACTIVITY LOGS

SAMPLE

Objective: To collect time/volume data on professional and support activities.

PROFESSIONAL LOG

Name _____ Job Title _____

Directions: List the task performed and answer the following questions about each task.

Task and brief description:

1. Was the task accomplished by a totally manual process or was an automated system used?

2. How many hours did it take?
   Hours spent doing it manually
   Hours spent using automated system
   Total Hours:

3. List the automated systems used in completing the task

4. Were any support-type functions performed to complete the task?
   By someone else
   By you, and why
   Hours spent on this function

SUPPORT LOG

Name _____ Job Title _____

Directions: Check the functions performed and fill-in the appropriate information in the corresponding space. Add any functions that are missing.

Function	Performed Manually?	Equipment Used	Hours Spent	What was produced & size? (e.g., # of pages)
taking dictation	_____	_____	_____	_____
transcribing	_____	_____	_____	_____
typing	_____	_____	_____	_____
photocopy/ collating	_____	_____	_____	_____
filing	_____	_____	_____	_____
telephone coverage	_____	_____	_____	_____
mail sorting/ delivery	_____	_____	_____	_____
preparing forms	_____	_____	_____	_____
posting information	_____	_____	_____	_____
using facsimile	_____	_____	_____	_____
composing letters	_____	_____	_____	_____
doing math calculations	_____	_____	_____	_____
researching	_____	_____	_____	_____

APPENDIX J

TECHNOLOGY ASSESSMENT

This appendix describes some of the technologies available for assisting professional and support staff perform office activities. Office systems can be described by equipment types (word processors, copiers, etc.) or by application (electronic mail, calendaring, desktop publishing, etc) or by function such as data capture, processing, storage, or distribution).

One problem in attempting to describe office technologies is that they are converging with new systems components being created from a combination of the three traditional information processing technologies; office automation, data processing, and voice communications. An example of this phenomenon is the personal computer which can perform word processing as well as data processing functions. When designing new office systems, this integration of technologies should be taken into consideration. Technological integration occurs at several levels in office systems. These include integration of:

Tools Office systems software such as calendars, file distribution and archiving, electronic mail, and word processing are supported under a single operating system which allow inter-system communication.

Media New system components will increasingly integrate voice, text, data, and image into the same files and system capabilities.

Organizational procedures Training, technical and reference manuals, system hardware diagnostics, and suggested approaches to organizing workflow will be embedded in the design of office systems.

Communication channels New forms of office systems which provide multi-channel facilities such as voice, video conferencing and traditional text and data transmission will be available.

Integrated office systems are hardware, data management, communications and software which when combined create an environment capable of capturing, processing, storing, retrieving and distributing organizational products and services. For the purpose of this guideline, these technologies are categorized into four phases of production preparation.

Information Capture Technologies (Input Phase) include the conversion of ideas or thoughts into complete and concise verbal or written communications. Representative equipment include:

Personal Computer Workstations -- provide professional and support staff opportunities to directly interact with office systems via video displays. Using typewriter keyboards with video display the staff can author products, retrieve information from system databases, or distribute files to others. Workstations support general administrative activities by providing text processing, financial analysis (spreadsheets), graphics, communications and database systems at one's desk.

Data Scanners -- Optical character readers, bar code readers, and image cameras provide an automated capability to capture previously created information in machine processable format.

Dictation Equipment -- Designed for local and/or remote capture of voice messages for subsequent translation to machine readable formats.

Information Processing Technologies (Production Phase) consist of processing or manipulating the ideas or thoughts created and/or stored during the input phase. Increasingly, this phase is being accomplished by the individual with a desktop computer. Departmental minicomputers and central computers perform special processing activities involving large centralized data base search and extraction, special graphics generation, and integration of organizational planning activities (i.e., calendar management, electronic messaging.

Departmental Minicomputers -- Medium scale multi-user systems designed to provide integrated support services to groups of office staffs.

Multi-function Workstations -- Desktop personal computers configured with application software to perform text and data processing tasks.

Integrated Office Software Systems -- A set of software including desktop tools (calculators, telephone directories, personal diaries and calendars), text processing, electronic mail, correspondence filing systems, document interchange, and access to data processing facilities (batch job execution, compilers, etc.)

Information Storage and Retrieval Technologies (Output Phase) encompass the storage and generation of electronic, optical or hard copy documents. In many instances, this phase may be indistinguishable from the capture and processing phases,

particularly for personal computer workstations. A distinguishing feature of this phase is that no further processing is required before final printing and/or distribution. Representative equipment includes:

Printers -- A variety of devices that convert stored data into a formatted hard copy document. Most will connect to a computer allowing machine readable data to be printed. There are several varieties on the market. Non-Impact printers (Dot Matrix) are generally inexpensive and can produce near letter quality printing. They are ideal as personal printers. For letter quality printing, the laser jet printer offer speed and multiple print fonts.

Publishing Systems -- Prepares finished, typeset quality copy using a variety of type faces and font sizes. Combined with laser printers they provide a convenient way to produce high quality printing.

Micrographics -- Reduces document storage space requirements. Microform types include roll, jackets, fiche, and aperture cards. Microform location determination can be accomplished by coding the film as documents are photographed. Retrieval devices range from mechanical reader-printers to automated terminals. Computer output microfilm (COM) and computer generated graphics are included in this group.

Optical Disks -- Provides an inexpensive way to store for later retrieval very large amounts of data or images. Optical disk storage media is transportable and does not require expensive equipment for information retrieval.

Information Interchange and Distribution Technologies (Output Phase) involve the transfer of information between office automation workstations. Special formatting and/or conversion may required before information can be used by receiving workstation. Representative equipments and systems include:

Smart Copiers -- Directly convert digital signals into images for output. Print requests and information are usually received via hardwired attachment or communication lines.

Facsimile (FAX) -- Relay alphanumeric and graphic information to remote sites through ordinary telephone lines or private transmission lines.

Executive telephones -- Aids the professional in daily communications and personal computing needs.

Local Area Networks (LANs) -- Provides peer to peer communications between workstations. Disk storage, printers and communication links can be shared.

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11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

This report is designed to help managers maximize the benefits to be achieved through the application of office automation technologies. It presents a systematic planning method which will guide the manager to technology solutions which can improve the quality, efficiency, or effectiveness of an organization's products or services. Planning for office automation is accomplished through a requirements analysis study. The study can be initiated in response to installing office automation systems in a non-automated office or acquiring additional systems for an existing automated environment. This report provides guidance in the overall process of determining requirements for office automation systems.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

Benefit cost analysis, computer based office systems, office automation, post implementation audit, requirements analysis, system design model

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