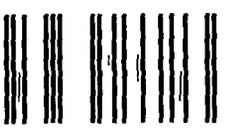
GAO

Report to the Chairman, Committee on Government Operations
House of Representatives

July 1986

ADP ACQUISITIONS

Patent Automation Encountering Major Planning and Procurement Problems



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GAO

United States
General Accounting Office
Washington, D.C. 20548

Comptroller General
of the United States

B-217448

July 17, 1986

The Honorable Jack Brooks
Chairman, Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

This report completes our response to your July 11, 1984, request that we review the Department of Commerce's Patent and Trademark Office automation program. It summarizes the results of our May 1985 through May 1986 review of the Patent and Trademark Office's efforts to automate its patent operations. We reported in April 1985 on automation of trademark operations and provided a fact sheet in December 1985 on selected aspects of patent automation.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies to the Secretary of Commerce, the Commissioner of the Patent and Trademark Office, and other interested parties and make copies available to others upon request.

Sincerely yours,

Shelton J. Fowler

for Charles A. Bowsher
Comptroller General
of the United States

Executive Summary

Purpose

The Patent and Trademark Office, part of the Department of Commerce, is involved in an office-wide automation program designed to computerize its two primary operating functions—granting patents and registering trademarks. The Office plans to spend about $808 million over the life of the program. In response to concerns expressed by the Chairman of the House Committee on Government Operations over the management of the program, GAO previously reported on the automation of trademark operations and on selected aspects of patent automation. This report focuses on the status of the patent automation program, agency planning for that program, Commerce oversight of those efforts, and management of the automated patent system procurement.

Background

The Patent and Trademark Office has an estimated 27 million documents on file and receives approximately 100,000 new patent applications each year. In response to an identified need for more efficient information management, Congress directed the Office, through Section 9 of Public Law 96-517, to develop a plan for computerizing its patent and trademark operations. The resulting plan was issued in December 1982. Commerce has oversight responsibility for the program and direct responsibility for the system contract. In April 1984, Commerce entered into an incrementally funded, cost-plus-fixed-fee contract with Planning Research Corporation of McLean, Virginia, for the design, development, implementation, and maintenance of the automated patent system. The contract was originally expected to cost $289 million and to take 18 years to complete. The Patent and Trademark Office is responsible for the day-to-day management of the program.

Results in Brief

Planning and oversight of the patent automation program by the Patent and Trademark Office and Commerce have been inadequate. Consequently, millions of dollars have been spent with little assurance that (1) the Office is implementing the best alternative for improving operations, (2) the benefits will exceed the costs, and (3) the system can be economically installed in current facilities.

At present, the program is over a year behind schedule, and additional delays are expected. Furthermore, the estimated cost of the patent system contract has increased dramatically by over 55 percent to $448 million. In addition, the acquisition strategy currently being used to procure the automated patent system has a number of serious weaknesses that greatly increase the risk of acquiring a system that will not achieve the automation goals as efficiently and economically as possible.

Principal Findings

Program Status

The Patent and Trademark Office has spent about $65 million on its program through fiscal year 1985 and has authorized Planning Research Corporation to procure the system's initial application software, as well as 2 large computers, 75 workstations, and several other hardware components. While these procurements support the system, it is not operational at this time, and current plans indicate that implementation of certain critical features will be delayed another 2 to 3 years. (See pp. 16 to 21.)

Agency Planning

The Office did not adequately follow federal regulations in planning the automation project. The Office did not comply with federal regulations requiring agencies to analyze the costs of alternatives for achieving automation goals. Without a documented analysis of alternatives, the government has little evidence that the chosen system is the most efficient and economical method for achieving automation goals. (See pp. 22 and 23.)

The cost/benefit analysis excluded costs of at least $51 million and incorrectly claimed benefits of $444 million. The analysis also projected a savings of $1.19 billion in patent litigation court costs due to improved patent quality. However, the Office has not shown how improved patent quality will lead to a decline in litigation cases. Such inadequate cost/benefit analysis provide little assurance that planned projects will be cost-beneficial. (See pp. 24 to 29.)

Even though federal regulations require a space management study to support automatic data processing acquisitions, Commerce and the Office did not conduct such a study. Consequently, even today, years after Commerce and the Office contracted for an automated patent system, there is no assurance that the planned system can be economically installed in the Office's facilities. (See pp. 29 to 31.)

Commerce Oversight

Commerce oversight of the patent automation program was inadequate during the planning stage. However, in mid-1985, as a result of congressional concern, the Department began implementing processes to increase its oversight of the program. (See pp. 31 to 34.)

Procurement

In October 1983, the Assistant Secretary for Administration granted the Office a waiver from Office of Management and Budget Circular A-109, which is designed to ensure effective and efficient acquisition of major systems such as the automated patent system. Commerce subsequently awarded an inappropriate cost-plus-fixed-fee contract for the design, development, implementation, and maintenance of the system, which was expected to take 18 years to complete. The awarding of this contract, which contains minimum contractor cost control incentives, was not consistent with federal regulations and guidance. Federal regulations also stipulate that cost-plus-fixed-fee contracts require close monitoring by the government due to the minimal risk imposed on the contractor. However, Commerce and the Office have not effectively administered or monitored the contract. (See pp. 36 to 52)

Recommendations

GAO recommends that the Secretary of Commerce reassess the direction and scope of the automated patent system to ensure that the best alternative for meeting program objectives is being pursued, that automation benefits will exceed costs, and that the planned system can be effectively and efficiently installed in the Office's facilities to achieve maximum benefits. (Details on the extent of the Secretary's reassessment appear on pages 55 to 57.) GAO also recommends that the Secretary not allocate additional funds to the automated patent system contract until he has completed the reassessment, determined the best approach to follow, and appropriately reported the reassessment results to Congress.

To help ensure that the reassessment is appropriately conducted, the Secretary should assign responsibility for the reassessment to the Assistant Secretary for Administration, the designated senior department official for information resources management. Furthermore, this official should use the National Bureau of Standards and obtain other independent reviews as necessary to ensure (1) that the reassessment is properly conducted and that the system includes only components with acceptable risk of cost-effective implementation and (2) that other critical issues, such as a thorough test of all critical components, are appropriately addressed.

Following the reassessment, the Secretary should determine the most appropriate acquisition strategy to mitigate the government's risk. As part of this determination, the Secretary must ensure that contractual arrangements reduce the risk currently imposed on the government, particularly for implementation and maintenance activities. In addition, all future acquisitions should involve competitive procurements with

fixed-price contract(s) to the maximum extent possible. (Pages 56 and 57 contain details on the steps that the Secretary should take.)

Agency Comments

GAO discussed key facts on patent automation with officials from Commerce, the Patent and Trademark Office, the Office of Management and Budget, the General Services Administration, and Planning Research Corporation and has included their comments where appropriate. However, GAO did not obtain the views of responsible officials on GAO's conclusions and recommendations, nor did GAO request official agency comments on a draft of this report.

Contents

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Abbreviations

ADP	automatic data processing
GAO	General Accounting Office
POTOMAC	Patent Office Techniques of Mechanized Access and Classification
PTO	Patent and Trademark Office

Introduction

The Department of Commerce's Patent and Trademark Office (PTO) administers the patent and trademark laws of the United States. Patent laws encourage technological advancement by providing incentives to invent, invest in, and disclose new technology. Trademark laws help to prevent product confusion among consumers and foster public awareness of the source of goods and services by providing for trademark registration.

PTO's primary role in administering patent laws is to examine patent applications and grant patent protection for qualified inventions. PTO also examines trademark applications and registers qualified trademarks. In April 1985, we reported that PTO had not properly managed various aspects of its trademark automation program.[1]

Currently, patent examiners, highly trained individuals who often specialize in a particular field, manually search loosely assembled paper files and compare previously granted patents with new applications to determine which applications represent genuine inventions that should be patented. During the examination process, the patent examiner studies an application to determine the scope of the claimed invention, outlines an appropriate field of search, and then conducts a search of prior art contained in the patent search files.[2] The examiner attempts to match the concept described in the application with the concepts in the prior art. If the examiner finds that the invention in the application is not new, the application is denied.

The large body of paper files used in the examination processes contains approximately 27 million documents and is continuously expanding. In carrying out its mission, PTO examines over 100,000 patent applications and 60,000 trademark applications annually. PTO has repeatedly identified growth of its paper files, increases in resources required to maintain the paper files, and degrading integrity of the files as impediments to carrying out its mission.

In 1980, the Congress directed PTO, through P.L. 96-517, to develop a plan for an office-wide automation program. PTO began implementing its automation plan in 1982. While, as of May 1986, it had obtained some automated patent system hardware and software designed to automate

[1] Patent and Trademark Office Needs To Better Manage Automation Of Its Trademark Operations, GAO/IMTEC-85-8, April 19, 1985.

[2] Prior art consists of U.S. patents, foreign patents, technical journals, and other publications

aspects of the patent examining process, the system was not operational. The agency plans to complete its testing and evaluation of automated patent searching capabilities by December 1986.

PTO Has a History of Patent Automation Projects

The current PTO patent automation program is the latest effort in a series of patent automation attempts. PTO, formerly the Patent Office, initiated numerous research and development projects from the late 1940s to the early 1970s in an attempt to provide mechanized search tools to assist examiners in analyzing patent documents. According to Patent Office documents, most of these research and development projects were not implemented due to their high costs.

In the early 1970s, the Patent Office expanded and combined its automation efforts under the name Project POTOMAC: Patent Office Techniques of Mechanized Access and Classification. The Patent Office planned this project to be the first office-wide automated system for use by patent office examiners and public patent searchers. The Patent Office anticipated that this project would automate its classification, search, and retrieval requirements and estimated that a fully operational project could be implemented for $52 million over 8 years.

In 1972, the Commissioner of Patents directed that the project be phased out, and he subsequently requested that the Department of Commerce's National Bureau of Standards perform a technical review and evaluation of the project to provide a basis for the future direction of automation efforts. In 1973, the Bureau reported that Project POTOMAC could not meet its primary goal of an effective system offering operational support to patent examination. In reporting on the technical feasibility of the project, the Bureau concluded that Project POTOMAC was not feasible because it did not sufficiently plan the aggregation of subsystems into its single system approach. The Bureau reported,

"While a single system is theoretically possible, experience in government and industry has shown that acquiring a single system to handle all requirements have not proven successful when the requirements are as diverse and changing as the Patent Office."

After abandoning Project POTOMAC, PTO implemented smaller automation programs for selected portions of the patent examining process. The project of automating the entire patent examining process was not initiated again until the 1980 legislative mandate.

Congress Required an Automation Plan

On December 12, 1980, Public Law 96-517 was enacted requiring PTO to prepare an automation plan. Section 9 of that law requires that

"the Commissioner of Patents and Trademarks shall report to Congress, within two years...a plan to identify, and if necessary develop or have developed, computerized data and retrieval systems equivalent to the latest state of the art which can be applied to all aspects of the operation of the Patent and Trademark Office, and particularly to the patent search file, the patent classification system, and the trademark search file. The report shall specify the cost of implementing the plan, how rapidly the plan can be implemented by the Patent and Trademark Office, without regard to funding which is or which may be available for this purpose in the future."

This requirement followed earlier comments regarding the need to improve patent and trademark operations through computer technology. In October 1979, President Carter charged that

"the patent process has become expensive, time-consuming, and unreliable... At my direction the Patent and Trademark Office will undertake a major effort to upgrade and modernize its processes...."

During a later 1979 hearing before the Senate Committee on the Judiciary, a former PTO Commissioner advocated the use of computers for some aspects of PTO's operations; however, he argued against automating the entire office, declaring "you can't do that [automating all PTO operations]...with any kind of reasonable finances." In addition, according to a September 9, 1980, Committee report, testimony before the House Committee on the Judiciary criticized the agency's failure to use modern computer technology.

Shortly before this program was initiated, we questioned the feasibility of automating the patent search process at PTO.[3] We reported that PTO officials believed that their most serious quality problem was the lack of file integrity caused by missing and misplaced patent documents in the examiners' files. We concluded that automation of the search process at that time would not significantly improve timeliness or quality; it would merely make the process more costly. We recommended that the Secretary of Commerce direct the Commissioner of Patents and Trademarks to (1) develop procedural systems that would let examiners and clerical support staff know what patent documents are removed from the examiners' files and (2) develop a system that would protect the examiners'

[3]The Feasibility of Automating the Search Process at the Patent and Trademark Office, GAO/FGMSD-80-40, May 9, 1980

search files from public users' abuse. In response to these recommendations, PTO stated in November 1980:

"Remedy of the conditions for which these audit recommendations were made will require planning and funds; hence, their requirements are budgetary and long term in nature. It is suggested that these recommendations be closed, and that plans to resolve the conditions described be incorporated into future budget submissions."

In response to Public Law 96-517, PTO prepared its Automation Master Plan, which envisioned "paperless" patent operations by 1987 and deployment of all planned capabilities by 1990. After public comment, the Department of Commerce and the Office of Management and Budget endorsed the plan, which was then submitted to the Congress on December 13, 1982. The plan discussed PTO's requirements for automating its patent, trademark, and management operations as well as the costs and benefits of the project. The anticipated costs were at least $720 million with benefits of about $1.4 billion. In addition, the plan outlined a life-cycle strategy for the 20-year automation project and a schedule of work for the initial 2 years (1983-1984).

Commerce and PTO Share Management Responsibility for the Program

The Department of Commerce and PTO share responsibility for managing the patent automation program. As specified by the Paperwork Reduction Act of 1980, Public Law 96-511, Commerce is responsible for managing all departmental information resources. Commerce has contracted for the automated patent system with Planning Research Corporation of McLean, Virginia. PTO's Office of Automation is responsible for the day-to-day management of the program.

The Paperwork Reduction Act's purpose is to improve the management of information resources within the executive branch of the federal government. The act states that executive branch agencies and departments are responsible for carrying out their information management activities with efficiency, effectiveness, and economy. A major objective of the Paperwork Reduction Act is to integrate agencywide and departmentwide information resources management activities and to establish a single, clear line of accountability for such activities. Accordingly, the act mandates that each department head designate a "senior official" to ensure effective and efficient management of agency and departmental information resources and to be responsible and accountable for acquisitions of automatic data processing (ADP) resources.

Commerce's Assistant Secretary for Administration, the department's designated senior official, has overall responsibility for all departmental information resources management activities, including those at PTO. Within the Assistant Secretary's office, the Director for Management and Information Systems has responsibility for implementing the Paperwork Reduction Act, with day-to-day responsibility for the act delegated to the Office of Information Resources Management. In addition, in March 1986, the Assistant Secretary appointed a new Deputy Assistant Secretary for Special Programs whose responsibilities include the patent automation program.

The Assistant Secretary is also charged with centralized procurement of ADP resources for the department. Within the Assistant Secretary's organization, the Office of Procurement Operations conducts the department's centralized procurements in the Washington, D.C., metropolitan area. Although Commerce has excluded PTO and three other operating units from its centralized procurement activity, its policy provides that, at Commerce's discretion, certain procurements of PTO and the other excluded operating units may be performed by the Office of Procurement Operations. The acquisition of the automated patent system is one such procurement.

PTO has program responsibility for the patent automation project. The PTO Office of Automation, under the Assistant Commissioner for Finance and Planning, manages the program. It organizes all automation resources of PTO under the Administrator for Automation, a position created to provide overall centralized planning, control, and direction for the program and to ensure the quality and data integrity of PTO's automated systems.

The Office of Automation, with approximately 200 staff members, includes staff and project management offices. Staff offices manage automation program planning, coordinating, monitoring, and evaluating. Automation project offices are responsible for day-to-day technical and schedule decisions. Each project office is headed by a project manager who reports to the Administrator for Automation.

The automated patent system project manager functions as the Contracting Officer's Technical Representative for the automated patent system prime contract with Planning Research Corporation. Commerce awarded this contract to Planning Research Corporation on April 12,

1984, at an anticipated cost of $289 million to design, develop, implement, and maintain the automated patent system. This contract is incrementally funded and is expected to take 18 years to complete. The technical representative's responsibilities include working with Commerce's Office of Procurement Operations to plan and conduct acquisitions, reviewing the planned work, and ensuring that the contractor's work meets PTO's requirements.

Objectives, Scope, and Methodology

In a July 11, 1984, letter, the Chairman, House Committee on Government Operations, raised concerns about the management of PTO's automation program. This report on the patent automation program is our third response to the Chairman's initial and subsequent requests for information on PTO automation. Our April 1985 report addressed PTO's automation of its trademark operations. In December 1985, we reported on the type and length of the automated patent system contract, the schedule status of the patent automation program, and the lack of a space management requirements analysis.[4]

On the basis of the Chairman's request and subsequent discussions with his office, our objectives were to

- determine the status of PTO's patent automation program,
- evaluate the adequacy of PTO's planning of patent automation,
- assess Commerce's oversight of PTO's patent automation efforts, and
- evaluate Commerce's and PTO's procurement of the automated patent system.

To determine the status of the patent automation program, we reviewed the original 1982 and subsequent versions of PTO's Automation Master Plan and the automated patent system files of PTO's Office of Automation. We also discussed program status with PTO, Commerce, and Planning Research Corporation officials.

To evaluate PTO's planning of patent automation, we analyzed PTO's initial and revised cost/benefit analyses, the Automation Master Plan, and changes in the patent automation implementation strategy. We interviewed Commerce and PTO officials, and we also reviewed federal regulations and guidance on ADP and information resources management and compared them with PTO's actions.

[4]Information on the Patent and Trademark Office Automation Program, GAO/IMTEC-86-4FS, December 20, 1985

Regarding Commerce's oversight of PTO's patent automation efforts, we traced Commerce's involvement with patent automation through discussions with officials of the agency's Office of Information Resources Management, Office of Procurement Operations, and Office of Budget. We reviewed Commerce's Office of Information Resources Management files on PTO automation and assessed adherence to federal information resources management laws and regulations.

To evaluate Commerce's and PTO's procurement of the automated patent system, we examined the acquisition strategy used by Commerce and PTO. We reviewed federal regulations and policies on the procurement of ADP capabilities, reviewed Commerce's automated patent system contract file, and examined audit reports on Planning Research Corporation. We also discussed the patent automation procurement with Commerce, PTO, General Services Administration, and Office of Management and Budget officials.

We performed our review from May 1985 to May 1986, primarily at PTO's offices in Arlington, Virginia, and at Commerce headquarters in Washington, D.C. We also visited the Planning Research Corporation's principal facility for the automated patent system contract at Dulles Airport in Virginia.[5] In addition to the agencies previously specified, we contacted Defense Contract Audit Agency officials on the Planning Research Corporation contract.

We discussed key facts with Commerce, PTO, Office of Management and Budget, General Services Administration, and Planning Research Corporation officials and have included their comments where appropriate. However, in accordance with the requester's wishes, we did not obtain the views of responsible officials on our conclusions and recommendations, nor did we request official agency comments on a draft of this report. Except as noted above, our work was performed in accordance with generally accepted government auditing standards.

[5]Planning Research Corporation's corporate headquarters are in McLean, Virginia

Status of Patent Automation Program

PTO's implementation of the patent automation program has experienced changes and delays. The proposed automated patent system is not yet operational, but PTO recently began limited testing of initial operating features. In 1985, PTO changed its implementation strategy to reflect new program priorities. Improvements in patent quality became the key automation goal; consequently, more effective patent searching was given greater emphasis in the automation program. Program costs of about $65 million are about the same as planned costs through fiscal year 1985. However, the program is over a year behind schedule in implementing the key feature of patent searching. PTO has also extended the planned delivery dates for implementing other system capabilities by 2 to 3 years. In addition, the estimated cost of the prime contract with Planning Research Corporation has now increased by $159 million to $448 million.

PTO Has Made Some Progress in Automating Its Patent Operations

While PTO has not met the schedules established in its 1982 Automation Master Plan, it has made some progress in implementing the patent automation program. From fiscal years 1983 through 1985, PTO has spent $64.8 million for its current patent and trademark automation program: $33.9 million for PTO automation staff and operations, $25.2 million for the automated patent system, $5.0 million for the automated trademark system, and $0.7 million for data base automation. PTO has obtained some system components, such as workstations, and has initiated limited testing of initial capabilities.

In October 1983, Commerce issued a request for proposals for a contractor to design, develop, implement, and maintain the automated patent system. Two vendors responded to this request, and on April 12, 1984, Commerce awarded a cost-plus-fixed-fee contract to Planning Research Corporation. As a system integrator, Planning Research Corporation will obtain and assemble the automated patent system and support its continued operation. The contractor's work was estimated to take 18 years to complete. For its services, Planning Research Corporation is to be reimbursed its costs, originally estimated to be about $275 million, and receive fees, originally estimated to be about $14 million, for a total of $289 million.

Under this contractual arrangement, Commerce periodically allocates funds to pay for Planning Research Corporation's costs. The contractor is not entitled to reimbursement of costs or payment of fees with respect to any activities unless Commerce has previously allocated funds for such purposes. Thus, the government may sever its relationship with

Planning Research Corporation by discontinuing funding of activities. Planning Research Corporation was initially awarded $8.1 million to cover costs and fees associated with the first set of activities. Subsequent activities have been funded through modifications or amendments to the initial award.

Commerce and PTO are responsible for monitoring Planning Research Corporation's acquisition process and for approving all subcontract awards. Planning Research Corporation's principal subcontractor—Chemical Abstract Services—provides software for the system. Through fiscal year 1985, PTO has paid $22.8 million to Planning Research Corporation.

Commerce and PTO, through Planning Research Corporation, have obtained many components of the automated patent system. For example, as of December 1985, Commerce and PTO had authorized Planning Research Corporation to procure 2 large computers, 75 workstations, and several other hardware components. Additionally, Planning Research Corporation plans to procure mass data storage devices using optical disk technology. PTO has acquired much of the operating system software, but the design and development of application software is continuing.

These procurements support the system architecture approved by PTO in September 1984. This planned architecture consists of eight interrelated subsystems: search and retrieval, text and image data base management, workstation services, network control, output generation, data capture, system management, and management services. The search and retrieval subsystem is the heart of the automated patent system because patent examiners will use it to compare patent applications to prior patents. The text and image data base management subsystem will maintain data such as issued patents and patent applications in electronic form. The users' main contact with this system will be through the workstation services subsystem. The most powerful workstations will contain dual-screen, high resolution displays, and local storage and processing capabilities. The network control subsystem will connect all of the subsystems, allowing users to access the other subsystems and to communicate with each other. The output generation subsystem will provide hard copy and electronic copies of information. The data capture subsystem will allow patents and patent applications to be entered into the system in electronic form. The system management subsystem will control and coordinate the system, and the management services

subsystem will support PTO management by monitoring day-to-day operations and maintaining current and historical data on patent applications. Over the life cycle of the system, PTO plans to consider alternatives to this architecture as technology advances.

This architecture and the equipment to support it are not yet operational. As of May 1986, software development was still ongoing. In addition, some equipment, such as dual-screen workstations, had not been installed in the initial test group.

PTO plans to install 24 dual-screen workstations in the test group, 1 of 15 patent examining groups, by July 1986. It plans to complete its evaluation of patent searching in this group by December 1986. PTO does not intend to consider office-wide deployment of these workstations until September 1987, after it has evaluated the system's capability to support patent searching within the performance requirements necessary for efficient searching.

PTO Altered Its Implementation Strategy

In 1985, PTO changed the implementation strategy outlined in its 1982 Automation Master Plan. Originally, PTO intended to test the total concept and system design in one patent examining group before deploying the total system to the remaining 14 groups. Currently, however, PTO plans a more incremental approach. It now plans to test specific capabilities in one group and then incrementally deploy each tested capability to the remaining examining groups.

The 1982 Automation Master Plan identified three system development objectives for patent automation: (1) development of a major new automated system to support all patent functions, (2) development of a data capture/data conversion system to prepare electronic data for the new patent automation system, and (3) enhancement and maintenance of the current management and administrative systems until their functions are absorbed into a new system. To meet these objectives, PTO developed an implementation strategy designed to "prove the concept and system design" before expanding the system further.

PTO's initial implementation strategy anticipated implementing the automated patent system in three stages. During Stage 1 (1983-1984), PTO had planned to develop, implement, and test the system's initial operational capabilities (such as patent searching, office automation, and application file maintenance) in one patent examining group. After successfully completing the evaluation of these features, in Stage 2 (1985-

1987), it had planned to deploy the automated system throughout the remaining 14 patent examining groups. During Stage 3 (1988-1990), it had planned to enhance the system with such items as expanded telecommunication capabilities and a "paperless" public search room. Ultimately, PTO planned to install 3,200 dual-screen and single-screen workstations including one per examiner.

Over 2 years after submitting the Automation Master Plan to the Congress, PTO established different priorities, a decision that led to the revision of automation schedules and objectives. In 1985, PTO changed the foremost goal of patent automation from an efficient paperless office to improved patent quality. According to PTO's original plan,

> "the primary goal of the automation program is to support more fully all PTO processes so that they are completed in a timely and efficient manner. This goal will be realized through a paperless patent and trademark operation.... The objectives of the automation program are designed to support more general objectives established for the PTO itself. These more general objectives are to increase the quality of the patents and trademarks themselves and to decrease the pendency of patent and trademark applications "

In mid-1985, the Commissioner of Patents and Trademarks decided that improved patent quality should be the highest priority goal. Although other automation goals were retained, their immediate importance and priority diminished. Under the new plan, the first priority for patent automation is the implementation of system functions and features that contribute to improved patent quality (such as automated searching). Installing capabilities considered cost-effective and productivity-improving (such as patent copy sales) was given second priority. Finally, application file maintenance was deferred until the two higher priorities have been implemented.

As a result of these new priorities, PTO changed its implementation strategy. Under the new strategy, PTO will incrementally deploy tested system functions to the remaining patent groups immediately after testing and evaluating the features, instead of testing all of the system's planned capabilities at one time. For example, the deployment of patent search capabilities to the remaining patent groups is scheduled to begin by December 1987 and to finish by March 1990. The application file maintenance function, however, is not scheduled to begin until April 1989 or to start deployment to the remaining patent groups until April 1990. Both of these functions (patent searching and application file maintenance) are Stage 1 features that PTO had originally planned to implement office-wide by the end of 1987.

PTO's Automation Program Has Experienced Delays

PTO is behind the original schedule in implementing its patent automation program. Features expected to be completed at the end of 1984 have been delayed until December 1986 through September 1988. Table 2.1 compares the PTO dates of certain features contained in the 1982 Automation Master Plan to those outlined in PTO's revised 1986 Automation Master Plan.

Table 2.1: Patent Automation Program Schedule Slippage

Features		Original estimated dates (1982 Plan)	Revised estimated dates (1986 Plan)	Schedule slippage (in months)
1	Complete evaluation of the patent search capabilities	Dec 1984	Dec 1986	24
2	Complete evaluation of capability to perform professional office automation operations	Dec 1984	Mar 1987	27
3	Establish capability to support the preparation of patent copy sales	Dec 1984	Sep 1988	45
4	Complete capture of image data bases of all U S patents in the testbed patent group	Aug 1984	June 1986	22
5	Complete capture of the image data bases of all foreign patents in testbed patent group	Aug 1984	Dec 1986	28
6	Complete deployment of searching capabilities[a]	Dec. 1987	Mar 1990	27

[a]PTO plans to complete search capability deployment by using 22-28 workstations formed in "clusters," rather than by providing individual workstations as originally envisioned in the 1982 Automation Master Plan PTO, however, still plans to upgrade its system to one workstation per examiner by 1991

In its 1986 revised master plan, PTO stated that future automation tasks would be more predictable and controllable because all but one of the major acquisitions of system components had been completed.

PTO's automation is over a year behind schedule. The 1982 automation plan estimated that the total cost of automation through fiscal year 1985 would be $59.3 million in 1982 dollars. PTO's actual automation program costs through fiscal year 1985 are $64.8 million. The 1986 revised master plan acknowledged that initial system costs were higher than expected. Furthermore, the estimated cost of the system contract with Planning Research Corporation has now increased by 55 percent to $448 million.

Although PTO has experienced these schedule delays and estimated cost overruns, it estimates that total program costs will be $808.2 million,

which is comparable to its 1982 estimates that ranged from $720 to $811 million. The $808.2 million includes the following: $450.9 million for the automated patent system, $130.2 million for automation staff, $91.5 million for automation of the patent data base, $82.4 million for currently operating automated systems, $27.9 million for a new central computer site, and $25.3 million for trademark automation. About 51 percent of these costs are expected to be incurred in the first 8 years (1983-1990) of the 20-year life cycle of the program. PTO has spent only 8 percent or $64.8 million of total estimated costs during the first 3 years of the program (1983-1985). Nevertheless, we are concerned that significant program cost growth may occur considering the delays in system implementation, the higher than expected initial system costs, and the estimated cost increase of the system contract.

Inadequate Planning Has Led to Improper Direction and Control of Patent Automation

PTO has not thoroughly planned its automated patent system. PTO did not adequately perform (1) the required comparative cost analysis of potential system alternatives, (2) a cost/benefit analysis of automation, and (3) a space management analysis of system installation. Consequently, the government has little assurance that (1) PTO's automated patent system is the most efficient alternative for improving operations, (2) automation benefits will exceed costs, and (3) PTO's system configuration can be effectively and efficiently installed in PTO's facilities. Furthermore, Commerce did not carry out its oversight responsibilities to ensure that the proposed program was properly planned.

PTO Has Not Adequately Considered Alternatives to the Automated Patent System

According to Federal Property Management Regulation, 41 CFR 101-35.209,[6]

"a comparative cost analysis shall be performed for each requirement to determine which alternative will meet the user's needs at the lowest overall cost over the system/item life "

Agencies are required to consider alternatives such as (1) the use of non-ADP resources to satisfy the requirement, (2) the use of existing ADP facilities and resources on a shared basis, or (3) the use of commercial ADP services.

In a November 1985 letter to us, the PTO Deputy Administrator for Automation stated that PTO considered this requirement but prepared no documents to support the analysis. According to this official, this requirement applies to computer system replacements and "has questionable applicability to totally new systems, except to question whether or not one could use installed computers." In our opinion, this requirement is critical in ensuring economical acquisition of new systems. Furthermore, Federal Procurement Regulation, 41 CFR 1-4.1103-2, required consideration of the operational and economic feasibility of alternatives for the acquisition of initial ADP capabilities.

Commerce adhered to General Services Administration Temporary Regulation 64 in submitting its August 1983 agency procurement request to the General Services Administration for the automated patent system. This regulation required agencies to cite their completed comparative

[6]The Federal Property Management Regulation, Subchapter F, the applicable regulation for the acquisition of the automated patent system, has been superseded by the Federal Information Resources Management Regulation This current regulation also requires that agencies perform a comparative cost analysis of alternatives

cost analysis in agency procurement requests. In its agency procurement request, Commerce stated that a comparative cost analysis was completed in December 1982. Commerce officials stated that the initial December 1982 PTO Automation Master Plan generally satisfied this requirement. However, the plan did not clearly present the costs of system alternatives.

In addition Commerce has expressed concern that PTO did not present any system alternatives in its recent automation master plan In its comments on a draft of PTO's cost/benefit analysis, Commerce stated that PTO should include the costs of alternatives in order to show which alternative is the most cost-beneficial. Despite these comments, PTO did not revise its analysis to show alternatives. Commerce officials later stated that they were satisfied with PTO's oral explanation of the cost/benefit analysis. According to the PTO Deputy Administrator for Automation, it is now too late to consider system alternatives because the program is in the process of being implemented.

PTO apparently believed that the congressional mandate for an automation plan provided a mandate to implement an automated system with little regard to cost. The January 1986 Automation Master Plan states that

"[t]he U.S. Congress called for the USPTO [United States Patent and Trademark Office] to develop a plan to automate all operations and not be limited by costs [underscoring added]. The original plan, following this direction, focused on automating virtually all aspects of patent automation "

The Congress stated that PTO should not be concerned with how its proposal would be funded; the Congress did not state that PTO should plan a program unlimited by costs. The congressional requirement states.

"The report shall specify the cost of implementing the plan, how rapidly the plan can be implemented by the Patent and Trademark Office, without regard to funding [underscoring added] which is or which may be available for this purpose in the future."

In the absence of a thorough cost comparison of alternatives for automating patent operations, the government has little assurance that the automated patent system is the most efficient and economical method to achieve its goals.

PTO Did Not Adequately Assess Automation Costs and Benefits

Federal regulations require that PTO consider the costs and benefits of its planned automation program. In April 1985, we reported that PTO's initial 1982 cost/benefit analysis was inadequate. The latest version of the analysis, completed in January 1986, lists total automation costs of $808.2 million, PTO benefits of $726 million ($703 million for patents and $23 million for trademarks), and public benefits of $1.19 billion. The analysis also states that the automation program will result in numerous non-quantifiable benefits. However, this analysis inadequately assesses the costs and benefits of automation because it excludes certain types of costs totaling at least $51 million, overstates PTO's benefits by $444 million, and claims questionable public benefits of $1.19 billion. Although Commerce questioned the adequacy of the analysis and recommended that numerous changes be considered, PTO did not make many of the suggested changes. As a result, the revised analysis is a questionable decision-making tool for agency management and the Congress.

Regulations Required a Cost/Benefit Analysis

When PTO completed its original cost/benefit analysis in December 1982, Federal Property Management Regulation 41 CFR 101-35.207,[7] required agencies to justify automation activities with a comprehensive requirements analysis. As part of this analysis, it required agencies to consider the costs and benefits that result from automation. Commerce directed PTO to comply with the National Bureau of Standards' Federal Information Processing Standards Publication 64, which provides guidance on preparing a cost/benefit analysis for acquiring ADP systems

In our April 1985 report on the automation of trademark operations, we reported that PTO's December 1982 cost/benefit analysis for patents and trademarks was inadequate because (1) trademark costs and benefits were not discounted to reflect the time value of money and (2) assumptions made as part of the analysis of trademark automation lacked analytical support and were disputed within PTO. PTO submitted its revised cost/benefit analysis to Commerce covering both trademark and patent automation in October 1985. According to Commerce, this analysis did not present a "convincing case and it [would] not stand up against a critical review." On November 15, 1985, PTO issued a revised analysis based on the comments received from Commerce. Commerce officials stated that they were satisfied with the revised analysis because PTO provided oral explanations on the Commerce comments that were not addressed.

[7]The Federal Information Resources Management Regulation, which superseded the ADP and Telecommunications Subchapter of the Federal Property Management Regulation, also requires a comprehensive requirements analysis

Commerce approved the analysis and sent it, along with the rest of the Automation Master Plan, to the Office of Management and Budget for review in December 1985. Commerce subsequently submitted the revised January 30, 1986, plan to numerous congressional committees in February 1986.

PTO's Analysis Excluded Certain Costs

The January 1986 PTO cost/benefit analysis excluded significant costs of the automation program. PTO's analysis estimated that the automation program would cost $808.2 million. This estimate excluded certain types of costs that Federal Information Processing Standards Publication 64 states should be included. According to the PTO Administrator for Automation, these costs were not included because they could not be accurately estimated. While the total magnitude of all excluded costs has not been determined, we obtained estimates of a portion of the excluded costs that show these are at least $51 million.

According to Publication 64, a cost/benefit analysis should include the costs of acquisition, development, operation, and maintenance activities. PTO's analysis excluded the costs of all planned dual-screen examiner workstations, user site preparation, lost production, personnel and equipment relocation, area specific training, additional office furnishings, printer operators, and patent examiners detailed to the Office of Automation. We did not determine the total dollar value of these categories because PTO could not readily provide us with the information, but we did obtain estimates for the excluded dual-screen workstations and for part of the site preparation and patent examiner costs.

Based on recent contractor and PTO cost estimates, we determined that between $42 million and $60.2 million in planned workstation costs were excluded from the PTO cost/benefit analysis. According to a February 1986 Planning Research Corporation life-cycle cost estimate, $60.2 million in workstation-related costs and fees were not included due to the introduction of workstation clusters and "the abandonment of the workstation per examiner concept." This cluster concept is a PTO deployment strategy where examiners will spend about 25 to 30 percent of their time at workstations, thereby reducing the number of needed workstations. The PTO cost/benefit analysis only includes the costs associated with this cluster concept, even though the January 1986 Automation Master Plan states that "the original concept of providing an electronic workstation to each examiner should be accomplished by 1991."

Because PTO plans to eventually have one workstation per examiner, the costs associated with these additional workstations should be included in the cost/benefit analysis. The PTO Administrator for Automation agreed that these additional workstations were not included but pointed out that the costs of 1,600 additional text terminals, a component of the cluster concept, were included. These additional 1,600 terminals were estimated to cost $18.2 million in the cost/benefit analysis. However, even if the full 5-year leasing costs of these terminals were included in the analysis, PTO still plans to obtain the additional workstations. Therefore, the minimum amount of costs incurred would be the additional workstation costs ($60.2 million) less some amount, if any, of unspent funds for the text terminals (up to $18.2 million), resulting in excluded costs of at least $42 million.

The estimates that we obtained for a portion of the excluded site preparation and the cost of detailing patent examiners to the program totaled about $9 million. According to PTO's fiscal year 1987 budget request, site preparation for only 180 examiner dual-screen workstations and 200 single-screen text terminals will cost $1.6 million. This equipment is only a portion of the amount required for the potential total of up to 1,676 dual-screen workstations and 1,600 terminals. In addition, the cost of detailed patent examiners is significant. To provide a user perspective on the automation program, in 1983 PTO detailed patent examiners to assist in system development. PTO expects to use them throughout the 20-year life cycle of the program. Since these examiners will not be analyzing patent applications, this lost production is a cost of the automation program. Furthermore, PTO estimates that the salaries and fringe benefits of these detailees will amount to $7.4 million for a 5-year period from 1985 to 1989.

Benefits Are Overstated

PTO's cost/benefit analysis overstated benefits of the patent automation program. Of the $703 million claimed in PTO patent automation benefits, the analysis included $444 million in cost avoidances that are not direct benefits of the patent automation program and thus under federal guidance should not have been claimed.

According to the analysis, $444 million is an estimate of the cost of changes that would have been made in paper file maintenance and methods of use to improve patent quality without the automated patent system. However, this type of cost avoidance is an alternative to, not a benefit of, the patent automation program. According to Publication 64, a cost avoidance benefit should "describe avoidance of future costs that

would be incurred if the best alternative were chosen from a set of alternatives, compared to maintaining current operations" (underscoring added). The $444 million does not represent the cost of maintaining current operations; rather, it is an alternative cost for improving current operations. Therefore, the $444 million is not a benefit of patent automation.

PTO's fiscal year 1986 and 1987 budget requests illustrate that the agency considers this benefit to be questionable. In 1983, the House Committee on Appropriations directed PTO to compare the planned costs, benefits, and schedule for the automated patent system, as shown in the original Automation Master Plan, to the actual costs, benefits, and schedule. In both fiscal year 1986 and 1987 budget requests to the Congress, PTO stated that the automation program did not have any benefits for fiscal years 1984 and 1985, respectively, even though its cost/benefit analysis claimed that cost avoidance benefits from automation were $19.9 million in 1983, $20.0 million in 1984, and $20.8 million in 1985. According to a PTO Office of Automation budget analyst, the cost avoidance benefits, part of the $444 million claimed from 1983 to 2002, are not "hard savings" and, therefore, were not included in the congressional requests.

In the latest revision of its analysis, PTO did not change its description of cost avoidance figures from benefits to alternatives, even though Commerce suggested that it do so. According to the PTO Administrator for Automation, Publication 64 is only general guidance for agencies to use in preparing cost/benefit analyses; therefore, PTO was not constrained to follow it exactly. Nevertheless, Commerce directed PTO to follow Publication 64. Therefore, the $444 million in claimed benefits should be characterized only as the cost of an alternative, not as a benefit.

Litigation Benefits Are Questionable

PTO's claim that litigation avoidance benefits will total $1.19 billion due to improved patent quality is questionable. PTO claimed that quantifiable benefits would result from the avoidance of costly litigation involving patent rights for which the public ultimately pays. According to PTO, improvements in patent quality will result in stronger patents, which in turn will result in greater acceptance and recognition that will reduce the volume of patent litigation, and therefore, result in litigation avoidance benefits. PTO had determined that these litigation avoidance benefits would total $1.19 billion from 1988 to 2002.

In computing savings from reduced litigation, PTO initially estimated that the total annual costs of patent litigation would range from about $700 million in 1988 to about $1 billion in 2002. It assumed that litigation avoidance benefits would begin with a 3.3-percent cost avoidance in 1988, a 6.6-percent cost avoidance in 1989, and a 10-percent annual avoidance from 1990 through 2002. Based on these assumptions, PTO estimated that improved patent quality would avoid litigation costs amounting to about $1.19 billion from 1988 to 2002. PTO's litigation avoidance benefits of $1.19 billion are questionable for the following reasons:

- PTO has not demonstrated that litigation avoidance benefits will occur as a result of automation. The annual 10-percent reduction is based on officials' judgment that higher quality patents resulting from automation will lead to reduced litigation. PTO officials stated that they had not included litigation avoidance benefits in earlier versions of the cost/benefit analysis because of the difficulty in obtaining empirical evidence to value these benefits. PTO eventually included these benefits in its revised analysis at the urging of Commerce, even though it had obtained no new evidence of the value in its revision of the analysis.
- In our 1980 report, we found that the high number of patents overturned by the courts appeared to be a poor measure of patent quality because (1) less than 1 percent of all patents are ever litigated, (2) an unknown number of patent challenges are settled out of court, and (3) an unknown number are subjected to intensive validity studies by patent attorneys who then decide not to contest the patent.
- PTO cannot adequately validate an improvement in patent quality because it does not have an agency definition of "quality." In 1980, we reported on the automation of the patent search process. We found that (1) PTO officials stated that patent quality is subjective and that quantitative measures do not exist and (2) PTO officials were unsure of the current quality of the patent process and conceded that, lacking measures, they did not know what the quality level should be. As of April 1986, PTO did not have an agencywide definition of "quality." Therefore, it could not adequately assess the current level of quality and validate whether quality actually will improve due to automation. However, the Administrator for Automation told us that PTO planned to define a set of measurements as quality indicators and to compare and analyze these indicators in system testing and evaluation.

Commerce Did Not Require Changes in PTO's Analysis

Commerce provided PTO with several critical comments on the October 1985 cost/benefit analysis. For example, Commerce told PTO that all relevant costs of the program should be included in the cost/benefit analysis. However, as previously discussed, PTO excluded several types of costs from the analysis. In another instance, Commerce stated,

"The analysis should describe and present alternatives separately and clearly for comparison.... This should, at a minimum, include the items covered in the cost-benefit analysis in FIPS Pub 64 [Federal Information Processing Standards Publication 64]."

In its analysis, PTO did not present alternatives and did not include the previously mentioned items covered in Publication 64.

Although PTO did not make all of the Commerce-recommended changes in its revised cost/benefit analysis, Commerce approved this revised version and forwarded it to the Office of Management and Budget for review. Commerce Office of Information Resources Management officials agreed that PTO did not make all requested changes but added that they recommended approval of the analysis because PTO officials gave them sufficient oral explanation of their positions on the comments that remained outstanding. Therefore, according to Commerce officials, it was unnecessary to pursue their comments further.

PTO Has Not Done a Space Management Study

Federal Property Management Regulation, 41 CFR 101-35.207, required that agencies prepare a comprehensive requirements analysis before acquiring ADP systems.[8] The analysis must include consideration of critical space management factors, such as heat dissipation, air flow, and temperature range. Over 3 years after the first master plan was published and 2 years after the prime contract for patent automation was awarded, PTO has not completed the required space management study. Although PTO considered performing a space management analysis in 1983, as of May 1986, it had not completed this task. The lack of a space management study has resulted in uncertainty and confusion concerning the cost, schedule, and ultimate configuration of the automated patent system.

[8]The Federal Information Resources Management Regulation, which superseded the ADP and Telecommunications Subchapter of the Federal Property Management Regulation, also requires analysis of space management factors

In a November 1983 memorandum to the Administrator for Automation, PTO's Office of General Services stressed the importance of space considerations, stating that

"[a] myriad of procurement and space regulations coupled with the nuances of dealing with GSA [General Services Administration] and Charles E. Smith companies [building owner and manager] oftentimes require specific approval, extensive lead times and/or particular acquisition methods If these requirements are not taken into consideration during planning stages, implementation of proposed plans may be thwarted or seriously delayed."

In June 1984, another PTO memorandum called for immediate action to determine whether the capacity of existing air-conditioning systems could handle the increased cooling requirements of the planned system. PTO later requested that the building manager prepare a cost estimate for this study. In late 1984, the building manager reported that a complete engineering study could be conducted for $180,000. PTO officials explained that the space management analysis was not done at that time because the Office of Automation had not anticipated the high cost of the study.

In May 1985, a year after the prime contract was signed, PTO officials recognized that the anticipated building renovation costs and schedule slippages caused by the workstation power and cooling requirements could constitute a serious problem. PTO officials realized that major renovation of existing buildings could be required because of the electrical power and cooling necessary to implement an automation plan that could provide workstations and printers for most individuals throughout PTO. At the same time, the PTO Commissioner reordered the priorities of implementing the complete automated patent system to emphasize those features that PTO considered the most direct steps toward improving the quality of issued patents.

The renovation concerns and reordered priorities led to a change in the PTO automation strategy. This new strategy called for a cluster concept of workstations (22 to 28 in a group). PTO officials anticipate that the cluster arrangement will require less building renovation (and consequently less cost and schedule impact) than the previous plan for the full deployment of individual workstations.

Although the cluster concept might provide an answer to some of the power and cooling problems, it represents a significant departure from PTO's original patent automation plan. Under the original plan for full

deployment of workstations, each examiner would use individual workstations continuously. With clusters, examiners would spend only 25 to 30 percent of their time at the workstation. PTO, however, still anticipates that the ultimate system configuration will result in one workstation per examiner by 1991.

In September 1985, PTO began the space management analysis process by requesting an architectural-engineering design study to determine the system deployment alternative most beneficial to the government. This study is now estimated to cost about $500,000 and is expected to require 31 weeks to complete after initiation. The study had not been initiated as of May 1986.

According to the Administrator for Automation, PTO addressed facilities evaluation issues at the proper times in the automated patent system planning and development cycles and in compliance with Federal Property Management Regulation 41 CFR 101-35. We believe, however, that the regulation is clear in stating that analyses of space management considerations are critical factors to be used in support of an acquisition—not following the award of a contract.

Commerce Oversight Was Deficient

Although the Paperwork Reduction Act requires federal departments to effectively manage ADP resources, Commerce's role in overseeing PTO's current automation program was minimal until mid-1985. Based on the legislative mandate to PTO to plan for automation, Commerce allowed PTO to proceed with its automation program without adequate oversight. After the Congress and our office expressed concern over the management of PTO's trademark automation project, Commerce increased its oversight of the total program.

Commerce Did Not Exercise Control Over PTO Automation

According to Commerce Office of Information Resources Management officials, they lacked effective authority to direct PTO action. They explained that PTO had a history of not responding to Commerce ADP planning requirements. According to Commerce officials, their lack of effective authority developed as a result of the congressional mandate for PTO's initial Automation Master Plan. They explained that after the plan was approved by Commerce, the Office of Management and Budget, and the Congress, PTO adopted a "holier than thou" attitude toward Commerce oversight. According to Commerce officials, PTO believed that

the congressional mandate for the Automation Master Plan gave it sufficient authority to independently plan and implement the automation program.

The Commerce Office of Information Resources Management's historic relationship with PTO is highlighted in the following example. In response to Commerce's ADP management planning requirements, PTO submitted its fiscal year 1983 ADP management plan. This plan sought Commerce's approval for initiating projects that PTO had identified in its original Automation Master Plan. The Commerce Office of Information Resources Management did not endorse this fiscal year 1983 ADP management plan because pertinent requirements documentation was missing and because costs of alternative solutions were not provided. PTO did not provide the requested information and proceeded with its automation program in accordance with the Automation Master Plan.

After this exchange, Commerce's Office of Information Resources Management and PTO had little communication for approximately a year, according to Commerce Office of Information Resources Management officials. These officials added that after some personnel changes within their office, they persuaded PTO to submit a fiscal year 1984 information technology plan. In August 1984, according to Office of Information Resources Management officials, their office approved this plan in order to re-open lines of communication with PTO.

Commerce Has Increased Its Oversight of PTO Automation

Commerce increased its involvement in PTO's automation effort in mid-1985 in response to congressional criticism of PTO's automation program and our April 1985 report on trademark automation. For example, Commerce initiated a task force to review PTO automation and requested that its National Bureau of Standards review the technical aspects of PTO automation.

Subsequent to our April 1985 report, top Commerce management and the Commissioner of Patents and Trademarks established a task force of experts from several disciplines within the department to study PTO's automation management practices and the adequacy of departmental oversight of the automation project. The task force concluded that PTO

had taken numerous corrective actions in response to criticisms of PTO management and the automation project. However, their report stated that

"we are concerned that several areas which are central to the success of the [automation] project, mainly procurement and ADP planning and management, still require substantial effort on the part of both PTO and the Department to better support the Automation Project."

In addition, Commerce's Deputy Secretary requested that Commerce's National Bureau of Standards' Institute for Computer Sciences and Technology conduct an overall technical evaluation of the automation project. Consequently, the National Bureau of Standards issued two reports: one on trademark automation in July 1985 and the other on patent automation in September 1985.

The report on patent automation found that PTO and its prime contractor developed a system architecture for the automated patent system that can be expected to meet the stated requirements for the system, as long as certain areas of technical risk are resolved. The report stated that

"the Automated Patent System is a large, complex system, with inherent high development risk because of the system's size, complexity, and the use of leading edge technology. This risk is inherent for a system such as this, and is not a result of any problem or deficiency in planning or development to date "

This report identified the area of greatest technical risk as systems integration: the integration of all of the leading edge technological subsystems into a system that provides the required functionality and performance. It recommended that "rather than evaluating individual system components and functions in a piecemeal fashion, existing and additional plans for evaluating parts of the system should be combined into a comprehensive evaluation plan for the extended testbed" before PTO commits the government to large-scale hardware procurements.

PTO plans to install 24 dual-screen workstations in the initial test group by July 1986 with the evaluation of patent searching in this group scheduled to be completed by December 1986. Based on the results of this evaluation, PTO plans to then decide in September 1987 whether to deploy hundreds of workstations office-wide. In this regard, the Director of the Center for Programming Science and Technology, of the National Bureau of Standards' Institute for Computer Sciences and Technology, stated in April 1986 that he was concerned that two critical system components may not be tested as part of this evaluation because

they will not yet be available. As of May 1986, PTO, through Planning Research Corporation, had not yet issued the request for proposals for the mass storage devices that will maintain much of the patent data. In addition, PTO does not plan to include another important system component—computers to be used for searching patent data—in the overall evaluation. According to the National Bureau of Standards' official, PTO should incorporate all critical components in its evaluation to ensure that the government minimizes the system's risk before major additional hardware procurements are approved.

During mid-1985, Commerce's executive management expressed concern about PTO automation. In providing feedback to the Commissioner on PTO's fiscal year 1987 budget request, Commerce's Deputy Secretary stated,

"I am concerned that the Revised [Automation Master] Plan presents an automation program that is significantly scaled-down from the original Automation Master Plan while requiring a higher investment of funds through 1991."

In addition, as part of Commerce's fiscal year 1985 Financial Integrity Act reporting requirements, the Secretary of Commerce reported inadequate management practices in connection with PTO's automation efforts as one of ten departmental material weaknesses. The Secretary reported that the department had reviewed the automation program and identified "a number of shortcomings in the Department's and PTO's management practices and also in the financial management over the Planning Research Corporation (PRC) contract." The Secretary stated that the department had taken actions to correct these shortcomings. These actions included establishing the management task force previously discussed and requesting the National Bureau of Standards to review the technical aspects of the program.

On March 21, 1986, the Assistant Secretary for Administration appointed a new Deputy Assistant Secretary for Special Programs. The patent automation program is one of his primary responsibilities. In addition, the Deputy Secretary of Commerce recently reported to us that the department was continuing to actively monitor the PTO automation program.

Commerce and PTO Have Not Effectively Managed the Automated Patent System Contract

Commerce and PTO management of the automated patent system procurement has not been effective. Commerce awarded an inappropriate cost-plus-fixed-fee contract that is not being adequately monitored. Although Office of Management and Budget Circular A-109 prescribes a phased acquisition strategy to provide increased assurance that major systems such as the automated patent system will operate as expected before significant expenditures are made, Commerce waived application of the circular. Commerce and PTO subsequently entered into a contract for all phases (design, development, implementation, and maintenance) of the automated patent system that is estimated to take 18 years to complete. Federal regulations and guidelines indicate that while cost-reimbursement contracts may be appropriate for the initial phases of the project, firmer prices should be established during the later phases so the government can minimize the risk of cost growth. Furthermore, although federal regulations stipulate that cost-plus-fixed-fee types of contracts require close monitoring by the government due to the minimal risk imposed on the contractor, Commerce and PTO have not effectively monitored and administered this contract. PTO now estimates that the cost of this contract will increase by $159 million to $448 million, and several of the contractor's products are significantly behind schedule.

Commerce Waived the Office of Management and Budget Circular A-109 Acquisition Policy

Commerce waived application of Office of Management and Budget Circular A-109 and subsequently awarded an incrementally funded, cost-plus-fixed-fee contract for the PTO automated patent system. This circular prescribes a procurement strategy for agencies to use in acquiring major systems. Although the automated patent system is a major system, Commerce elected to waive this requirement. Commerce maintained that the provisions of the circular were not applicable because it considered the system to be off-the-shelf and it believed that A-109 did not apply to a single, one-of-a-kind system. However, the automated patent system is not off-the-shelf. Furthermore, A-109 applies to all major systems even if the system is one-of-a-kind.

Circular A-109 Prescribes a Major System Acquisition Strategy

Office of Management and Budget Circular A-109, dated April 1976, establishes policies to be followed by executive branch agencies in the acquisition of major systems. According to the Office of Management and Budget, the circular is intended to effect reforms that will reduce cost overruns and diminish the controversy associated with whether new systems are needed. It is designed to ensure effectiveness and efficiency in acquiring major systems.

The circular requires agencies to establish clear lines of authority, responsibility, and accountability for management of major system acquisition programs and directs a phased contracting approach for system acquisition. Major system acquisitions are defined as those that (1) are directed at, and critical to, fulfilling an agency mission, (2) entail the allocation of relatively large amounts of resources, and (3) warrant special management attention.

The Circular A-109 strategy uses demonstration tests between competing vendors to obtain system performance information before awarding the contract for the installation of the system, thereby allowing design and engineering changes to be made early and providing increased assurance that the system will operate as expected before large amounts of money are spent. After design, the circular prescribes competitive demonstrations leading to full-scale system development. According to the circular, awarding an implementation contract without adequate assurance that the system will meet performance requirements could lead to higher costs, schedule delays, or an installed system that does not perform as required. Thus, the circular prescribes a phased system acquisition approach including competitive test demonstrations of the proposed system. Agencies are required to obtain maximum practicable competition to ensure that the government's needs are satisfied at the lowest cost.

Commerce Department Administrative Order 208-3, which prescribes the policy, procedures, and responsibilities for implementing the provisions of the circular, applies departmentwide to the acquisition of major systems. As allowed by A-109, Commerce's policy establishes additional criteria for defining a major system as having research, development, test, and evaluation costs of more than $10 million, or production costs of more than $30 million. The automated patent system meets these criteria because the system contract for the design, development, implementation, and maintenance phases was awarded at an estimated cost of $289 million.

Commerce Waived Circular A-109

In October 1983, the Assistant Secretary for Administration granted PTO a waiver from the process prescribed by Circular A-109 for the acquisition of the automated patent system even though the automated patent system was a major system, as defined by the circular and the Com-

merce order. The Assistant Secretary's waiver memorandum to PTO's Commissioner stated the following:

"I am granting a waiver from the process prescribed by OMB Circular A-109 as implemented by Department Administrative Order (DAO) 208-3 in the acquisition of the Automated Patent System. The procurement strategy developed by our respective staffs is to acquire state-of-the-art, off-the-shelf, and commercially available hardware and software to the extent possible. Since the provisions of A-109 envision competing designs, its provisions are not suitable for our off-the-shelf, single system approach "

In discussing the propriety of the waiver decision, the Director of Commerce's Office of Procurement Operations explained that the departmental order implementing Circular A-109 allows the Secretary of Commerce to establish additional criteria to define major systems. This official stated that the waiver constituted an additional criterion. However, in our opinion, if waivers were considered additional criteria, existing criteria for defining a major system would be meaningless because an agency could simply issue a waiver whenever it did not want a system to be acquired under the A-109 process. The only additional criteria Commerce established were the dollar thresholds cited above, which the automated patent system clearly exceeded.

Although the waiver states that the automated patent system's software and hardware will be off-the-shelf and commercially available, PTO's revised Automation Master Plan states that "significant amounts of application software must be designed and developed" to support the automated patent system. As early as March 1983, PTO informed Commerce:

"For the patent examiner workstation, the required combination of dual-screen display on high-resolution graphic images does not currently exist in an integrated off-the-shelf package. Consequently, it will be necessary to undertake special design and development, with prototype units to be delivered...."

PTO's Administrator for Automation, in referring to the availability of technology for the automated patent system, stated that "the greatest area of risk in terms of available shelf componentry was in the electronic workstation, which we did not see in existence anyplace else." He also stated that "there were not any off-the-shelf systems that were capable of satisfying the total set of requirements."

More recently, a 1985 National Bureau of Standards technical review of the program stated that the automated patent system is a large, complex

system, with high development risk, because of the system's size, complexity, and use of "leading edge" technology. According to the National Bureau of Standards, the largest risk in the development of the system is integrating all of the leading edge technological subsystems into a system that provides the required functionality and performance.

Commerce also maintained that the A-109 approach was not suitable for a single, one-of-a-kind system such as PTO's. An internal Commerce memorandum discussing this issue stated,

"The rationale is that competitive designs required under the A-109 policies are not applicable to available hardware buys where development is not a requirement and where we are not buying multiple copies of a system "

The Director of Commerce's Office of Procurement Operations added, "the provisions of A-109 were not suitable to our single system approach...." However, the circular explicitly states that it applies to all programs for the acquisition of major systems even if the system is one-of-a-kind.

The Office of Management and Budget recently questioned the basis for Commerce's waiver. In a February 6, 1986, memorandum on PTO's automation project, it stated:

"First, we question the basis on which the A-109 waiver was provided; however, since the PTO is following the intent of Circular A-109 we see no reason to mandate full compliance at this time Second, it is preferred that a long term system-integration contract not exceed 10 years and be based on annual fixed-price options "

While Office of Management and Budget officials explained that PTO's approach followed the intent of A-109 by involving high-level agency officials and competitively selecting subcontractors, they agreed that the Planning Research Corporation contract was not consistent with policies intended in the circular.

Commerce and PTO pursued an acquisition strategy that differed from the phased approach prescribed by Circular A-109. The A-109 approach envisions the award of separate contracts commensurate to the complexity of the project phases. However, instead of following A-109 guidance, Commerce and PTO merged the phases of the automated patent system acquisition into a single, incrementally funded, cost-plus-fixed-fee contract that provides a minimal amount of cost responsibility on the contractor. In our opinion, the combining of the design, development,

implementation, and maintenance phases into one contract is not consistent with the circular nor is it a prudent acquisition approach for the automated patent system.

Commerce Awarded an Inappropriate Contract for the Automated Patent System

Although federal regulations and General Services Administration guidelines caution agencies in their use of long-term, cost-plus-fixed-fee contracts, Commerce awarded a cost-plus-fixed-fee contract to Planning Research Corporation for the automated patent system that is estimated to take 18 years to complete. This contract is for the design, development, implementation, and maintenance of the automated patent system and was originally estimated to cost $289 million. Federal regulations and guidelines indicate that a better procurement strategy is the use of multiple contracts for the different phases of the acquisition in order to correlate the type of contract awarded with the contractor's risks. In March 1986, Planning Research Corporation officials told us that the automated patent system project had progressed to the point that a firm-fixed-price contract could be established. However, they did not offer to have their cost-plus-fixed-fee contract changed accordingly.

Federal Regulations and Guidelines Caution Agencies Against Long-Term Cost-Plus-Fixed-Fee Contracts

PTO was required to follow the Federal Procurement Regulation in obtaining a contractor for the automated patent system. This regulation, issued by the General Services Administration, provided direction on the types of contracts agencies should award and cautioned agencies in their use of long-term, cost-reimbursement type contracts.[9] Under a cost-plus-fixed-fee contract (a cost-reimbursement type), the government reimburses the contractor for all costs associated with the contract as well as a pre-determined fixed-fee. The fixed-fee, once negotiated, does not vary with actual costs incurred unless there is a change in the work or services performed.

According to the Federal Procurement Regulation, 41 CFR 1-3.405-5(a), because the fee does not change relative to the amount of costs incurred by the contractor, "the cost-plus-fixed-fee contract provides the contractor with only a minimum incentive for effective management control of costs." These regulations also stated that, relative to other types of

[9]Applicable sections of the Federal Procurement Regulation have been superseded by the Federal Acquisition Regulation and the Federal Information Resources Management Regulation The Federal Acquisition Regulation also cautions agencies in their use of long-term, cost-reimbursement type contracts According to the Federal Acquisition Regulation, 48 CFR 16 103(c), "In particular, contracting offices should avoid protracted use of a cost-reimbursement or time-and-materials contract after experience provides a basis for firmer pricing "

contracts, such as fixed-price or cost-plus-incentive-fee contracts, under cost-plus-fixed-fee contracts, "the contractor's cost responsibility is...minimal." The regulations further cautioned that

"for a single contract running for a lengthy term. .the repetitive or unduly protracted use of cost-reimbursement type ..is to be avoided where experience has provided a basis for firmer pricing which will promote efficient performance and will place a more reasonable degree of risk on the contractor."

Additional General Services Administration guidance suggests system acquisition methods that agencies should consider, particularly for procurements involving both system design and implementation. A General Services Administration May 1981 bulletin states:

"To the extent possible, agencies should ensure that the major portion of their overall systems engineering budgets are awarded on the basis of fixed-price contracts for specified fixed products. If requirements for the final system or a major portion of it are not well enough defined to be contracted for on a fixed-price basis, the agency should consider awarding a smaller cost-reimbursement contract for requirements definition so that a subsequent fixed-price type arrangement can be employed. .. Only in unusual situations should more than half of the overall systems engineering budget be contracted for on a cost-reimbursement basis. When used, however, a cost-plus-incentive fee (CPIF) or cost-plus-award-fee (CPAF) should be considered."

Commerce Awarded a Cost-Plus-Fixed-Fee Contract for PTO's Automated Patent System

On August 5, 1983, Commerce submitted an Agency Procurement Request to the General Services Administration detailing its need for a contractor for the automated patent system. This procurement request "anticipated that the contract type will be cost reimbursement, with some form of incentive." About a month later, the General Services Administration granted Commerce a Delegation of Procurement Authority based on this request.

On October 14, 1983, Commerce issued a Request for Proposals that anticipated the award of a cost-plus-fixed-fee contract. According to Commerce's Director of the Office of Procurement Operations, Commerce intended to negotiate an incentive fee or an award fee contract when the procurement request was submitted but reluctantly abandoned the idea because Commerce and PTO could not identify reasonable technical and award fee parameters to judge the contractor's performance. In addition, the Director stated that a major obstacle to awarding an incentive-type contract for the automated patent system was his office's lack of experience with this type of contract.

Commerce decided to award the cost-plus-fixed-fee contract based upon its Contracting Officer's determination that PTO's requirements were so complex that it was impracticable to accurately determine costs for system design or development at the time of contract award. In addition, this Contracting Officer added that final costs could not be determined until the system design was completed. According to the Commerce Director of Procurement Operations, Commerce and PTO needed a long-term contract because

"PTO was looking for a secure and stable contractual relationship that provided the contractor and subcontractors with an incentive to develop a system that would perform well and enhance their corporate reputations."

The Director added that a series of contracts conforming to system phases (as prescribed by Circular A-109) would reduce stability, increase the possibility of delays, and eliminate the "learning curve" benefits of contractor continuity.

According to the federal regulations, cost-reimbursement contracts are suitable when contract performance cannot be estimated with sufficient reasonableness for the use of fixed-price contracts, and fixed-price contracts are appropriate when design and performance specifications are available and fair and reasonable prices can be established. Therefore, cost-plus-fixed-fee contracts may be appropriate during the early phases of the acquisition process, such as design and development, when the system design and performance specifications are uncertain. During later phases of the acquisition process, such as implementation and maintenance, the design and performance requirements should be adequately defined so that a cost-plus-fixed-fee contract is no longer necessary and the contractor can assume more cost risk.

In our opinion, PTO's system is the type of acquisition particularly suited to the phased contracting approach suggested by federal regulations and guidance. The Contracting Officer at the time of contract award asserted that final costs could not be determined until the system design was completed. We believe that cost-type contracts may be warranted for some systems for the initial uncertain design period, but firmer pricing should be established after this period is completed. Such multiple contracts of shorter duration would allow full competition for all system phases and place more stringent cost control incentives on the contractor. In March 1986, Planning Research Corporation representatives stated that the automated patent system project had progressed to the

point that a firm-fixed-price contract could be established. These officials added that, with minor additional work and within 1 year, the system definition could be further specified and functional and technical baselines and schedules could be established to allow this contract conversion.

The current Contracting Officer, when asked whether Commerce could renegotiate a different type of contract with the contractor, replied that "there is no incentive for them [the contractor] to cooperate in such an effort because any other contract type would increase their risk." The Contracting Officer added that, although it would be difficult, it might be in the government's best interest to convert the contract type and that Commerce and PTO would continue to analyze this issue. General Services Administration officials agreed that Commerce should consider recompeting the contract for the implementation and maintenance phases. Similarly, in a February 6, 1986, memorandum to Commerce on PTO's automation program, the Office of Management and Budget stated that

"it is preferred that a long-term system integration contract not exceed 10 years and be based on annual fixed-price options ... We strongly recommend that the subject of an incentive fee be discussed with the contractor."

In July 1986, the Contracting Officer stated that Commerce, PTO, and Planning Research Corporation officials were discussing the possibility of revising the contract to include an incentive fee provision.

Commerce and PTO Have Ineffectively Administered the Prime Contract

According to Federal Procurement Regulation, 41 CFR 1-3.405-1(b), it was essential that, for cost-reimbursement contracts, the government perform adequate surveillance of the contractor.[10] This requirement aided the government in assuring the propriety of contractor-incurred costs. Commerce and PTO, however, have not effectively administered the Planning Research Corporation contract, as indicated by the following:

- PTO and Commerce could not accurately measure contractor performance because the contract reflected an obsolete implementation strategy.
- PTO and Commerce officials did not agree on the definition of the contract's initial task until 18 months after its completion.

[10]The Federal Acquisition Regulation, which superseded the Federal Procurement Regulation, also requires appropriate government surveillance

- Commerce and PTO have no on-site personnel at Planning Research Corporation to monitor the contractor's performance.

PTO Could Not Accurately Measure Contractor Performance

Until March 1986, the Planning Research Corporation contract incorporated a program implementation schedule discarded by PTO in October 1984. As a result, Commerce and PTO did not have an accurate contractual basis to measure Planning Research Corporation's performance from October 1984 to March 1986.

When the contract was awarded in April 1984, PTO's original three-stage implementation plan became the standard for measuring the contractor's performance in implementing the automated patent system. In October 1984, PTO modified its original implementation strategy when it decided to separate the initial system capabilities into smaller implementation intervals and to revise the associated schedules of contractor products. In March 1985, a Commerce procurement official wrote to PTO that the most critical outstanding contractual issue was to establish the baseline schedule for contract deliverables under this new implementation strategy. In July 1985, PTO reported that this new approach was revised and expanded in order to accelerate the deployment of the system capabilities to the remaining patent examining groups in multiple releases as they are tested and evaluated.

Commerce and PTO did not fully incorporate the implementation revisions into the contract in 1984 and 1985, respectively, when it would have been most appropriate, but instead did so in March 1986. This delay occurred because Commerce, PTO, and the contractor took this amount of time to determine how to implement the revised strategies. While PTO is currently working on the task, it has not traced the costs between the current strategy and the original strategy. Therefore, neither a cost nor schedule comparison between planned and actual contractual events can currently be made.

PTO Ineffectively Administered the Contract's Initial Deliverables

PTO and Commerce management of the first major milestone under the contract illustrates the government's need for improved administration of the Planning Research Corporation contract. The first task to be completed by Planning Research Corporation under the contract was to finalize the system design and architecture by September 11, 1984, at an estimated cost of $8.1 million. Until March 1986, Commerce and PTO officials could not agree on when the initial task was completed

In December 1985, PTO's Administrator for Automation told us that the task was completed in November 1984. Later his office amended this statement to September 1984, the date when the system architecture was accepted by PTO management. However, in a May 1985 letter to Planning Research Corporation, Commerce's Contracting Officer, the only person authorized to make or approve any changes to the contract, stated that the system design was not accepted by the government and, therefore, the task could not be considered complete at that time. On March 11, 1986, the Commerce Contracting Officer reversed his May 1985 position by informing the contractor that he agreed with PTO's statement that this task was completed in September 1984 when PTO accepted the system architecture. The Contracting Officer made this determination, even though the preliminary design document, which defines the design characteristics of the system, was still not accepted by Commerce and PTO. Thus, PTO and Commerce did not agree that the initial task was completed until 18 months after its completion date.

Because Commerce and PTO were unsure when the first task under the contract was completed, equally conflicting information exists on the cost of the initial task. In August 1984, Planning Research Corporation estimated that the task would cost $10.5 million: more than $2 million over the original estimate of $8.1 million. While PTO has paid all of the contractor's invoices, it did not determine the cost of the task. PTO officials stated that it would be difficult to determine the cost of this task, although contractor officials stated that it could be done if PTO requested this information.

Officials from Commerce and Planning Research Corporation attribute the above inconsistencies to the imprecise definition of what constitutes the first task of the contract. Regardless, because the contract explicitly set forth a completion date and cost of the task, we believe that Commerce and PTO should have monitored the contractor's progress to determine the contractor's compliance and effectiveness.

Commerce and PTO Have No On-Site Personnel at Planning Research Corporation

Federal Procurement Regulation, 41 CFR 1-3.405-1(h), required that, for a cost-reimbursement contract,

"It is essential that . appropriate surveillance by Government personnel during performance will give reasonable assurance that inefficient or wasteful methods are not being used "[11]

[11]The Federal Acquisition Regulation, which superseded the Federal Procurement Regulation, also requires appropriate government surveillance

In August 1983, PTO agreed with Commerce's Office of the Inspector General's recommendation to establish "a resident on-site review team with quality assurance, financial management and procurement expertise...for continuous review of the contractor's performance and progress" for the automated patent system contract. PTO's Assistant Commissioner for Finance and Planning responded that PTO planned to have an on-site team but noted that resources for on-site procurement personnel would have to be provided by the cognizant Commerce procurement office. As of April 1986, neither Commerce nor PTO had established an on-site government team to monitor about 100 contractor personnel working on PTO's project at Planning Research Corporation's Dulles Airport, Virginia, facility.

Under the Planning Research Corporation contract, the government can request on-site facilities for up to 15 government personnel for contract administration and oversight. The contract anticipated that the on-site team would consist of: technical specialists, program and financial analysts, and an administrative contract specialist. PTO Automation and Patent Office officials stated that since no such permanent on-site team exists at the contractor's site, PTO cannot reliably determine whether the contractor's reported labor hours are accurate.

In December 1985, the PTO Assistant Commissioner for Finance and Planning stated that although he is in favor of an on-site team to monitor the efforts of Planning Research Corporation, at this point he only sees marginal benefits in establishing one. Commerce and PTO officials also explained that the agencies do not have sufficient staff to support an on-site team. According to PTO's Administrator for Automation, PTO staff are not required to be on-site, and he does not consider it critical enough to construct such a team. The Administrator added that PTO relies on the accuracy of the contractor's labor reporting system and reviews of the system conducted by the Defense Contract Audit Agency. A Defense Contract Audit Agency auditor, however, stated that her agency does not determine the legitimacy of the number of labor hours charged to PTO.

We believe that an on-site team with appropriate PTO and Commerce officials is necessary for a project of this scope and complexity. Planning Research Corporation has over 100 personnel working on this project, yet there are no on-site government personnel to monitor the contractor's performance.

Prime Contract Has Schedule and Estimated Cost Overruns and Accounting System Deficiencies

Commerce and PTO have encountered additional difficulties with the performance of the Planning Research Corporation prime contract:

- PTO's latest life-cycle cost estimates show a $159 million contract cost overrun.
- The scheduled completion of the prime contractor's products has slipped considerably.
- Independent reports indicate problems with the prime contractor's accounting system.

PTO's Latest Estimate Shows a $159 Million Cost Overrun

PTO's January 1986 Automation Master Plan estimates the total contract cost at $448 million. Because the contract's estimated cost was $289 million when awarded, this $159 million increase represents a projected cost overrun of over 55 percent. According to PTO's Administrator for Automation, PTO's requirements have not changed, but equipment quantities and unit prices have undergone significant revisions, and therefore, the estimated contract cost has increased.

PTO's contract with Planning Research Corporation had an expected cost of $289 million: $31 million for the implementation of the system's initial operating capabilities (such as patent searching, office automation, and application file maintenance) in one patent examining group; $69 million to expand these capabilities to the remaining patent examining groups; $65 million to complete the public search room capabilities and other system enhancements; and $124 million for maintenance. This distribution is no longer valid since PTO made a fundamental change to its implementation strategy, as previously discussed in chapter 2.

In addition to PTO's January 1986 Automation Master Plan estimate, on February 18, 1986, Planning Research Corporation delivered its latest life-cycle cost estimate to Commerce and PTO. This estimate projects a slightly lower total cost of $447 million: $158 million over the original contract estimate.[12] This estimate assumes that PTO no longer requires one workstation per examiner, which reduces the total costs by $60.2 million. However, PTO's January 1986 Automation Master Plan asserts that one workstation per examiner remains the goal of the office and will be accomplished by 1991.

Planning Research Corporation originally estimated costs through December 1985, at $31.5 million. Actual costs were below this amount,

[12]This includes a proposed fixed-fee increase of $6 4 million.

totaling $26.9 million. This decrease is misleading, however, because the contractor is also over 1 year behind schedule.

The Schedule of the Prime Contractor's Deliverables Has Slipped Considerably

Planning Research Corporation proposed government acceptance of the system's initial operating capabilities, such as patent searching, office automation, and application file maintenance, by June 1985. The contractor's latest estimate calls for acceptance testing of patent searching by August 1986 and office automation by November 1986. At PTO's direction, the contractor has deferred application file maintenance development until late 1987.

Other examples of delays occurred in the delivery of hardware for the system that Planning Research Corporation procured through subcontracts. The installation of one of the system's two large computers, for instance, originally scheduled for July 1984, was not completed until March 1985, more than 8 months late. The installation of each of the components from the remaining five subcontracts was at least 7 months late. Another critical hardware component, the mass storage devices used to store automated data such as patents, was scheduled for installation in January 1985, but as of July 1, 1986, Planning Research Corporation had not yet issued a Request for Proposals for this equipment.

Commerce and PTO officials stated that Planning Research Corporation underestimated the scope of the automated patent system and that their original schedules were optimistic. In a May 1985 letter to Planning Research Corporation, Commerce's Contracting Officer asserted that the schedule delays were caused by

> "the lack of understanding and poor quality of PRC's [Planning Research Corporation's] deliverables. While some delay may be attributed to actions by the Government, the major cause was the need for PRC to become familiar with the requirements and to improve the quality of its deliverables."

Planning Research Corporation officials told us that the primary reason for the schedule delays was a longer and more rigorous validation process than originally anticipated due to more user involvement by PTO. The officials added that they saw this as a positive step that would lessen potential future problems. One official admitted that some of the Corporation's earlier deliverables were inadequate but added that the problem had been corrected.

Independent Reports Indicate Problems With the Prime Contractor's Accounting System

Federal Procurement Regulation, 41 CFR 1-3.405-(b), required agencies to consider the adequacy of a contractor's accounting system when making contract awards.[13] According to this regulation, it is essential that, for a cost-reimbursement contract, "the contractor's cost accounting system is adequate for the determination of costs applicable to the contract."

Before the contract award, Commerce requested that the Defense Contract Audit Agency review Planning Research Corporation's cost proposal. The Defense Contract Audit Agency concluded that the proposal was acceptable for negotiation purposes. In 1985 and 1986, the Defense Contract Audit Agency and other independent reports, however, identified problems with the contractor's accounting system.

In January 1985, PTO requested a review of Planning Research Corporation by the Department of the Navy's Naval Electronic System Command, Cost Estimating and Analysis Office. This office's subsequent review outlined many problems such as (1) the absence of contractor internal controls because budgeted costs were not compared to the actual costs incurred, (2) the lack of a clearly defined work breakdown structure (a work breakdown structure provides a comparison of actual and budgeted costs at detailed levels), and (3) the absence of an assigned contractor employee to manage the principal subcontractor's costs. In March 1985, Commerce's Office of the Inspector General outlined similar concerns.

Due to the severity of their concerns, the Navy group recommended, in January 1985, that PTO stop work on the automated patent system project until Planning Research Corporation and PTO prepared a well-defined work breakdown structure. The Navy group added,

> "If the PTO is able to temporarily stop work on this APS [Automated Patent System] project, perhaps PRC [Planning Research Corporation] will realize the serious nature of their management malaise regarding the overrun Hopefully PRC will recognize that the PTO (and U.S. Government) does not have a endless bucket of money, restraint and management control must be implemented.. or even worse for both parties the APS project could be terminated far short of completion."

Although PTO did not agree with the recommendation to stop work, PTO and Planning Research Corporation took measures to address some of the concerns outlined by the Navy group and Commerce's Office of the

[13]The Federal Acquisition Regulation, which superseded the Federal Procurement Regulation, also requires consideration of the contractor's accounting system

Inspector General. For example, the contractor submitted a more detailed monthly status report in August 1985, with a newly established work breakdown structure and comparisons between actual and budgeted costs and labor hours. These budget figures, however, are not from the original contract estimates but from the contractor's September 1985 cost projections. Consequently, the government has limited ability to monitor the contractor's cost effectiveness because a comparison between the original estimates and the actual costs is not being performed.

Commerce-requested reviews of the contractor's accounting system are ongoing. In October 1985, the Defense Contract Audit Agency informed Commerce that the contractor was not in compliance with certain cost accounting standards required by the contract and federal regulations. Specifically, it said that Planning Research Corporation was not in compliance with the standards requiring consistency in estimating, accumulating, reporting, and allocating costs. In addition, on February 5, 1986, the audit agency notified the contractor that it would no longer approve the contractor's invoices sent to PTO until Planning Research Corporation resolved several outstanding accounting issues under the PTO contract. It recently revised this position by agreeing to conditionally approve the contractor's vouchers on the basis of the contractor's commitment to implement an accounting system that meets Defense Contract Audit Agency standards.

Consequences of Contract Termination

According to the contract, to cancel the Planning Research Corporation contract, the government is required to terminate the contract for the convenience of the government, unless Commerce and PTO find that the contractor is in default under the contract. The contract states that termination for the convenience of the government requires the contractor to immediately stop work on the contract and to submit a termination claim detailing the termination costs and a percentage of the fixed fee. The government and the contractor then negotiate the claim and, if they cannot agree, the Contracting Officer determines the final amount. The contractor can subsequently appeal the Contracting Officer's claim determination.

According to the Contracting Officer, the government will experience significant cost and program consequences if the contract is cancelled. He added that if the government considered termination, the most economical time to terminate is at the end of the fiscal year. Although he could not provide exact cost and program consequences, the Contracting

Officer estimated that if termination occurred effective September 30, 1986, the additional costs incurred by the government would probably not exceed $5 million, assuming timely notice of termination to the contractor.

The maximum obligation of the government under the automated patent system contract is controlled by two contract clauses: the Limitation of Funds clause and the Termination for Default or for Convenience of the Government clause. In a March 24, 1986, letter to us, the Department of Commerce Contracting Officer explained the government's obligation as follows:

"If the government elects to discontinue funding the PRC [Planning Research Corporation] contract, the PTO's financial obligation to PRC would be determined under the Limitation of Funds clause and the Termination for Default or for Convenience of the Government clause The Limitation of Funds clause limits the government's liability to the amount allocated to the contract This is contingent on a timely notice to the contractor that additional funds will not be available This allows the contractor to absorb settlement costs from the remaining contract funding However, if the government led the contractor to believe, through action or silence, that additional funds would be made available and encouraged the contractor to continue performance, then the government may be liable for settlement costs in excess of the remaining contract funding. In either case, the reasonable costs of termination would be based on the principles set forth in the Termination clause."

As of May 1986, Commerce had allocated $45.8 million to fund activities under the contract through September 30, 1986. Through March 1986, Commerce and PTO had spent about $31.8 million under the contract. According to the Contracting Officer, if the contract were terminated for the convenience of the government, the government's maximum contractual liability would be the difference between the amounts allocated and spent, assuming timely notice of termination to the contractor. Therefore, based on the Contracting Officer's statement, if the contract were terminated effective September 30, 1986, with timely notice, the government's maximum liability would be $45.8 million less the amount spent by the contractor as of September 30, 1986. The Contracting Officer estimated that the additional costs incurred by the government would not likely exceed $5 million.

According to the Contracting Officer, if the Planning Research Corporation contract were terminated for the convenience of the government, the contractor would be entitled to reimbursement for (1) incurred costs, (2) profit on work completed, (3) costs of outstanding contractual commitments, (4) costs of removal, storage, and transportation of equipment, (5) other costs related to stopping work in progress, and (6)

settlement costs. The Contracting Officer added that these costs cannot be accurately determined at this time. In addition, he said that costs could increase significantly if termination does not occur at the end of the fiscal year. The Contracting Officer stated that since all subcontracts except one are renewed at the end of the fiscal year, if termination occurs after this date, Planning Research Corporation (and consequently the government) would be liable for the full-year equipment costs of the equipment (up to $7 million).

Another major consideration in determining whether to terminate the Planning Research Corporation contract for the convenience of the government is the resulting effect on the principal subcontractor, Chemical Abstract Services. This subcontractor provides PTO with proprietary software and is developing significant portions of the automated patent system's software. According to Commerce officials, the Chemical Abstract Services software is critical to the patent automation effort. If Commerce terminates the prime contract, the government (1) could elect to continue its agreement with Chemical Abstract Services for the use of its proprietary software and (2) shall have unlimited rights to all software and documentation developed under the subcontract.

Another consideration in terminating the contract concerns ownership of the hardware procured through subcontracts. All of the hardware components were procured under 60-month, lease-to-ownership-plans. According to the Contracting Officer, title resides with either the vendor, Planning Research Corporation, or a third-party financing institution (whichever provided the funding), until the government completes payments for the lease charges. Therefore, according to the Contracting Officer, unless the government is able to arrange an early buy-out agreement through Planning Research Corporation, PTO may lose the money it has invested and would be required to return the equipment. However, as of December 1985, PTO had only paid Planning Research Corporation for one of the six hardware subcontracts. Since the first payment for a hardware subcontract did not occur until March 1985, and assuming the continuation of the 60-month, lease-to-ownership-plan, the initial equipment would not be owned by the government until 1990.

Conclusions and Recommendations

Conclusions

PTO has not effectively managed its multimillion dollar patent automation program. Planning has been inadequate and implementation ineffective. As a result, PTO is spending millions of dollars with little assurance that (1) it is implementing the best alternative for improving operations, (2) the benefits will exceed the costs, (3) the system can be economically installed in current PTO facilities, and (4) program costs are being appropriately minimized.

Given the $808 million estimated cost of PTO's automation effort ($448 million for the patent system contract), the complexity of the ADP technology expected to be used, and the potential impact of automation on the agency's mission, we believe that it was incumbent on Commerce and PTO to ensure that the program was adequately planned and effectively implemented and that system contracting and contract monitoring appropriately minimized program costs and risks.

PTO has little assurance that its automation project is the best alternative because it did not prepare comparative cost analyses that properly addressed alternatives. We believe that this is an important missing piece in the justification necessary to continue funding the current approach to patent automation. Similarly, PTO's cost/benefit analysis was inadequate because it understated costs by at least $51 million, overstated anticipated benefits by over $444 million, and included, in our view, unsubstantiated benefits of $1.19 billion. This means that the costs of this program may outweigh benefits by several hundred million dollars, making it economically unjustified.

In addition, even today, years after PTO contracted for its automated patent system, PTO has no assurance that the planned system can be economically installed in its facilities. Despite 1983 and 1984 internal PTO memorandums that highlighted the potentially severe adverse consequences of delaying a required space management analysis, PTO contracted for the system in April 1984 without completing the required space management study. Because PTO has not completed this study, final system configuration remains uncertain; thus, PTO cannot reliably estimate the cost (required renovation can dramatically increase costs), schedule, and ultimate capabilities of the system.

Furthermore, the automated patent system contract is an inappropriate cost-plus-fixed-fee agreement that is estimated to take 18 years to complete. This contract for the system's design, development, implementation, and maintenance is not consistent with federal guidance and contains minimum contractor cost control incentives. Because cost-

reimbursement contracts are normally used only for design and development, under the current contract the government assumes too much risk of higher than appropriate costs after development and testing of the patent system.

Finally, Commerce and PTO have not effectively administered the contract for the automated patent system. Because PTO altered the implementation plans without making corresponding changes in the prime contract, PTO did not have an accurate contractual basis to judge contractor performance from September 1984 through March 1986. Furthermore, despite recent independent reports of accounting system problems, recent contract cost estimate escalation of about $159 million to $448 million, and actual schedule slippage of over a year, Commerce and PTO have decided not to establish needed on-site agency oversight at the contractor's facility to monitor the contract. We believe that the continued absence of on-site monitoring increases the risk of higher costs.

Although PTO has already spent about $23 million on its automated patent system contract and $65 million on the total program through fiscal year 1985, this amount represents only a small part of the total $448 million automated patent system contract, which is the major component of PTO's entire $808 million automation effort. We are concerned about PTO planned expenditures of another $32.5 million (planned fiscal year 1987 prime contract costs) before the issues we have discussed are addressed by the Department and PTO management. The usefulness of these expenditures and the ultimate success of the entire program is currently questionable because of the previously noted management deficiencies. Consequently, we believe that the approach being used by Commerce and PTO to automate the patent activities has a number of serious weaknesses that greatly increase the risk of acquiring a system that will not achieve the automation goals in the most efficient and effective manner. Furthermore, we believe that the most prudent current course of action for Commerce and PTO is to (1) fully reassess the program to ensure that objectives will be achieved in the most cost-effective manner and (2) revise the automated patent system contract as appropriate, to coincide with the reassessment decision and to provide additional contract cost control incentives.

Recommendations

We recommend that the Secretary of Commerce reassess the direction and scope of the automated patent system to ensure that the best alternative for meeting program objectives is being pursued, automation benefits will exceed costs, and the planned system can be effectively and

efficiently installed in PTO facilities to achieve maximum benefits. Furthermore, we recommend that the Secretary not allocate additional funds to the automated patent system contract until the reassessment is completed and the Secretary has determined the best approach to follow and appropriately reported the reassessment results and planned actions to the Congress.

In reassessing this program the Secretary should follow applicable federal guidance, including the Federal Information Resources Management Regulation, and at a minimum should

- establish management controls and quantifiable measures to gauge program effectiveness,
- identify and develop alternatives for meeting PTO's program objectives with a comparative analysis that can be used to select the most cost-effective alternative,
- thoroughly support and document all appropriate costs and benefits associated with each alternative, as indicated by Federal Information Processing Standards Publication 64, and
- ensure that an appropriate space management analysis is adequately and expeditiously implemented.

To help ensure that the reassessment is appropriately conducted, the Secretary should assign responsibility for the reassessment to the Assistant Secretary for Administration, the designated senior department official for information resources management. Furthermore, this official should use the National Bureau of Standards and obtain other independent reviews as necessary to ensure (1) that the reassessment is properly conducted and that the system includes only components with acceptable risk of cost-effective implementation and (2) that other critical issues, such as a thorough test of all critical components, are appropriately addressed.

Following the reassessment, the Secretary should determine the most appropriate acquisition strategy to mitigate the government's risk. As part of this determination, the Secretary must ensure that contractual arrangements reduce the risk currently imposed on the government, particularly for implementation and maintenance activities. In addition, all future acquisitions should involve competitive procurements with fixed-price contract(s) to the maximum extent possible.

Finally, because of the Congress' initial mandate for an automation plan and the magnitude of the planned expenditures, we recommend that the

Secretary report on the results of the reassessment and on planned actions to the House Committee on Government Operations, Senate Committee on Governmental Affairs, and House and Senate Committees on the Judiciary and Appropriations before he acts on the reassessment.

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