

GAO

Testimony

Before the Subcommittee on Courts, the
Internet, and Intellectual Property,
Committee on the Judiciary, House of
Representatives

For Release on Delivery
Expected at 1:00 p.m. EDT
Thursday, September 8, 2005

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Improvements Needed to
Better Manage Patent Office
Automation and Address
Workforce Challenges

Statement of Anu K. Mittal, Director
Science and Technology Issues
and
Linda D. Koontz, Director
Information Management Issues





Highlights of [GAO-05-1008T](#), testimony before the Subcommittee on Courts, the Internet, and Intellectual Property, Committee on the Judiciary, House of Representatives

Why GAO Did This Study

The United States Patent and Trademark Office (USPTO) is responsible for issuing patents that protect new ideas and investments in innovation and creativity. However, the volume and complexity of patent applications to the agency have increased significantly in recent years, lengthening the time needed to process patents and raising concerns about the validity of the patents that are issued. Annual applications have grown from about 185,000 to over 350,000 in the last 10 years and are projected to exceed 450,000 by 2009. Coupled with this growth is a backlog of about 750,000 applications. Further complicating matters, the agency has faced difficulty in attracting and retaining qualified staff to process patent applications.

USPTO has long recognized the need to automate its patent processing and, over the past two decades, has been engaged in various automation projects. More recently, in its strategic plan, the agency articulated its approach for accelerating the use of automation and improving workforce quality. In two reports issued in June 2005, GAO discussed progress and problems that the agency faces as it develops its electronic patent process, its actions to attain a highly qualified patent examination workforce, and the progress of the agency's strategic plan initiatives.

At the Committee's request, this testimony summarizes the results of these GAO reports.

www.gao.gov/cgi-bin/getrpt?GAO-05-1008T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Anu Mittal at (202) 512-3841 or mittala@gao.gov or Linda Koontz at (202) 512-6240 or koontzl@gao.gov.

INTELLECTUAL PROPERTY

Improvements Needed to Better Manage Patent Office Automation and Address Workforce Challenges

What GAO Found

As part of its strategy to achieve an electronic patent process, USPTO had planned to deliver an operational patent system by October 2004. It has delivered important capabilities, for example, allowing patent applicants to electronically file and view the status of their applications and the public to search published patents. Nonetheless, after spending over \$1 billion on its efforts from 1983 through 2004, the agency has not yet developed the fully integrated, electronic patent process articulated in its automation plans, and when and how it will achieve this process is uncertain. Key systems that the agency is relying on to help reach this goal—an electronic application filing system and a document imaging system—have not provided capabilities that are essential to operating in a fully electronic environment. Contributing to this situation is the agency's ineffective planning for and management of its patent automation initiatives, due in large measure to enterprise-level, systemic weaknesses in its information technology investment management processes. Although the agency has begun instituting essential investment management mechanisms, such as its enterprise architecture framework, it has not yet finalized its capital planning and investment control process, or established necessary linkages between the process and its architecture to guide the development and implementation of its information technology. The Under Secretary of Commerce for Intellectual Property and the agency's chief information officer have acknowledged the need for improvement.

USPTO has taken steps to attract and retain a highly qualified patent examination workforce by, for example, enhancing its recruiting efforts and using many of the human capital benefits available under federal personnel regulations. However, it is too soon to determine the long-term success of the agency's efforts because they have been in place only a short time and have not been consistently sustained because of budgetary constraints. Long-term uncertainty about the agency's hiring and retention success is also due to the unknown impact of the economy. In the past, the agency had more difficulty recruiting and retaining staff when the economy was doing well. Further, USPTO faces three long-standing challenges that could undermine its efforts: the lack of an effective strategy to communicate and collaborate with examiners, outdated assumptions in production quotas that it uses to reward examiners, and the lack of required ongoing technical training for examiners. Patent examiners said the lack of a collaborative work environment has lowered morale and created an atmosphere of distrust between management and patent examiners.

Overall, USPTO has made more progress in implementing its strategic plan initiatives aimed at increasing its patent processing capability through workforce and process improvements than in its initiatives to decrease patent pendency and improve electronic processing. It has fully or partially implemented all 23 capability initiatives, but only 8 of 15 initiatives to reduce patent pendency and improve electronic processing. The agency cited a lack of funding as the primary reason for not implementing all initiatives.

Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to participate in your oversight hearing of the United States Patent and Trademark Office's (USPTO) efforts to modernize its patent application processing capability. Our testimony focuses on several critical aspects of the agency's overall goal: (1) its ongoing initiative to achieve a paperless, electronic patent process, (2) its actions to attract and retain a highly qualified patent examiner workforce and address human capital challenges, and (3) the implementation of critical initiatives outlined in its 21st Century Strategic Plan—issued in 2002 in response to a congressional requirement that the agency improve patent quality, implement electronic government, and reduce the number of pending patent claims.¹

Rapid growth in both the volume and complexity of patent applications to USPTO has lengthened the time needed to process patents and has raised concerns among intellectual property organizations, patent holders, and others about the quality of the patents that are issued. Over the last 10 years, the number of patent applications filed annually has increased 91 percent, from about 185,000 in 1994 to over 350,000 in 2004. Along with this growing workload is a 28-month backlog of approximately 750,000 applications. Further complicating this picture, is that USPTO's resources have not kept pace with the increases in its patent workload. Agency officials acknowledge that, at times, they have had difficulty competing with the private sector to attract and retain staff with the high degree of scientific, technical, and legal knowledge required to be patent examiners.

Recognizing the need to improve its patent processing capability, over the past 2 decades, USPTO has undertaken various efforts to automate its patent process. In addition, as part of an aggressive 5-year modernization effort outlined in its strategic plan, the agency has articulated its approach to creating a more productive and responsive patent organization through accelerating its use of automation and enhancing the quality of its patent examination workforce. At the request of the Committee, our testimony today summarizes the work presented in two reports that we issued in June 2005—one addressing the agency's progress, and problems faced, in developing and using electronic information and systems to achieve its

¹Patent and Trademark Office Authorization Act of 2002, Pub. L. No. 107-273, § 13104, 116 Stat. 1899, 1900, required USPTO to develop a 5-year strategic plan for meeting these three requirements. USPTO also prepared the Strategic Plan to fulfill the requirements of the Government Performance and Results Act.

automated patent processing capability² and the other addressing its steps to attract and retain a workforce of qualified patent examiners, three long-standing human capital challenges that could undermine recent efforts, and the overall status in implementing its strategic plan.³

In summary, we found the following:

USPTO is pursuing a long-standing strategy to implement a paperless, electronic patent process, with the goal of replacing the manual processing of applications with an electronic process for researching patent information and viewing and manipulating application text throughout all processing phases. While the agency has achieved important electronic capabilities through information systems that it has implemented, such as electronic filing and patent application classification and search, collectively these functions have not provided the fully integrated electronic patent processing capability articulated in its automation plans. Two of the primary systems that the agency is relying on to enhance its capabilities—its electronic filing system and a document imaging system that it acquired from the European Patent Office—have not yielded processing improvements that the agency considers essential to operate successfully in an electronic environment. Contributing to this situation are ineffective planning and management of its patent automation projects—due in large measure to enterprise-level, systemic weaknesses in its information technology investment management processes.⁴ Although the agency had begun instituting certain essential investment management mechanisms, it had not yet finalized its capital planning and investment control process and had not established the necessary linkages between the process and its enterprise architecture to ensure that projects will comply with the architecture.⁵ As a result, the

²GAO, *Intellectual Property: Key Processes for Managing Patent Automation Strategy Need Strengthening*, [GAO-05-336](#) (Washington, D.C.: June 17, 2005).

³GAO, *Intellectual Property: USPTO Has Made Progress in Hiring Examiners, but Challenges to Retention Remain*, [GAO-05-720](#) (Washington, D.C.: June 17, 2005).

⁴A key requirement of the Clinger-Cohen Act of 1996 (40 U.S.C. §11312) is that agencies have capital planning and investment control processes. Such processes aid management by providing a means to obtain necessary information about the progress of an investment in terms of cost, capability of the system to meet specified requirements, timeliness, and quality.

⁵An enterprise architecture serves as a blueprint for systematically and completely defining an organization's current operational and technology environment and as a roadmap toward the desired state.

agency had not rigorously assessed its patent systems' compliance with the enterprise architecture and it lacked reliable experience-based data to consistently demonstrate the costs and benefits of its systems.

In addition, to help attract and retain a qualified patent examination workforce, USPTO has taken steps such as enhancing its recruiting efforts and using many of the human capital benefits available under federal personnel regulations. However, it is too soon to determine the long-term success of the agency's recruiting efforts because they have been in place only a short time and have not been consistently sustained because of budgetary constraints. Long-term uncertainty about USPTO's hiring and retention success is also due to the unknown impact of the economy. In the past, when the economy was doing well, the agency had more difficulty recruiting and retaining the staff it needed. Further, USPTO faces three long-standing challenges that could undermine its efforts to retain a qualified workforce: (1) the lack of an effective strategy to communicate and collaborate with examiners, (2) outdated assumptions in the application processing quotas it uses to reward examiners, and (3) the lack of required ongoing technical training for examiners. According to patent examiners, the lack of communication and a collaborative work environment has resulted in low morale and an atmosphere of distrust that is exacerbated by the contentious relationship between management and union officials.

Overall, USPTO has made more progress in implementing its strategic plan initiatives to increase the agency's capability than it has in implementing the initiatives to decrease patent pendency⁶ and improve electronic processing. The agency has fully or partially implemented all 23 capability initiatives that focus on improving the skills of employees, enhancing quality assurance, and altering the patent system through changes in existing laws or regulations. In contrast, the agency has partially or fully implemented only 8 of the 15 initiatives aimed at reducing patent pendency and improving electronic processing. A lack of funding was cited as the primary reason for not implementing these initiatives. With the passage of legislation in December 2004 to increase fees available to USPTO for the next 2 years, the agency is reevaluating the feasibility of implementing some of these initiatives.

⁶The time between filing for and being granted a patent historically has been referred to as "patent pendency."

In our reports, we made recommendations aimed at improving the agency's management of its patent automation strategy and related information technology investments and at enhancing communication and collaboration between management and patent examiners, and between management and union officials. USPTO generally agreed with the findings, conclusions, and recommendations in both reports, although it only partially agreed with several material aspects of our assessment of its patent automation strategy, including our recommendation that it reassess its approach to automating its patent process.

Background

USPTO helps promote industrial and technological progress in the United States and strengthen the national economy by administering the laws relating to patents and trademarks. A critical part of its mission is examining patent applications and issuing patents. A patent is a property right granted by the U.S. government to an inventor who secures, generally for 20 years from the date of initial application in the United States, his or her exclusive right to make, use, offer for sale, or sell the invention in exchange for disclosing it.⁷ The number of patent filings to USPTO continues to grow and, by 2009, the agency is projecting receipt of over 450,000 patent applications annually.

Patent processing essentially involves three phases: pre-examination, examination, and post-examination. The process begins when an applicant files a patent application and pays a filing fee. During the pre-examination phase, patent office staff document receipt of the application and process the application fee, scan and convert the paper documents to electronic format, and conduct an initial review of the application and classify it by subject matter. During the subsequent examination phase, the application is assigned to a patent examiner with expertise in the subject area⁸ who searches existing U.S. and foreign patents, journals, and other literature and, as necessary, contacts the applicant to resolve questions and obtain additional information to determine whether the proposed invention can

⁷According to 35 U.S.C. §154(a)(1), a patentee may also exclude others from importing the patented invention into the United States.

⁸USPTO has eight technology centers that define its subject areas as follows: Biotechnology and Organic Chemistry; Chemical and Materials Engineering; Computer Architecture, Software, and Information Security; Communications; Semiconductors, Electrical and Optical Systems and Components; Designs for Articles of Manufacture; Transportation, Construction, Electronic Commerce, Agriculture, National Security and License and Review; Mechanical Engineering, Manufacturing, and Products.

be patented.⁹ Examiners document their determinations on the applications in formal correspondence, referred to as office actions. Applicants may abandon their applications at any time during this process. If the examiner determines that a patent is warranted, a supervisor reviews and approves it and the applicant is informed of the outcome. The application then enters the post-examination phase and, upon payment of an “issue fee,” a patent is granted and published.¹⁰ Historically, the time from the date that a patent application is filed to the date that the patent is either granted or the application is abandoned has been called “patent pendency.”

Because of long-standing concerns about the increasing volume and complexity of patent applications, USPTO has been undertaking projects to automate its patent process for about the past two decades. In 1983, the agency began one of its most substantial projects—the Automated Patent System (APS)—with the intent of automating all aspects of the patent process. APS was to be deployed in 1990 and, when completed, consist of five integrated subsystems that would (1) fully automate incoming patent applications; (2) allow examiners to electronically search the text of granted U.S. patents and access selected abstracts of foreign patents; (3) scan and allow examiners to retrieve, display, and print images of U.S. patents; (4) help examiners classify patents; and (5) support on-demand printing of copies of patents.

In reporting on APS more than 10 years following its inception, we noted that USPTO had deployed and was operating and maintaining certain parts of the system, supporting text search, limited document imaging, order-entry and patent printing, and classification activities.¹¹ However, our report raised concerns about the agency’s ability to adequately plan and manage this major project, pointing out that its processes for exercising effective management control over APS were weak. Ultimately, USPTO never fully developed and deployed APS to achieve the integrated, end-to-end patent processing system that it envisioned. The agency reported

⁹A proposed invention is patentable if it is a new or useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof.

¹⁰To keep the patent active, the patentee must pay maintenance fees at 3.5 years, 7.5 years, and 11.5 years.

¹¹GAO, *Patent and Trademark Office: Key Processes for Managing Automated Patent System Development Are Weak*, [GAO/AIMD-93-15](#) (Washington, D.C.: Sept. 30, 1993).

spending approximately \$1 billion on this initiative from 1983 through 2002.¹²

In addition, in 1998, the agency implemented an Internet-based electronic filing system at a reported cost of \$10 million, enabling applicants to submit their applications online. Further, through 2002, the agency continued to enhance its capabilities that enabled examiners to search patent images and text, and upgraded its patent application classification and tracking systems.¹³

To help the agency address the challenges of reviewing an increased volume of more complex patent applications and of reducing the length of time it takes to process them, Congress passed a law requiring USPTO to improve patent quality, implement electronic government, and reduce pendency.¹⁴ In response to the law, in June 2002, the agency embarked on an aggressive 5-year modernization plan outlined in its 21st Century Strategic Plan, which was updated to include stakeholder input and re-released in February 2003. The strategic plan outlines 38 initiatives related to the patent organization that focus on three crosscutting strategic themes: capability, productivity, and agility. The capability theme focuses on efforts to enhance patent quality through workforce and process improvements; the productivity theme focuses on efforts to decrease the pendency of patent applications; and the agility theme focuses on initiatives to electronically process patent applications. To fully fund the initiatives in its strategic plan, the agency requested authority from Congress to increase the user fees it collects from applicants and to spend all of these fees on patent processing.¹⁵ Legislation enacted in December

¹²The reported cost included system enhancements and maintenance through the end of the project's life cycle in 2002.

¹³The initial deployment of USPTO's patent tracking system occurred in 1980. This system provides workflow tracking, status reporting, and examiner production information.

¹⁴Patent and Trademark Office Authorization Act of 2002, Pub. L. No. 107-273, § 13104, 116 Stat. 1899, 1900.

¹⁵USPTO is authorized to collect fees from the public for specific activities related to processing applications. The spending of those fees is subject to provisions in annual appropriations acts at the discretion of the Congress.

USPTO Continues to Pursue a Fully Automated Patent Process, but Has Not Effectively Managed its Strategy for Achieving This Capability

2004 increased the fees available to USPTO;¹⁶ however, the increases are only effective for fiscal years 2005 and 2006.

As was its intent with APS, USPTO has continued to pursue a paperless, end-to-end, automated patent process. In 2001, the agency initiated its Tools for Electronic Application Management (TEAM) automation project, aiming to deliver an end-to-end capability to process patent applications electronically by fiscal year 2006. Under the TEAM concept, the agency had planned to integrate its existing electronic filing system and the classification and search capabilities from the earlier APS project with new document management and workflow capabilities, and with image- and text-based processing¹⁷ of patent applications to achieve a sophisticated means of handling documents and tracking patent applications throughout the examination process. By implementing image- and text-based capabilities, the agency had anticipated that patent examiners would be able to view and process applications online, as well as manipulate and annotate text within a patent application, thus eliminating manual functions and improving processing accuracy, reliability, and productivity, as well as the quality of the patents that are granted.

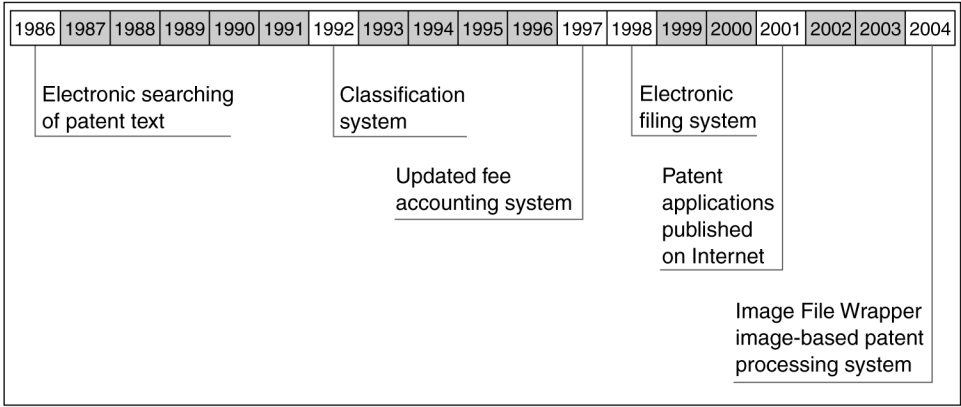
With the issuance of its 21st Century Strategic Plan, however, USPTO altered its approach to accomplishing patent automation. The strategic plan, among other things, identified the agency's high-level information technology goals for fully automating the patent process as part of the 5-year modernization effort. It incorporated automation concepts from the TEAM project, but announced an accelerated goal of delivering an operational system to electronically process patent applications by October 1, 2004, earlier than had been scheduled under TEAM.

¹⁶Consolidated Appropriations Act, 2005, § 801, Pub. L. No. 108-447, 118 Stat. 2809, 2924 (Dec. 8, 2004).

¹⁷*Image-based processing* uses a graphic representation of documents produced by scanning paper documents or by converting electronic documents into images. To transform image content into text, optical character recognition (OCR) software is used to derive text from the image. OCR can convert image documents to hidden text, which is searchable. In *text-based processing*, the words and sentences in the document are retained as text and can be stored, processed, and retrieved by a document management system. Unlike image-based processing, text-based processing allows the text to be searched and extracted.

In carrying out its patent automation plans, USPTO has delivered a number of important processing capabilities through the various information systems that it has implemented. For example, an automated search capability, available since 1986, has eliminated the need for patent examiners to manually search for prior art in paper files, and the classification and fee accounting capabilities have facilitated assigning applications to the correct subject areas and managing collections of applicable fees. In addition, the electronic filing system that has existed since 1998 has enabled applicants to file their applications with the agency via the Internet. Using the Internet, patent applicants also can review the status of their applications online and the public can electronically access and search existing published patents. Further, an imaging system implemented in August 2004, called the Image File Wrapper, has given USPTO the capability to scan patent applications and related documents, which can then be stored in a database and retrieved and reviewed online. The agency’s progress in implementing its automated patent functions is illustrated in figure 1.

Figure 1: USPTO’s Patent Automation Progress



Source: USPTO.

Nonetheless, even with the progress that has been made, collectively, these automated functions have not provided the fully integrated, electronic patent processing capability articulated in the agency’s automation plans. Two of the key systems that it is relying on to further enhance its capabilities—the electronic filing system and the Image File Wrapper—have not yielded the processing improvements that the agency has deemed essential to successfully operate in a fully integrated, electronic environment.

Specifically, in implementing its electronic filing system, USPTO had projected significant increases in processing efficiencies and quality by providing patent applicants the capability to file online, thus alleviating the need for them to send paper applications to the agency or for patent office staff to manually key application data into the various processing systems. However, even after enhancements in 2002 and 2004, the system did not produce the level of usage among patent filers that the agency had anticipated. For example, although USPTO's preliminary justification for acquiring the electronic filing system had projected an estimated usage rate of 30 percent in fiscal year 2004, patent officials reported that, as of April 2005, fewer than 2 percent of all patent applications were being submitted to the agency via this system. As a result, anticipated processing efficiencies and quality improvements through eliminating the manual re-keying of application data have not been realized.

In September 2004, USPTO convened a forum of senior officials representing the largest U.S. corporate and patent law firm filers to identify causes of patent applicants' dissatisfaction with the electronic filing system and determine how to increase the number of patents being filed electronically. According to the report resulting from this forum, the majority of participants viewed the system as cumbersome, time-consuming, costly, inherently risky, and lacking a business case to justify its usage. Among the barriers to system usage that the participants specifically identified were (1) users' lack of a perceived benefit from filing applications electronically, (2) liability concerns associated with filers' unsuccessful use of the system or unsuccessful transmission of patent applications to USPTO, and (3) significant disruptions to filers' normal office/corporate processes and workflow caused by factors such as difficulty in using the automated tools and the inability to download necessary software through firewalls.

Several concerns raised during the forum mirrored those that USPTO had earlier identified in a 1997 analysis of a prototype for electronic filing. However, at the time of our review, the agency had not completed plans to show how it would address the concerns regarding use of the electronic filing system.

The agency's Image File Wrapper also had not resulted in critical patent processing improvements. The system includes image technology for storage and maintenance of records associated with patent applications and provides the capability to scan each page of a submitted paper application and convert the pages into electronic images. Patent examiners in a majority of the focus groups that we conducted

commented that the system had provided them with the ability to easily access patent applications and related information. In addition, patent officials stated that the system had enabled multiple users to simultaneously access patent applications.

Nonetheless, patent officials acknowledged that the system had experienced performance and usability problems. Specifically, in speaking about the system's performance, the officials and agency documentation stated that, after its implementation, the Image File Wrapper had been unavailable for extended periods of time or had experienced slow response times, resulting in decreased productivity. To lessen the impact of this problem, patent officials said they had developed a backup tool to store images of an examiner's most recent applications, which can be accessed when the Image File Wrapper is not available. Further, in commenting on this matter, the USPTO director stated that the system's performance had begun to show improvement.

Regarding the usability of the system, patent officials and focus group results indicated that the Image File Wrapper did not fully meet processing needs. For example, the officials stated that, as an image-based system, the Image File Wrapper did not fully enable patent examiners to electronically search, manipulate, or track and log changes to application text, which were key processing features emphasized in the agency's automation plans. The examiners also commented that a limited capability to convert images to text, which was intended to assist them in copying and reusing information contained in patent files, was error-prone, contributing to their need to download and print the applications for review. Further, because the office's legacy systems were not integrated with the Image File Wrapper, examiners were required to manually print correspondence from these systems, which then had to be scanned into the Image File Wrapper in order to be included as part of an applicant's electronic file.

Patent and Office of Chief Information Officer (OCIO) officials largely attributed the system's performance and usability problems to the agency's use of software that it acquired from the European Patent Office. The officials explained that, to meet the accelerated date for delivering an operational system as outlined in its strategic plan, the agency had decided in 2002 to acquire and use a document-imaging system owned by the European Patent Office, called ePhoenix, rather than develop the

integrated patent processing system that had been described in its automation plans.¹⁸ According to the officials, the director, at that time, had considered ePhoenix to be the most appropriate solution for further implementing USPTO's electronic patent processing capabilities given (1) pressures from Congress and from customers and stakeholders to implement an electronic patent processing system more quickly than originally planned and (2) the agency's impending move to its new facility in Alexandria, Virginia, which did not include provisions for transferring and storing paper patent applications.¹⁹

However, they indicated that the original design of the ePhoenix system had not been compatible with USPTO's technical platform for electronic patent processing. Specifically, they stated that the European Patent Office had designed the system to support only the printing of files for subsequent manual reviews, rather than for electronic review and processing. In addition, they stated that the system had not been designed for integration with other legacy systems or to incorporate additional capabilities, such as text processing, with the existing imaging capability. Further, an official of the European Patent Office noted that ePhoenix had supported their office's much smaller volume of patent applications.²⁰ Thus, with USPTO's patent application workload being approximately twice as large as that of its European counterpart, the agency placed greater stress on the system than it was originally designed to accommodate. OCIO officials told us that, although they had tested certain aspects of the system's capability, many of the problems encountered in using the system were not revealed until after the system was deployed and operational.

Patent and OCIO officials acknowledged that the agency had purchased ePhoenix although senior officials were aware that the original design of the system had not been compatible with USPTO's technological platform

¹⁸In November 2002, patent officials entered into an agreement with the European Patent Office, in which that office agreed to provide USPTO with a license to use its patent processing software and to provide technical assistance in customizing the software to meet USPTO's needs. USPTO completed its implementation of the system in August 2004, at a reported total cost of approximately \$14 million.

¹⁹In December 2003, USPTO began relocating its headquarters from Arlington (Crystal City), Virginia, to Alexandria, Virginia, with the intent of consolidating all of its major operations in a central facility. The agency completed this move in July 2005.

²⁰Over the past 2 years, the European Patent Office reported processing about 160,000 to 170,000 patents per year using ePhoenix.

for electronic patent processing. They stated that, despite knowing about the problems and risks associated with using the software, the agency had nonetheless proceeded with this initiative because senior officials, including the former USPTO director, had stressed their preference for using ePhoenix in order to expedite the implementation of a system. Patent and OCIO officials acknowledged that management judgment, rather than a rigorous analysis of costs, benefits, and alternatives, had driven the agency's decision to use this system.

To a significant extent, USPTO's difficulty in realizing intended improvements through its electronic filing system and Image File Wrapper can be attributed to the fact that the agency took an ad hoc approach to planning and managing its implementation of these systems, driven in part by its accelerated schedule for implementing an automated patent processing capability. The Clinger-Cohen Act of 1996,²¹ as well as information technology best practices and our prior reviews, emphasize the need for agencies to undertake information technology projects based on well-established business cases that articulate agreed-upon business and technical requirements; effectively analyze project alternatives, costs, and benefits; include measures for tracking projects through their life cycle against cost, schedule, benefit, and performance targets; and ultimately, provide the basis for credible and informed decision making and project management. Yet, patent officials did not rely on established business cases to guide their implementation of these key automation initiatives.

The absence of sound project planning and management for these initiatives has left the agency without critical capabilities, such as text processing, and consequently, has impeded its successful transition to an integrated and paperless patent processing environment. The Under Secretary of Commerce for Intellectual Property, who serves as the director of USPTO, stated at the conclusion of our review that he recognized and intended to implement measures to address the weaknesses in the agency's planning and management of its automated patent systems.

²¹ 40 U.S.C. §11312.

USPTO Lacks Essential Information Technology Investment Management Processes to Support Its Patent Automation

USPTO's ineffective planning for and management of its patent automation projects, in large measure, can be attributed to enterprise-level, systemic weaknesses in the agency's information technology investment management processes. A key requirement of the Clinger-Cohen Act is that agencies have established processes, such as capital planning and investment control, to help ensure that information technology projects are implemented at acceptable costs and within reasonable and expected time frames, and contribute to tangible, observable improvements in mission performance. Such processes guide the selection, management, and evaluation of information technology investments by aiding management in considering whether to undertake a particular investment in information systems and providing a means to obtain necessary information regarding the progress of an investment in terms of cost, capability of the system to meet specified requirements, timeliness, and quality.

Further, our Enterprise Architecture Framework²² emphasizes that information technology projects should show evidence of compliance with the organization's enterprise architecture, which serves as a blueprint for systematically and completely defining an organization's current (baseline) operational and technology environment and as a roadmap toward the desired (target) state. Effective implementation of an enterprise architecture can facilitate an agency by informing, guiding, and constraining the decisions being made for the agency, and subsequently decrease the risk of buying and building systems that are duplicative, incompatible, and unnecessarily costly to maintain and interface.

At the time of our study, USPTO had begun instituting certain essential information technology investment management mechanisms, such as a framework for its enterprise architecture and components of a capital planning and investment control process. However, it had not yet established the necessary linkages between its enterprise architecture and its capital planning and investment control process to ensure that its automation projects would comply with the architecture or fully instituted enforcement mechanisms for investment management. For example, USPTO drafted a capital planning and investment control guide in June 2004 and issued an agency administrative order on its integrated

²²For more information, see GAO, *Information Technology: A Framework for Assessing and Improving Enterprise Architecture Management* (Version 1.1), [GAO-03-584G](#) (Washington, D.C.: April 2003).

investment decision practices in February 2005. However, according to senior officials, many of the processes and procedures in the guide had not been completed and fully implemented and it was unclear how the agency administrative order was being applied to investments.

In addition, while the agency had completed the framework for its enterprise architecture, it had not aligned its business processes and information technology in accordance with the architecture. According to OCIO officials, the architecture review board responsible for enforcing compliance with the architecture was not yet in place; thus, current architecture reviews were of an advisory nature and were not required for system implementation. Our analysis of architecture review documents that system officials provided for the electronic filing system and the Image File Wrapper confirmed that the agency had not rigorously assessed either of these systems' compliance with the enterprise architecture. Adding to these conditions, a study commissioned by the agency in 2004 found that its Office of Chief Information Officer was not organized to help the agency accomplish the goals in its automation strategy and that its investment management processes did not ensure appropriate reviews of automation initiatives.

USPTO has an explicit responsibility to ensure that the automation initiatives that it is counting on to enhance its overall patent process are consistent with the agency's priorities and needs and are supported by the necessary planning and management to successfully accomplish this. At the conclusion of our review, the agency's director and its chief information officer acknowledged the need to strengthen the agency's investment management processes and practices and to effectively apply them to USPTO's patent automation initiatives.

USPTO Has Taken Steps to Help Attract and Retain a Qualified Patent Examiner Workforce, but Long-Term Success Is Uncertain

Since 2000, USPTO has also taken steps intended to help attract and retain a qualified patent examination workforce. The agency has enhanced its recruiting efforts and has used many human capital flexibilities to attract and retain qualified patent examiners. However, during the past 5 years, its recruiting efforts and use of benefits have not been consistently sustained, and officials and examiners at all levels in the agency told us that the economy has more of an impact on their ability to attract and retain examiners than any actions taken by the agency. Consequently, how USPTO's actions will affect its long-term ability to maintain a highly qualified workforce is unclear. While the agency has been able to meet its hiring goals, attrition has recently increased.

USPTO's recent recruiting efforts have incorporated several measures that we and others identified as necessary to attract a qualified workforce.²³ First, in 2003, to help select qualified applicants, the agency identified the knowledge, skills, and abilities that examiners need to effectively fulfill their responsibilities. Second, in 2004, its permanent recruiting team, composed of senior and line managers,²⁴ participated in various recruiting events, such as job fairs, conferences sponsored by professional societies, and visits to the 10 schools that the agency targeted based on the diversity of their student population and the strength of their engineering and science programs.²⁵ Finally, for 2005, USPTO developed a formal recruiting plan that, among other things, identified hiring goals for each technology center and described the agency's efforts to establish ongoing partnerships with the 10 target schools. In addition, the agency trained its recruiters in effective interviewing techniques to help them better describe the production system and incorporated references to the production-oriented work environment in its recruitment literature.

USPTO has also used many of the human capital benefits available under federal personnel regulations to attract and retain qualified patent examiners. Among other benefits, it has offered

- recruitment bonuses ranging from \$600 to over \$10,000;
- a special pay rate for patent examiners that is 10 percent above federal salaries for comparable jobs;
- non-competitive promotion to the full performance level; and
- flexible working schedules, including the ability to schedule hours off during midday.

²³See GAO, *Human Capital: A Self-Assessment Checklist for Agency Leaders*, [GAO/OCG-00-14G](#), version 1 (Washington, D.C.: September 2000); and Office of Personnel Management, *Human Capital Assessment Accountability Framework*, (Washington, D.C., Sept. 20, 2000).

²⁴USPTO's permanent recruiting team was established in 2002. However, the agency suspended recruiting efforts in 2002 and 2003 in the face of budgetary uncertainty.

²⁵The 10 target schools selected were Florida International University, North Carolina Agricultural and Technical State University, North Carolina State University, University of Florida, University of Maryland, University of Pennsylvania, University of Puerto Rico-Mayaguez, University of Virginia, University of Wisconsin-Madison, and Virginia Polytechnic and State University.

According to many of the supervisors and examiners who participated in our focus groups, these benefits were a key reason they were attracted to the agency and are a reason they continue to stay. The benefits that examiners most frequently cited as important were the flexible working schedules and competitive salaries.

However, it is too soon to determine the long-term effect of the agency's efforts, in part because neither its recruiting efforts nor the human capital benefits have been consistently sustained due to budgetary constraints. For example, in 2002 the agency suspended reimbursements to examiners for law school tuition because of funding limitations, although it resumed the reimbursements in 2004 when funding became available. Examiners in our focus groups expressed dissatisfaction with the inconsistent availability of these benefits, in some cases saying that the suspension of benefits, such as law school tuition reimbursement, provided them an incentive to leave the agency. More recently, in March 2005, USPTO proposed to eliminate or modify other benefits, such as the ability of examiners to earn credit hours and to set their own work schedules.

Another, and possibly the most important, factor adding to the uncertainty of USPTO's recruiting efforts is the unknown potential impact of the economy, which, according to agency officials and examiners, has a greater effect on recruitment and retention than any actions the agency may take. Both agency officials and examiners told us that when the economy picks up, more examiners tend to leave the agency and fewer qualified candidates are attracted to it. On the other hand, when there is a downturn in the economy, the agency's ability to attract and retain qualified examiners increases because of perceived job security and competitive pay. When discussing their reasons for joining USPTO, many examiners in our focus groups cited job security and the lack of other employment opportunities, making comments such as, "I had been laid off from my prior job, and this was the only job offer I got at the time." This relationship between the economy and USPTO's hiring and retention success is part of the reason why the agency has met its hiring goals for the last several years. However, the agency has recently experienced a rise in attrition rates. In particular, a high level of attrition among younger, less experienced examiners could affect its efforts to maintain a highly qualified patent examination workforce. Attrition of examiners with 3 years or less experience is a significant loss for the agency because considerable time and dollar resources are invested to help new examiners become proficient during their first few years.

USPTO Faces Long-Standing Human Capital Challenges that Could Undermine Its Recruiting and Retention Efforts

While USPTO has undertaken a number of important and necessary actions to attract and retain qualified patent examiners, it continues to face three long-standing human capital challenges which, if not addressed, could also undermine its recent efforts. First, although organizations with effective human capital models have strategies to communicate with employees and involve them in decision making, the lack of good communication and collaboration has been a long-standing problem at USPTO. We found that the agency does not have a formal communication strategy and does not actively seek input from examiners on key management decisions. Most of the emphasis is on enhanced communication among managers but not between managers and other levels of the organization, such as patent examiners. Patent examiners and supervisory patent examiners in our focus groups frequently stated that communication with agency management was poor and that managers provided them with inadequate or no information, creating an atmosphere of distrust of management. The examiners also said that management was out of touch with them and their concerns and that communication with the managers tended to be one way and hierarchical, with little opportunity for feedback. Management officials told us that informal feedback can always be provided by anyone in the organization—for example, through an e-mail to anyone in management.

The lack of communication between management and examiners is exacerbated by the contentious working relationship between management and union officials and by the complexity of the rules about what level of communication can occur between managers and examiners without involving the union.²⁶ Some managers alluded to this contentious relationship as one of the reasons why they had limited communication with patent examiners, who are represented by the union even if they decide not to join it. Specifically, they believed they could not solicit the input of employees directly without engaging the union. Another official, however, told us that nothing prevents the agency from having “town hall” type meetings to discuss potential changes in policies and procedures, as long as the agency does not promise examiners a benefit that impacts their working conditions. Union officials agreed that USPTO can invite comments from examiners on a plan or proposal; however, if the proposal concerns a negotiating issue, the agency must consult the examiners’

²⁶Patent examiners are represented by, but not required to join, the Patent Office Professional Association (POPA), an independent union of professional employees formed in 1964.

union, which is their exclusive representative with regard to working conditions.

Second, human capital models suggest that agencies should periodically assess their monetary awards systems to ensure that they help attract and retain qualified staff. However, patent examiners' awards are based largely on the number of applications they process, and the assumptions on which application processing quotas are based have not been updated since 1976. Patent examiners and management have differing opinions on whether these assumptions need to be updated. Examiners in our focus groups told us that, in the last several decades, the tasks associated with and the complexity of processing applications have greatly increased while the time allowed has not. As a result, many of the examiners and supervisory patent examiners in our focus groups and respondents to previous agency surveys reported that examiners do not have enough time to conduct high-quality reviews of patent applications. The examiners noted that these inadequate time frames create a stressful work environment and are cited in the agency's exit surveys as a primary reason that examiners leave the agency. In contrast, USPTO managers had a different perspective on the production model and its impact on examiners. They stated that the time estimates used in establishing production quotas do not need to be adjusted because the efficiencies gained through actions such as the greater use of technology have offset the time needed to address the greater complexity of the applications and the increase in the number of claims. Moreover, they said that for an individual examiner, reviews of applications that take more time than the estimated average are generally offset by other reviews that take less time.

Finally, counter to current workforce models, USPTO does not require ongoing technical education for patent examiners, which could negatively affect the quality of its patent examination workforce. Instead, the agency requires newly hired examiners to take extensive training only during their first year of employment; all subsequent required training is focused on developing legal expertise. Almost all patent examiners are required to take a range of ongoing training in legal matters, including patent law. In contrast, patent examiners are not required to undertake any ongoing training to maintain expertise in their area of technology, even though the agency acknowledges that such training is important, especially for electrical and electronic engineers. In 2001 the agency stated, "Engineers who fail to keep up with the rapid changes in technology, regardless of degree, risk technological obsolescence." However, agency officials told us that examiners automatically maintain currency with their technical fields by just doing their job. Patent examiners and supervisory patent

examiners disagreed, stating that the literature they review in applications is outdated, particularly in rapidly evolving technologies. The agency does offer some voluntary in-house training, such as technology fairs and industry days at which scientists and others are invited to present lectures to patent examiners that will help keep them current on the technical aspects of their work. In addition, the agency offers voluntary external training and, for a small number of examiners, pays conference or workshop registration fees. Agency officials could provide no data on the extent to which examiners have taken advantage of such training opportunities.

USPTO Has Made Greater Progress on Strategic Plan Initiatives that Enhance the Agency's Capability Rather than Productivity and Agility

In carrying out its strategic plan to become a more productive and responsive organization, our work found that USPTO has made greater progress in implementing its initiatives to make the patent organization more capable by improving the quality of examiners' skills and work processes than it has in implementing its productivity and agility initiatives aimed at decreasing the length of time to process a patent application and improving electronic processing. Specifically, of the activities planned for completion by December 2004, the agency has fully or partially implemented all 23 of the initiatives related to its capability theme to improve the skills of employees, enhance quality assurance, and alter the patent process through legislative and rule changes. In contrast, it has partially implemented only 1 of the 4 initiatives related to the productivity theme to restructure fees and expand examination options for patent applicants and has fully or partially implemented 7 of the 11 initiatives related to the agility theme to increase electronic processing of patent applications and to reduce examiners' responsibilities for literature searches. Table 1 provides our assessment of each of the strategic plan initiatives.

Table 1: Status of Strategic Plan Initiatives to Improve Workforce Skills

Capability initiatives to improve workforce skills	Implemented	Partially implemented	Not implemented
Increase the pool of qualified management candidates by adding awards to total compensation	•		
Explore alternate organizational structures for the workplace	•		
Develop interim pre-employment measures to assess English language skills	•		
Recertify the skills of examiners with authority to issue patents (primary examiners) through examinations and expanded work product reviews	•		
Certify that examiners possess the requisite knowledge, skills, and abilities prior to promotion to a position with authority to negotiate on behalf of USPTO	•		
Improve the selection and training of supervisory patent examiners		•	
Use examinations and other means to ensure that new patent examiners possess the requisite skills prior to promotion		•	
Implement a pre-employment test to assess English language skills		•	
Create an Enterprise Training Division		•	
Capability initiatives to enhance quality assurance			
Expand current quality assurance program to include works in progress (in-process reviews)	•		
Establish “second pair of eyes” reviews in each technology center	•		
Survey customer regarding transactions with USPTO on specific applications to supplement comprehensive customer surveys	•		
Evaluate the quality of examiners’ literature searches		•	
Enhance the reviewable record for each patent application with additional information from the applicant and examiner		•	
Capability initiatives to change legislation and rules			
Delete the requirement for physical surrender of the original patent papers	•		
Certify the legal knowledge of patent attorneys and agents who wish to practice before USPTO and periodically recertify the skills of practicing attorneys and agents		•	
Evaluate whether to adopt a unity of invention standard		•	
Simplify adjustments to the patent term		•	
Permit individuals who have been assigned patent rights to sign an oath declaring that the inventor is the original and first inventor		•	
Permit individuals who have been assigned patent rights to broaden the claims in an application		•	
Correct an inconsistency regarding unintentionally delayed submission of certain claims		•	
Eliminate certain exemptions from the requirement to publish most patent applications within 18 months of when they were first filed		•	

Amend current legislation regarding certain limitations on an inventor's right to obtain a patent	•	
Productivity initiatives		
Restructure fees and provide for refunds	•	
Offer patent applicants a choice of up to 5 examination options based in part on the ability to rely on searches conducted by others		•
Offer patent applicants the option of an accelerated examination		•
Revise postgrant review procedures to allow greater public input		•
Agility initiatives		
Establish an information security program	•	
Transition to electronic patent processing	•	
Transition to electronic processing for postgrant reviews	•	
Ensure availability of critical data in the event of a catastrophic systems failure	•	
Promote international harmonization and pursue goals to strengthen international intellectual property rights of U.S. inventors	•	
Pursue international agreements to share patent search results	•	
Accelerate Patent Cooperation Treaty reforms	•	
Rely on other sources to classify patent documents		•
Rely on other sources to support domestic and international literature searches		•
Rely on other sources to transition to a new global patent classification system		•
Develop stringent conflict of interest clauses for search firms		•

Source: GAO analysis of USPTO data.

Agency officials primarily cited the need for additional funding as the main reason that some initiatives have not been implemented. With passage of the legislation in December 2004 to restructure and increase the fees available to USPTO, the agency is reevaluating the feasibility of many initiatives that it had deferred or suspended.

In summary, through its attempts to implement an integrated, paperless patent process over the past two decades, USPTO has delivered a number of important automated capabilities. Nonetheless, after spending over a billion dollars on its efforts, the agency is still not yet effectively positioned to process patent applications in a fully automated environment. Moreover, when and how it will actually achieve this capability is uncertain. Largely as a result of ineffective planning and management of its automated capabilities, system performance and usability problems have limited the effectiveness of key systems that the agency has implemented to support critical patent processes. Although

USPTO's director and its chief information officer have recognized the need to improve the agency's planning and management of its automation initiatives, weaknesses in key information technology management processes needed to guide the agency's investments in patent automation, such as incomplete capital planning and investment controls, could preclude their ability to successfully accomplish this. Thus, the agency risks further implementing information technology that does not support its needs and that threatens its overall goal of achieving a fully electronic capability to process its growing patent application workload.

Further, to improve its ability to attract and retain the highly educated and qualified patent examiners it needs, USPTO has taken steps recognized by experts as characteristic of highly effective organizations. However, without an effective communication strategy and a collaborative culture that includes all layers of the organization, the agency's efforts could be undermined. The absence of effective communication and collaboration has created distrust and a significant divide between management and examiners on important issues such as the appropriateness of the production model and the need for technical training. Unless the agency begins to develop an open, transparent, and collaborative work environment, its efforts to hire and retain examiners may be adversely affected in the long run. Overall, while USPTO has progressed in implementing strategic plan initiatives aimed at improving its organizational capability, the agency attributes its limited implementation of other initiatives intended to reduce pendency and improve electronic patent application processing primarily to the need for additional funding.

Given the weaknesses in USPTO's information technology investment management processes, we recommended that the agency, before proceeding with any new patent automation initiatives, (1) reassess and, where necessary, revise its approach for implementing and achieving effective use of information systems supporting a fully automated patent process; (2) establish disciplined processes for planning and managing the development of patent systems based on well-established business cases; and (3) fully institute and enforce information technology investment management processes and practices to ensure that its automation initiatives support the agency's mission and are aligned with its enterprise architecture. Further, in light of its need for a more transparent and collaborative work environment, we recommended that the agency develop formal strategies to (1) improve communication between management and patent examiners and between management and union officials and (2) foster greater collaboration among all levels of the

organization to resolve key issues, such as the assumptions underlying the quota system and the need for required technical training.

USPTO generally agreed with our findings, conclusions, and recommendations regarding its patent automation initiatives and acknowledged the need for improvements in its management processes by, for example, developing architectural linkages to the planning process and implementing a capital planning and investment control guide. Nonetheless, the agency stated that it only partially agreed with several material aspects of our assessment, including our recommendation that it reassess its approach to automating its patent process. Further, the agency generally agreed with our findings, conclusions, and recommendations regarding its workforce collaboration and suggested that it would develop a communication plan and labor management strategy, and educate and inform employees about progress on initiatives, successes, and lessons learned. In addition, USPTO indicated that it would develop a more formalized technical program for patent examiners to ensure that their skills are fresh and ready to address state-of-the-art technology.

Mr. Chairman, this concludes our statement. We would be pleased to respond to any questions that you or other Members of the Committee may have at this time.

Contacts and Acknowledgments

For further information, please contact Anu K. Mittal at (202) 512-3841 or Linda D. Koontz at (202) 512-6240. They can also be reached by e-mail at mittala@gao.gov and koontzl@gao.gov, respectively. Other individuals making significant contributions to this testimony were Valerie C. Melvin, Assistant Director; Cheryl Williams, Assistant Director; Mary J. Dorsey, Vijay D'Souza, Nancy Glover, Vondalee R. Hunt, and Alison D. O'Neill.

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