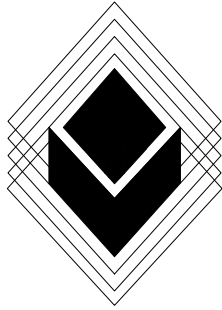

Title Imaging Project

**NYS Department of Motor Vehicles
&
Center for Technology in Government**

CTG Project Report 94-1



**Center for Technology in Government
University at Albany / SUNY**



Center for Technology in Government

Title Imaging Project New York State Department of Motor Vehicles

Project Report

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Executive Summary

Paperwork. Few words evoke such a negative picture of government operations. Yet, government is an information-intensive enterprise with a legal obligation to create and maintain huge volumes of public records. The paperwork problem exists in part because these records are caught up in processes that are antiquated, slow, error prone, and expensive.

Document imaging and work flow management systems merge several technologies to convert paper documents to electronic images. They offer safe, economical storage and quick, reliable access to documents. A well-designed system sharply reduces the costs of filing, locating, and moving paperwork. It can streamline manual operations that have resisted automation with traditional data processing applications. These characteristics make imaging an attractive tool for improving and simplifying government operations.

Document imaging systems, however, are expensive to implement and nearly always require extensive analysis, business process reengineering, and organizational change. Although New York's government agencies are very interested in imaging and work flow technologies, they have had little experience to help them make sound decisions about design, procurement, and implementation. The initial project of the Center for Technology in Government demonstrated document imaging and work flow solutions in a particular government application, the vehicle title operation at the New York State Department of Motor Vehicles. This project addressed both specific DMV operations, and more general questions of interest throughout the public sector.

The project was completed in 1993 and involved staff from the Department of Motor Vehicles, several corporate partners led by AT&T Global Information Solutions, and faculty, staff, and graduate students from the University at Albany. It produced a prototype application of a portion of the title issuance operation at DMV, answering many technical, managerial, and organizational questions. The project also involved demonstrations and presentations to more than thirty-five other government agencies and generated several important lessons about imaging and work flow that are of benefit to them all.

For the Department of Motor Vehicles, the project:

- Contributed to the implementation of major improvements in title processing, with a substantial reduction in average processing time--without implementing the technology. The process reengineering embodied in the project reinforced the agency's strong customer focus and quality management efforts. It gave DMV the information it needed to make immediate improvements without added cost.

- Postponed an isolated procurement effort for title processing, in favor of an agency-wide evaluation of customer-oriented processes which could be improved by imaging and work flow tools.
- Demonstrated the ability of this technology to prolong the useful life of expensive legacy systems. The current title processing system at DMV was designed more than twenty years ago. Agency technical staff acquired a good understanding of the issues associated with distributed networked applications and learned how these new technologies can give new and continued utility to such existing mainframe applications.
- Demonstrated how a process involving more than 20 consecutive steps could be redesigned into one with fewer than half that number, with dramatic reductions in processing time.
- Demonstrated an entirely new work process where a single staff person handles complete transactions, rather than just one action in an assembly line of fragmented tasks.
- Involved more than 300 staff from every level of the Department including data processing professionals, program staff, top level managers, and all supervisors and employees in the Title Bureau. Through demonstration and discussion, all employees who would be affected by processing changes participated in their design. This organizational learning process prepared the agency staff to accept the changes which were needed in order to achieve significant improvements.

The more generic lessons of the project have value throughout state and local government. These include:

- Business process analysis is an indispensable first step in the design and development of imaging and work flow applications. Much, if not most, of the value of a new system can be derived simply from rethinking and redesigning business processes.
- Flexible, modern information tools can be successfully integrated with existing mainframe-based information systems. Adding a PC-based front end to legacy mainframe applications in a client-server architecture can be a powerful enhancement to staff productivity and an effective way to prolong the value of old, but indispensable systems.
- Imaging and work flow systems are deeply embedded in organizational context. They directly affect employees, work culture, and work processes. To reduce organizational resistance and improve prospects for success, the people who will be affected by these changes must be full participants in their design and implementation.

- Prototyping is a flexible, low-cost, low-risk approach to expensive and significant technological change. Once defined, the DMV prototype was constructed in only four weeks. It gave the agency an opportunity to learn about new technologies, to test the reaction of key organizational units, and to learn important lessons before proceeding to full system design and procurement.
- Public demonstrations, presentations, and careful documentation of prototype projects can turn one agency's investment into learning that benefits many others. The DMV prototype demonstrations generated well-informed enthusiasm for imaging and work flow applications and gave many agencies their first thoughtful look at the attendant costs and benefits.

1. Project Overview

Vehicle titles are issued in New York State under provisions of the Uniform Vehicle Certificate of Title Act. The current process for issuing titles is largely paper-bound. Over the past twenty years, the number of titles issued annually by the New York State Department of Motor Vehicles (DMV) has increased more than 400%, from 660,000 to over 3.7 million. Along with other factors, this growth in volume has led to waiting times of up to 120 days to process a title application. The resulting inconvenience to customers has received executive and legislative attention. A 1990 DMV study to resolve these problems recommended that the agency explore a computerized image transaction processing system to improve service.

Nearly every other state employs microfilm to store images of vehicle title applications and associated paperwork. While microfilm is more efficient and less costly than DMV's current paper storage system, it is only a partial solution for a jurisdiction as large as New York since it does nothing to alleviate the cumbersome use of paper during transaction processing. Digitizing the images, however, eliminates paper at the beginning of the process, permitting a fully automated work-in-process transaction processing system. This approach also improves job satisfaction by enabling an employee to complete all aspects of a transaction rather than just a fragmented task.

As a result of the 1990 study, DMV began to plan for a computer-based imaging transaction processing system. Following standard practice, the agency requested information about imaging technology from all major vendors. The responses varied greatly in technology, scope, cost, and application with no clearly preferred approach. Rather than write specifications in a subsequent Request for Proposal (RFP) for a technology with which they had little experience, DMV sought instead to explore these technologies in the Solutions Laboratory at the Center for Technology in Government (then called the Center for Government Technology Solutions). By developing a prototype application for a portion of their Title Bureau processing, agency managers expected to gain hands-on experience that would better equip them to make informed decisions about procurement and deployment of imaging technology.

Current Title System

The majority of DMV title transactions are partially processed in DMV field offices as part of registration transactions. For these transactions, all data entry is performed in the field to create a mainframe computer record in the central office. The title-related paperwork (typically documents of varying sizes such as forms and possibly checks) is then forwarded to the central DMV office in Albany in batches. Batches are identified by date and terminal number with laser printed receipts that tie each transaction to its mainframe computer record. These receipts are printed on field laser printers and can be

in bar code or text format suitable for optical character recognition (OCR). Each transaction is relatively autonomous and rarely requires additional information for processing. At the central office, most of the field transaction work is merely audited. The remaining field-generated transactions require additional information to be gathered before they can be completed.

There is also a category of title work that is received by mail at the central office in Albany and is totally processed centrally. These, combined with field exceptions and problem resolutions, total over a million transactions handled annually at the central office. These transactions are typically of a more difficult nature. Approximately 2.5% of title transactions cannot be processed centrally without obtaining additional information. When DMV historical information is necessary, it can normally be provided through computerized records. However, there are also approximately five hundred manual searches of old paper files each day. More typically, additional information is requested through mail correspondence with the customer. These exception transactions often result in return telephone calls from customers with questions that require quick access to the original paperwork. Since rapid access is often difficult, these transactions frequently result in additional return calls and dissatisfied customers.

Except for data entry and the printing of documents, processing within the current system is manual and paper bound. All work is handled in applications batches as they were configured in the field offices or created in the Title Bureau. The assigned batch numbers are the key to retrieval of paper applications and supporting documentation while in process or after filing. Consequently, applications for vehicle registration that do not require title work flow through the entire title issuance process in order to keep the entire box of batches together. Title-related documents must be maintained for five years before destruction.

In the current system, anything that is not routine is deferred for later processing. Problems both large and small are resolved at the end of the process. In many cases, a resolution could be accomplished earlier in the process by simply redirecting the application to another departmental unit. However, separating a transaction from the rest of the paper batch makes it difficult to track and access the transaction, and creates additional work to refile the paperwork at a relatively inaccessible remote site. In addition to the high volume of exceptions, problem resolution is burdened with an inefficient data entry and processing system, cumbersome and slow manual retrieval of paper records, and a labor-intensive case tracking system.

Center for Technology in Government Project

To help them better prepare to write a Request for Proposals, DMV staff proposed to develop a prototype of a work-in-process imaging system for a portion of title operations at the Center for Technology in Government. The agency expected that an automated image storage and retrieval system would produce several major benefits:

1. It would improve customer service in a cost-effective manner. The agency expected it to help operations by speeding up title processing, improving data accuracy, providing rapid access to historical information and partially-completed transaction files, and increasing employee productivity.
2. Agency management hoped to acquire tools for more efficient assignment of work. This would include an executive management information system enabling the agency to monitor work load, throughput and employee performance, increase security, decrease vulnerabilities, and reduce per-item processing costs.
3. By resolving many of the current title system problems, DMV management hoped the new process would positively impact other departmental operations that rely on Title Bureau functions. These departments, including over a hundred issuing offices statewide, the Auto Theft Investigation Units, the Junk and Salvage Examination Program, and Internal Audit and Revenue Accounting, interact with the Title Bureau to perform certain functions.

A major objective of the project was to assist the agency in assessing whether the proposed imaging system would enable them to achieve these goals.

DMV proposed this project to the New York State Forum for Information Resource Management's Standing Committee on the Center, which had solicited proposals of projects to be undertaken at the then-new Center. In early 1992, the Standing Committee endorsed this proposal as the Center's first project.

Project Objectives

As defined jointly by the project participants, the objectives of the imaging project were to:

1. Create a prototype imaging application for a portion of title operations at DMV. The portion selected was the processing of requests to issue a duplicate title.
2. Evaluate how images may be indexed, audited, and tracked within large agency operations, and how new technologies may work with existing systems.

3. Evaluate how imaging, automated work flow management, networking, and other information management technologies may improve quality or lower the cost of these and other government services that rely on documents.
4. Develop cost benefit bases for making decisions about technology alternatives and configurations for various kinds of agency applications.
5. Evaluate the robustness of imaging and work flow technology in different settings, and identify important characteristics, both functional and physical, that are critical for agency environments.
6. Provide accurate information to other agencies about these technologies, and educate decision makers about their possibilities and limitations both now and in the future.

Project Workplan and Participant Roles

To accomplish these objectives, several activities were planned:

1. Install a basic imaging system at the Center for Technology in Government.
2. Develop a prototype application supporting the processing of requests for duplicate titles at DMV.
3. Investigate work flow software and its ability to facilitate business process reengineering.
4. Establish an interactive connection between this new application and the mainframe applications that are currently used in DMV's operations. All applications should be available on a single desktop in an integrated environment.
5. Investigate ancillary imaging technologies such as optical character recognition (OCR) and rapid prototyping tools.
6. Present demonstrations of the prototype for personnel from DMV and other public agencies.

The work began with the development of a workplan, and the recruitment of corporate partners, University faculty, and students. The imaging project team, with approximately ten members, consisted of technical and management staff from DMV, AT&T Global Information Solutions,* NewVision Systems, and faculty and staff from the Computer Science Department at the University at Albany. Overall project coordination was handled by a team consisting of one member from each of the three sectors (private,

* At the time of this project, this organization was known as NCR/AT&T Corporation.

agency, University). This initial team, joined by other DMV staff, was introduced to DMV's business processes and the system development environment. Discussion and analysis of the current process flow within DMV took place before development of the prototype began.

Shortly after the prototype development started, final specifications for the prototype were established. Within a month, the prototype was completed. Public demonstrations for DMV staff and other state and local government representatives were conducted over the final month of the project. All participants worked on the prototype specifications, development, and coding. The team from AT&T GIS installed a basic imaging system. NewVision Systems provided a base custom imaging and work flow system (taken from an existing insurance application) that was modified to support DMV's duplicate title processing. Both corporate partners also worked with the agency and University team members to integrate the DMV mainframe, applications, and data into the system. Students integrated word-processing tasks into the system. Several joint application development sessions were held with all participants to design the system. All team members participated in testing the various software components of the prototype system.

Hardware, software, and support for the prototype development was provided by AT&T GIS. Since an evaluation of sophisticated custom OCR capability was one of the objectives of the project, Grumman Data Systems, in partnership with Scan-Optics Corporation and under the direction of AT&T GIS, contributed a demonstration and seminars on their advanced OCR systems. Training and system support were provided by AT&T GIS and NewVision Systems. Early project management assistance was provided by DRT Systems International, and desktop software was provided by Microsoft Corporation.

Once the workplan was established, the entire project was completed in approximately six months.

2. Project Results

1. Create a prototype imaging application for a portion of title operations at DMV.

Functional Specification of the Prototype

The prototype was designed to use imaging and work flow technology to issue a duplicate vehicle title. The final prototype supported four activities: scanning, indexing, assignment and processing of tasks, and viewing and presenting.

To meet prototype requirements, the document flow was altered from the traditional DMV approach. In the new system, the process began with the conversion of documents from paper to electronic images in the scanning phase. Each image was stored in an "application file folder" and stored within the system.

In the indexing phase, each document was indexed using a unique identifier. The prototype used a combination of the vehicle identification number (VIN), year, make, and plate number to associate each document with its corresponding title record on the DMV mainframe. Once a set of documents was indexed it was available for retrieval within the system. The Grumman, AT&T GIS, and Scan-Optics project demonstrated how OCR and bar code could be used to automate the indexing.

The next phase assigned the document to an operator for processing. This step illustrated how imaging and a windows-based system would simplify duplicate title processing for both routine and problem situations. The system supported generation of routine correspondence, with cut-and-paste capabilities that allow scanned images (such as inaccurate checks) to be included in the correspondence.

The retrieval process was provided by a view and print capability. A document could be retrieved by entering a search via a vehicle's unique identifier. Although each vehicle was identified by a combination of VIN, year, make and plate, searching for a vehicle could be done using all or part of any of the fields. While it took more processing time, this partial-match capability offered the flexibility necessary to support typical user inquiries.

Overall, the application successfully illustrated the potential uses and capabilities of imaging hardware and software within the title processing operation.

Software and Hardware Architecture

The final system prototype was based on a networked configuration of three AT&T System 3000 486-based DOS Windows workstations with 19" high-resolution monitors. The network included an AT&T System 3000 running UNIX system V Release 4 used as a dedicated database server, a modem to interface with the DMV mainframe, a laser printer, and a scanner. Each workstation was equipped with the capability to compress and decompress document images in order to increase storage efficiency.

The software used to develop the prototype included both database, and client/server technologies. Microsoft Windows was used to provide a graphical user interface (GUI) to enhance the ease of use of the prototype. Other software components were used to develop the interface to the DMV mainframe, and to provide handling and indexing mechanics for the scanned images.

Additional technical details of the software and hardware architecture are presented in Appendix C.

System Development

The prototype system was developed to meet DMV's objectives by modifying an application previously developed by NewVision Systems for an insurance function. Early in the project, rapid prototyping software developed by Image Innovations was provided for evaluation by AT&T. The project personnel gained valuable experience in working with the beta version of this powerful software, but modification of the NewVision system was a more expedient alternative. System development went smoothly, the prototype was completed in approximately four weeks, and delivered on all its major objectives.

2. Evaluate how images may be indexed, audited, and tracked within large agency operations, and how new technologies may work with existing systems.

The system successfully demonstrated the ability of a DOS/Windows and UNIX-based client-server application to communicate with legacy mainframe systems. Prior to this project, the users and technical staff at the agency had little experience with networked applications. The ability to display data from multiple existing applications on a single desktop and the ability to run mainframe applications from within the DOS/Windows environment were important objectives and were successfully achieved.

An important module in the system handled the scanning of documents. In the prototype system, indexing was performed with manual data entry. In a production system, indexing using OCR, voice input, or bar-coding is a more likely environment. Due to time and resource constraints, these capabilities were not incorporated in the prototype.

3. Evaluate how imaging, automated work flow management, networking and other information management technologies may improve quality and lower the cost of these and other government services that rely on documents.

The Title Imaging Project provided DMV and University participants an opportunity to learn how a basic imaging and work flow management system works. The time invested in working with OCR and work flow technologies was augmented with seminars, videos, demonstrations, and expert consultation.

The project provided first-hand experience with the capabilities and limitations of current imaging and work flow management systems. As the project progressed, participants could ask better questions about the technology from the on-hand experts. The prototype demonstrated how government services that rely on documents would change with imaging. Implementing and demonstrating the technology was also educational for agency staff who would eventually work on a new system. Tasks that were previously fragmented were accomplished in an "assembly line" structure. The technology brought all of the required information together at a single workstation, thus enabling one worker to complete the entire task. This is expected to result in more efficient processing, reduced errors, and improved morale.

One conclusion that came from the Title Imaging Project was that imaging technology could provide enhanced capabilities to users at all levels of the organization. Imaging is normally a bottom-up technology – it is the lower levels within an organization that drive the need for and derive the initial benefits from the new technology. The project provided additional impetus for DMV management to explore the advantages of reengineering the Title Bureau operation. In order for business process reengineering to be successful, however, workers at all levels of the organization must be involved in identifying the necessary changes and be empowered to implement process changes at their level in the organization.

As a consequence, the prototype demonstration involved DMV staff at all levels of the organization. Hundreds of DMV employees, from the Agency Commissioner to staff in the mail room, including every staff member in the Title Bureau, had an opportunity to review the current processing steps and see how they might be performed in an imaging environment. All aspects of titling were examined in an attempt to streamline processes and eliminate those which were ineffective. Management and staff worked together to combine functions and tasks to prepare for the new technology, but the process brought benefits even without introduction of the technology. In the months following the demonstration, DMV began the task of process reengineering that involved the entire organization.

Because workers had a concrete example of the technology, and a clearer understanding of the anticipated information infrastructure in the department, they could better anticipate and prepare for the new technology. It is significant that this process analysis

and reengineering was begun without the incorporation of the new technology. The Center project focused attention on the current processing steps and brought about a re-examination of the current process. By eliminating ineffective steps and combining functions in the Title Bureau process, management and staff were able to create a better work flow and more complete job units. This brought significant benefits even without the technology components.

The CTG project was one of the factors enabling this process change. As previously mentioned, the reexamination of the department's current processes had begun in 1989 when the initial issue of imaging as an enabling technology was raised. As this investigation was occurring, many other aspects of DMV's operations were being changed, and legislative authority and funding for an imaging system was established. Shortly after the CTG project began, AT&T GIS provided project participants with a series of lectures on imaging technologies and the reengineering process. These were complemented with activities at the agency to apply the principles presented by AT&T GIS.

The first of these lectures focused on a new methodology for performing an imaging cost benefit analysis on the tasks involved in the titling process. The "duplicate titling" process was re-evaluated, in order to determine what the resource requirements and processing efficiencies of a new imaging system would be. Tasks that added value in the process were distinguished from tasks that merely involved handling a title application. As a result of this evaluation, it was determined that processing of a complex duplicate title application involves over twenty individuals in unique processing steps, more than half of them simple paper-handling steps. Use of an imaging system could eliminate those steps.

4. Develop cost benefit bases for making decisions about technology alternatives and configurations for various kinds of agency applications.

The second presentation by AT&T GIS continued the focus on linking the business objectives to the technologies, and on analyzing the cost of the technologies. This process involved staff from the Division of the Budget and DMV's Finance Office as well as other DMV personnel. The AT&T lecturer described a successful project in another state, and the methodologies used to analyze the costs and benefits of this similar system. Project participants developed a measurement tool describing what was needed in the system, so that an effective cost/benefit analysis could be performed when DMV was ready to propose a full system application.

5. Evaluate the robustness of technology in different settings, and identify important characteristics, both functional and physical, that are critical for agency environments.

In the original project proposal, DMV itemized forty-six specific technical questions that might be addressed in the project. These ranged from scanner functionality to OCR capabilities to security capabilities. While resource and time constraints precluded a complete investigation of all these issues, the major technical issues were incorporated in the project. These included:

The prototype system integrated DMV's existing mainframe system and the new imaging applications on a single Microsoft Windows desktop. Transfer of information between the legacy system, off-the-shelf word processing system, and the document imaging system was demonstrated to be possible in this client-server application. Cooperative interaction between the IBM 3090-400J mainframe system, the AT&T System 3000 UNIX back-end server, and the Microsoft Windows clients was demonstrated.

The system demonstrated that adding a PC-based front end to legacy mainframe applications in a client-server architecture is a powerful enhancement to staff productivity. The current processing system in the Title Bureau employs a twenty year old flat file processing environment designed in 1972. As a result of previous reengineering efforts in the department, straightforward title transactions were decentralized and processed outside of the Title Bureau. As a result, the remaining workload at the central office has become proportionately more complex and often involves multiple mainframe searches of different files that are not linked. This requires the Title Bureau employees to search a record, write down information, exit that session, sign on to a different system to access more information, and compare it to what they had written down. They are often then required to return to the original session to complete the transaction.

In the prototype, the workstation front-end was designed to perform these searches automatically and display multiple mainframe sessions concurrently. This facilitated the

matching of information and proper records (e.g. a car owner and his or her license record), thus eliminating both data entry and the need to write down the information. Information could be moved between windows with cut and paste capabilities, eliminating the potential for errors. Routines were written to further automate common activities by copying information from an official record and inserting it in the appropriate fields for the transaction processing mask.

The ergonomics of a simple work-in-process system, with automated work flow between tasks, was demonstrated both to the technical staff and the ultimate users of the system. Many DMV workers had never been exposed to a graphical user interface prior to this demonstration, and seeing a DMV application in a windows environment exposed them to this technology.

A good estimate of the training, development, and operations requirements for maintaining an imaging system was obtained. This included estimates both for technical Data Processing staff as well as for system users. DMV staff were also able to estimate the amount of time it would take to make changes to the client-server system.

The openness of the prototype components was investigated. This included evaluations of the application program interfaces, communications between system components, and integration with off-the-shelf systems. The new components, involving Microsoft Windows, UNIX, the AT&T DMS Imaging System, and TCP/IP, were successfully integrated with the existing DMV mainframe system on a single user platform.

Project participants experimented with a rapid prototyping environment for creating the initial prototype application. For this prototype, it was more efficient to modify an existing production system provided by NewVision Systems rather than build the application from scratch using unfamiliar development tools. However, the participants did become familiar with these tools as a result of this project.

6. Provide accurate information to other agencies about these technologies, and educate decision makers about their possibilities and limitations both now and in the future.

As a result of the project activities (cost/benefit briefings, prototype development, prototype demonstration, and scanning/OCR briefings), DMV staff received a thorough first-hand introduction to document imaging technologies. The latter two activities also involved staff from over thirty-five additional agencies, and, while their exposure was not as deep, these agencies were able to benefit indirectly from the investment made by DMV in the project. Given that imaging technology has potential applications in the operations of most agencies, this exposure to a broad range of agencies was an important benefit of the project.

3. Value of the DMV Title Imaging Project

Innovation diffusion is a process which requires information about the new technology to be explored and understood by organizations who may potentially adopt it. Using prototyping to introduce a technology is an effective activity in this diffusion process. In particular, if a government agency has a clearer understanding of the capabilities of a technology, then it can better determine the effectiveness that technology may have on its operations.

Rogers (1983) in *Diffusion of Innovations* proposes that innovations diffuse through an organization in four stages: awareness, matching, decision, and implementation. The awareness stage provides information about how the new technology works. The matching stage reviews several perceived characteristics of the innovation, such as relative advantage, complexity, compatibility, trialability and observability. Rogers defines each characteristic as follows: relative advantage is the degree to which the innovation is judged superior to its predecessor; compatibility is the degree to which an innovation is perceived consistent with an organization's background and mission; complexity is the degree to which the potential innovation is deemed easy-to-use; trialability is the degree to which the organization may try the innovation before deciding to implement it; and observability is the degree to which the results to be achieved with the innovation are easy-to-see. The decision and implementation stages control the levels of acceptance and use within an organization.

The DMV Title Imaging Project specifically helped agencies who viewed the prototype with Rogers' first two stages: awareness and matching. DMV received valuable information for its decision-making and implementation strategy. The project provided DMV with an opportunity to experiment with imaging. It provided other agencies with an opportunity to see clearly the results and complexity of the technology.

Value to DMV

As a result of this project, all six of the major project goals were realized. The original proposal submitted by the agency focused almost exclusively on the technical characteristics of the proposed system, and these goals were largely met. The agency was also aware of the importance of the organizational and management issues that could be addressed in the prototype demonstrations, and took advantage of this project to focus agency attention on those issues as well. Staff achieved widespread appreciation of the opportunities provided by the technology. In addition, the reengineering activities carried out in preparation for the technology resulted in an immediate improvement of the current processing steps, even without introduction of the technology itself. Moreover, the knowledge gained in the project prompted the agency to broaden its approach to imaging beyond the title operation and to evaluate its potential for use throughout the agency.

Many benefits were gained by conducting the project at the Center for Technology in Government. The agency had access to University faculty, students, and staff to assist in the project; in fact, after the project was completed, one student was hired by the agency to help write specifications for a subsequent purchase. Because the project was conducted away from the day to day operations of the agency, staff were free to focus on the project fully. This ability to concentrate on the prototype allowed rapid development and learning to take place.

Value to State and Local Government

Exploratory prototyping is difficult to carry out within New York State procurement regulations. State agencies and local governments are restricted from receiving donations of equipment from private corporations by state procurement and ethics laws. As a result, agencies have limited ability to investigate new technologies like imaging, and therefore often prepare specifications in a Request for Proposal for technology with which they have little or no experience. Often the final outcome of a new technology procurement is a system that fails to meet agency needs and expectations. As a result, the state must absorb the cost and operational shortcomings which could be reduced or avoided by adequate research and evaluation before procurement. Since this project was divorced from any specific procurement, corporate partners could participate freely. As a result, DMV received experience with state-of-the-art technology which it would not otherwise have been able to acquire.

The Title Imaging Project provided many other agencies the opportunity to learn about the capabilities of imaging technology. During the project demonstrations, over 500 representatives from DMV and other agencies visited the Center. The demonstrations were user-focused, so that both technical and non-technical staff would understand what imaging technologies are and what they can and cannot do. In short, the investment of one agency resulted in benefits for all the agencies that participated in these activities.

Value to the University Community

The Title Imaging Project provided faculty and students an opportunity to apply new technologies to real-world problems. Students learned how to solve real problems using state of the art technologies in an out-of-classroom setting. Both groups gained experience with applied problems of information technology in government operations. This experience is valuable to both groups as they move into other research and teaching settings. Albany's first doctorate in Information Science was awarded to a candidate who served as a Research Fellow in the Center during this project. His dissertation evaluated document imaging as an example of innovation diffusion in the public sector.

In addition to enhancing personal, teaching, and research skills, the Title Imaging Project was an educational service opportunity for the University. Individuals from various public agencies had the opportunity to visit the Center and view the DMV prototype. These visits are an important contribution to the diffusion of new technologies into government agencies. Through the DMV project, the University provided a research and development environment where public agencies learned about new technologies that may improve service, increase productivity and reduce costs. By documenting the results, the University is creating a permanently available body of knowledge for use by others.

Value to Corporate Partners

Private corporations contributed state of the art technologies and services to the project in exchange for a better understanding of practical applications in government. Corporate partners in the DMV project had a unique opportunity to work with both practicing government managers and academic research teams. As a result, they achieved a better understanding of the capabilities and constraints which government agencies face. This knowledge assists the partners in their efforts to better define the government market, which in turn allows them to provide that market with better products and services. Corporate partners on this project report increased opportunities for work in New York State as a result of the capabilities they demonstrated during the project. In addition, corporate partners worked directly with top graduate students who may be recruited for future employment.

Appendix A - Project Timeline

Timeline for major blocks of work:

July 1990	DMV report recommends investigation of Imaging technologies.
Spring 1992	Proposal for Imaging project at Center approved by the Forum's Standing Committee. Recruitment of corporate partners begun.
May 1992	AT&T GIS formally proposes to join project.
June 1992	AT&T GIS selected as primary corporate partner.
August 1992	Initial project workplan developed.
December 1992	Workplan completed. Students recruited and introduced to vendors and DMV vehicle title process.
February 1993	Introduction to system development environment presented to agency and Center participants.
March 1993	Walk through and discussion of current process flow.
April 1993	Prototype development begun. DMV's final specifications for prototype. Prototype development complete.
May 1993	First public demonstration of the prototype. Several demonstration programs for DMV staff. Demonstration programs for other agencies.

Appendix B - Project Participants

The DMV project team consisted of agency, corporate and Center personnel as well as University at Albany faculty and students. Agency participants came from the New York State Department of Motor Vehicles. Corporate partners included NCR/AT&T Corporation, NewVision Systems Corporation, Image Innovation, Grumman Data Systems, DRT Systems International, and Microsoft Corporation.

- **Department of Motor Vehicles:**

Peter Poletto - Director of Data Processing
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- **University at Albany Faculty and Staff:**

Peter Bloniarz - Center Laboratory Director
Seth Chaiken - Computer Science Department
Donna Berlin - Center Facility Manager

- **Students:**

Tzu-Ni (Grace) Chen, Computer Science Department
Lie-Wen Cheng, Computer Science Department
Ellen Cuttler, Computer Science Department

- **Corporate Partners:**

AT&T Global Information Solutions (formerly NCR/AT&T Corporation) provided hardware and software systems, system and network installation and maintenance, consulting and training, and expert presentations.

Kevin Keipper	Ruth Mockus
John Gable	Edward McCormick
Mike Macica	Del Baldwin
Christine Kovaleski	David Heit
Gary Marcus	Laura McNulty

NewVision Systems Corporation provided integration services, training, consulting, application software, and expert presentations.

Ron Watkins
Jack Tomlinson
Ted Conforti

Image Innovation provided rapid prototyping software, training, and expert presentations.

Kevin Tweedy
Bruce Hoban

Grumman Data Systems provided demonstration software, off-site document scanning, and expert presentations.

Michael Biase

DRT Systems International (formerly Polaris Consulting Services, L.P.) provided start-up project coordination services.

Lawrence Stoltenberg

Microsoft Corporation provided system and word processing software.

Connie Mitchell Dean

Appendix C - Hardware and Software Architecture

Prototype Specifications

The initial targeted system size for the prototype was 500,000 images annually. This figure is approximately ten percent of the total work-in-process transaction volume plus five percent of the non-exceptional transaction volume. The prototype therefore had to meet daily requirements of approximately 447 transactions and 2,091 images. Given these statistics, it is estimated that a full system implementation for DMV would need to process over five million images annually with over 4000 transactions being processed daily. Due to time and resource constraints, the initially targeted size was reduced in order to enable the testing of alternative solutions, refine the system design, measure alternate system efficiencies, and develop a cost benefit analysis for budgeting.

The prototype consisted of the following components:

Hardware:

Three AT&T System 3000 workstations 486/33 MHz 4 MB RAM Two 40M hard drives NCR high-resolution monitors Image Manipulator Accelerator cards	AT&T 6436 laser printer 24 ppm AT&T 7811 flatbed scanner 24 ppm AT&T Starlan Smarthub 10BaseT Ethernet
AT&T System 3000 server 486/66 MHz 16MB RAM 2GB Fixed Disk Tape backup	Modems

Software:

AT&T MS-DOS Microsoft Windows 3.1 UNIX System V, Release 4 AT&T DMS 1.1 Imaging System, Data Manager, Media Manager, Development Kit	Informix database system Rumba terminal emulation for mainframe access TCP/IP network communications Runtime Image Support Image print server support
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Appendix D - Related Products

CTG Document: DMV93-01

Request for Information: NYS Department of Motor Vehicles Imaging and Work Processing System for a New Title System. Study and request for information published by DMV. Total 53 pages.

CTG Document: DMV93-02

Original DMV Imaging Project Workplan. Total 4 pages.

CTG Document: DMV93-03

Document Imaging System Detail Description for the Forum Title Imaging Experiment. Total 39 pages.

CTG Document: DMV93-04

DMV Imaging Project Final Proposal. Total 13 pages.

Appendix E -- Selected Bibliography

NewVision Systems. 1993. *Detail Description for the Forum Title Imaging Experiment.*

New York State Department of Motor Vehicles. 1990. *Request for Information - Imaging and Work Processing System for a New Title System.*

Rogers, Everett. 1983. *Diffusion of Innovations.* New York: Free Press.

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