

**REPORT OF
THE COUNCIL ON INFORMATION MANAGEMENT**

**A STUDY OF THE FEASIBILITY
AND EFFECTIVENESS OF USING
BAR CODE TECHNOLOGY BY
THE DEPARTMENT OF MOTOR
VEHICLES AND THE
DEPARTMENT OF STATE POLICE**

**TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA**



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The Honorable George Allen
Governor of Virginia
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Members of the Virginia General Assembly
General Assembly Building
Richmond, Virginia 23219

Dear Governor Allen and Members of the General Assembly:

The Council on Information Management is pleased to submit the enclosed *Study of the Feasibility and Effectiveness of Using Bar Code Technology by the Department of Motor Vehicles and the Department of State Police*, as directed by Item 86 in the 1997 Appropriations Act (Chapter 924).

We hope you find the report responsive and informative.

Respectfully submitted,

A handwritten signature in black ink, reading 'N. Jerry Simonoff'.

N. Jerry Simonoff
Acting Director

NJS/lh
Enclosure

**A STUDY OF THE FEASIBILITY AND EFFECTIVENESS OF USING BAR CODE
TECHNOLOGY BY THE DEPARTMENT OF MOTOR VEHICLES AND THE
DEPARTMENT OF STATE POLICE**

PREFACE

Authority for Study

House Joint Resolution (HJR 2042) of the 1997 Session of the General Assembly directs the Department of Motor Vehicles (DMV) and the Department of State Police, in conjunction with the Council on Information Management, to work together toward using bar code technology, as well as other types of emerging technology, to improve the operation of the agencies whenever feasible and effective.

Further, Item 86 of the 1997 Appropriations Act directs that the Council on Information Management, in conjunction with the Department of Motor Vehicles (DMV) and the Department of State Police, study the feasibility of designing operator licenses, state registration forms, vehicle inspection stickers, or other similar forms that would include machine-readable scan lines or bar codes that will permit the automatic electronic transmission of information pertaining to the vehicle for which they were issued. The study shall also examine any privacy protection issues, pursuant to § 46.2-208 of the *Code of Virginia*.

Work Plan

The Council on Information Management coordinated the efforts as directed by HJR 2042. DMV and the Department of State Police provided information regarding current and future initiatives where the application of bar code technology is, or might be, considered feasible.

The Council on Information Management also conducted research to determine the extent of use of bar code technology by motor vehicle and public safety agencies in other states. Leading vendors of the technology provided information on the current status of bar coding and projections of future innovations.

Participants in the study identified four major objectives to be achieved in reaching the goal of determining where, and how, bar code technology could be used by DMV and the Department of State Police to improve their operations:

- Identify current levels of current or proposed use of the technology
- Determine needs which might be met by the use of the technology
- Assess the effect of implementing bar code technology on operations and service provision
- Evaluate the potential cost of implementing bar code technology

Based on its findings, the Council on Information Management submits the following report on the benefits of the use of bar code technology by DMV and the Department of State Police.

TABLE OF CONTENTS

	<u>Page</u>
I. EXECUTIVE SUMMARY	1
II. INTRODUCTION	3
III. BAR CODE TECHNOLOGY	3
Definition and Classification	3
Current Scope.....	4
Feasibility of Use	4
IV. VIRGINIA DEPARTMENT OF MOTOR VEHICLES.....	5
Current Capabilities	5
Planned Implementations.....	6
Proposed Uses	7
V. VIRGINIA DEPARTMENT OF STATE POLICE.....	9
Current Capabilities	9
Benefits of Bar Code Technology.....	9
Associated Costs	9
VI. CONCLUSIONS AND RECOMMENDATIONS	10

I. EXECUTIVE SUMMARY

Introduction

Today, the use of bar code technology is rapidly gaining favor among motor vehicle departments across the United States, addressing numerous different data communication needs. As the need to transmit electronic vehicle information increases, states are looking to new forms of technology that will provide accurate information, while promoting the efficiency of motor vehicle departments and the safety of police officers.

In Virginia, the Department of Motor Vehicles (DMV) has launched an aggressive program to incorporate the use of bar code technology to enhance customer service and improve its business operations.

Bar Code Technology

Bar codes are a form of automatic data capture (ADC) technology. ADC technologies can be classified in several categories. The relevant ADC technologies include magstripe, standard bar code and a third category which includes two dimensional (2D) bar code, chip card and optical card.

In studying ADC technologies, one will find 2D bar codes to be regarded as the best technology for holding and maintaining vehicle information. Many states are using 2D bar codes to meet information retrieval needs.

The 2D bar code is approved by the American Association of Motor Vehicle Administrators (AAMVA). They suggest that 2D bar codes serve as a standard among states to facilitate the transmittal of information between jurisdictions.

Virginia Department of Motor Vehicles

Currently, DMV prints the AAMVA adopted standard PDF (Portable Data File) 417 bar code on the vehicle registration renewal form, the Postnet bar code on the driver's license renewal form, as well as the 3 of 9 bar code on transcripts printed for mailing. Postnet bar codes are also used for large mailings, such as vehicle renewals.

DMV is currently working to broaden its use of 2D bar code technology. Several major projects are being implemented by DMV that would place bar codes on additional driver and vehicle documents.

There is an abundance of evidence that demonstrates the impracticality of placing bar codes on license plates, and AAMVA does not currently recommend that bar codes be placed on license plates.

Section 46.2-208 of the *Code of Virginia* assigns responsibility to DMV for ensuring that only those who are specifically entitled to view personal and vehicle information may do so. Since

Use of Bar Code Technology

bar code reading equipment is available to the general public, only limited vehicle-related information could be included in a license plate bar code.

Department of State Police

The Virginia State Police Department is currently researching new technology methods to improve the efficiency and effectiveness of the Department. However, these new technology plans do not include adding bar code reading capabilities.

Bar code technology could prove beneficial to public safety agencies in identity document authentication. The greatest potential benefit of bar coding is in aiding in reporting. However, significant costs to public safety agencies would be incurred in equipping vehicles with bar code reading capabilities.

Conclusions and Recommendations

The Virginia Department of Motor Vehicles recognizes the usefulness of bar code technology and has successfully incorporated it into many of its current operations. Because the agency sees a bright future for the use of the 2D bar code, they intend adding more bar code capabilities as appropriate.

While DMV is implementing a system to produce many forms of bar codes, the Virginia State Police possesses no reading capabilities to benefit from applications of the technology. Therefore, the full potential of bar code technology cannot be met. Supplying only the Department of State Police with readers would also be of limited benefit without the existence of parallel capabilities in city and county police departments.

DMV and the Virginia State Police both share goals and address many common issues. By aggressively implementing the technology as opportunities are presented, DMV has paved the way for other agencies, particularly public safety agencies, to use DMV-produced bar coding.

Based on the results of the study, the following recommendations are made:

- The benefits of bar coding vehicle license plates would be problematic for both DMV and the Department of State Police and is, therefore, not recommended.
- Assuming the continued development of the use of bar code technology by DMV, it is recommended that the Department of State Police be directed to determine the cost and feasibility of acquiring the capability of employing bar code technology as opportunities are presented.
- It is recommended that a joint technology committee of DMV and the Virginia State Police, to include representation from the Council on Information Management, be created by the heads of the two agencies. The purpose of the committee would be to jointly research and consider how existing and new technology opportunities can be employed to improve services offered by the two departments to the citizens of the Commonwealth.

II. INTRODUCTION

As the need to transmit electronic vehicle information increases, states are looking to new forms of technology that will provide accurate information, while promoting the efficiency of motor vehicle departments and the safety of police officers.

According to the American Association of Motor Vehicle Administrators (AAMVA), its members have defined the need for communicating large amounts of machine readable information on documents and drivers' licenses to address existing information systems problems and limitations and to enhance information access in future implementations.¹ While the support for bar code technology is less vigorous within the public safety community than among motor vehicle agencies, the same needs exist and, thus, propel the search for appropriate uses of technology by which to improve their operations whenever feasible and effective.

In Virginia, not only do the Department of Motor Vehicles (DMV) and the Department of State Police have similar needs, they share common goals since both have as part of their mission ensuring the safety of the motorists who travel on Virginia's highways. Working together to achieve these common goals would appear to be mandatory.

Computers have dramatically changed how we live and work. But while they have transformed so much of the way we do business, they have had a curiously limited relationship with increasing productivity through re-engineering processes. Instead, computers are used to generate hundreds of millions of paper documents. Beyond the commercial retail environment, for instance, where bar coding is used extensively, machine-readable information or embedded information is just now beginning to replace paper driven processes.

Today, the use of bar code technology is rapidly gaining favor among motor vehicle departments across the United States, addressing numerous different data communication needs. Standardization is a major factor, however, in its application and to guarantee continued growth.

III. BAR CODE TECHNOLOGY

Definition and Classification.

Bar codes are a form of automatic data capture (ADC) technology. ADC technologies can be classified in several categories. Each group is designed to serve specific informational purposes and are not comparable.

The relevant ADC technologies may be characterized as follows:

Magstripe. Magstripe has a typical data capacity of about 200 bytes. Its primary purpose is for identification, and it normally contains all the information required on its own. Hence, it is expected to be usable off-line. The best example is the credit card. When read or "swiped" by a

¹ IAB Review of the AAMVA Magnetic Stripe and 2D Symbology Structures, August 1, 1995.

Use of Bar Code Technology

cashier, it yields the card owner's name, account number, expiration date, and validity code; i.e., all the information required to complete the transaction without access to any computer data base. In short, with a magstripe the desired information is stored on the card.

Standard Bar Code. This bar code has a small data capacity, typically about 10 bytes. Its primary purpose is as an access key to a computer data base, and it normally contains no information on its own. Hence, it is expected to be used with an on-line system. An example is the UPC bar code on grocery products. When scanned at the supermarket checkout counter and transmitted to the store's computer, the database stored in the computer identifies it as a specific item made by a specific manufacturer with a specific selling price. Thus, with a standard bar code the desired information is stored elsewhere.

Two Dimensional (2D) Bar Code, Chip Card, Optical Card. These three ADC technologies have typical data capacities of 1000+ bytes. They are generally grouped together since their primary purpose is for data storage rather than as access key or identification. They are used where significant amounts of information are required off-line; i.e., more than that required for identification purposes.

The above three types of ADC technologies are not competitive. They serve different purposes, not alternatives for the same purpose. This distinction is important since it largely determines the future course of development in each technology.

Current Scope

As the need to transmit electronic information increases, bar coding, as well as other ADC devices, is used in more numerous ways to meet information and security needs, both in the private and public sectors. From the grocery store to the highway, ADC technology has changed how information is managed and accessed. Every day, companies invent new ways to use and reproduce this technology. Among states, the technology is most prevalent in motor vehicle departments where it is used to track and organize large sources of information about vehicles and drivers.

Feasibility of Use

In studying ADC technologies, one will find 2D bar codes to be regarded as the best technology for holding and maintaining vehicle information. Many states are using 2D bar codes to meet information retrieval needs. 2D bar codes satisfy motor vehicle agencies' data communication needs through the following features:

- Capable of carrying a large amount of information
- Inexpensive to produce and can be generated using standard printing methods in use today
- Robust error correction capability to survive wear and abuse
- Codes can contain multiple forms of data, including text, photographs, fingerprints, signatures, or combinations thereof.

The 2D bar code is approved by AAMVA. They suggest that 2D bar codes serve as a standard among states to facilitate the transmittal of information between jurisdictions. Through these

Use of Bar Code Technology

standards, AAMVA hopes to increase efficiency in the exchange of information, particularly across state boundaries.

2D bar codes are currently being used or implemented in the following places, at least for the purposes listed:

- *Drivers Licenses*
Alabama, Delaware, Georgia, Illinois, Indiana, Iowa, New York, North Carolina, North Dakota, Oregon, West Virginia, Hawaii, State of Washington
- *Vehicle Registration:*
Virginia, New York, New Zealand, Pennsylvania, Delaware, Iowa, New Jersey
- *Titles*
Florida, Connecticut, Delaware, Maryland, New York, Pennsylvania, Texas
- *Emissions Window Sticker*
Colorado, New York, Massachusetts, New Jersey
- *Cab Cards*
Iowa
- *Salvage Re-Title Sticker*
Florida

IV. VIRGINIA DEPARTMENT OF MOTOR VEHICLES

Current Capabilities

The Department of Motor Vehicles has been at the forefront, both in State government and nationally, in using bar code technology to enhance both service and business functions within the agency. Bar code technology is used in numerous scenarios and plans are in place for its expanded use.²

Currently, DMV prints the AAMVA adopted standard PDF (Portable Data File) 417 bar code on the vehicle registration renewal form, the Postnet bar code on the driver's license renewal form, as well as the 3 of 9 bar code on transcripts printed for mailing. Postnet bar codes are also used for large mailings, such as vehicle renewals. It sorts mail in zip code order, saving a step for the postal service making mailing less expensive for DMV.

DMV is capable of printing bar code on all documents produced by the laser printer linked to laser printers at the Department of Information Technology (DIT) or DMV (software resides on

² Richard D. Holcomb, Commissioner, Department of Motor Vehicles, to Hudnall R. Croasdale, Director, Council on Information Management, May 21, 1997. (correspondence)

Use of Bar Code Technology

the DIT main frame computer). These documents include DMV letterhead and most outgoing correspondence, driver transcripts, driver license renewals, vehicle registration renewals, motor vehicle dealer license applications, foreign motor vehicle dealer certificate of registration applications and prototypes of application for title (proofs only). This capability also extends to water craft trailer dealer certificate of registration applications, fuel tax certificates, International Fuels Tax Agreements (IFTA), quarterly tax reports, Virginia motor fuel road tax renewals or additional decal applications, IFTA applications for insurance registration/interstate operating authority; and letters and correspondence for the Department of Taxation. In addition, DMV can produce the following bar code types: UPCA; UPCE; Bar Code 128; Modified Plessey; Interleaved 2 of 5; Codebar; EAN; FIM; and the above-mentioned 3of 9, Postnet, and PDF417 2D bar code.

After replacing the current hardware in their customer service centers, DMV is planning to implement bar code technology in some of its daily operational procedures to compliment internal agency work. DMV can use bar code technology internally to improve agency efficiency and continue customer satisfaction. Driver and vehicle databases are only ranked less in value than social security and tax databases. Their large exposure to the public and massive amount of data they contain increases the likelihood of their having inaccuracy problems. Bar codes would potentially improve customer service, while making them less susceptible to inaccuracy and fraud.

Planned Implementations

The Virginia Department of Motor Vehicles is currently working to broaden its use of 2D bar code technology. Several major projects are being implemented by DMV that would place bar codes on the following items:

- *Titles and registration cards.* DMV is re-engineering the replacement of hardware (Service 2000 project) in the customer service centers to make them more responsive to the agency and customers' needs. At the completion of this effort, bar codes will be printed on titles and registration cards produced in the customer service centers and in the headquarters computer room. This will help the Department to improve the speed of delivery, increase accuracy, and reduce transaction costs.
- *Drivers' Licenses.* After replacing the current digitized licensing platform, bar code imprinting on drivers' licenses will be a part of the new system. A bar code on the license would help verify driver identity. This technology could potentially be a great asset to public safety agencies and the retail community.

In evaluating 2D bar codes for drivers' licenses, one must consider both the public safety user and retail communities. Since drivers' licenses are the most widely accepted identification documents in the world, they are frequently subject to fraud. Adding a bar code could greatly reduce the occurrence of this activity. Retailers could place greater reliance in reading the driver licenses to verify age for alcohol, tobacco, lottery ticket purchases and check cashing. Law enforcement agencies could use the information both for reporting and for document authentication.

Use of Bar Code Technology

- *Microfilm.* The Department of Motor Vehicles is researching bar code technologies that will entail printing bar code labels in a large overnight batch, then placing labels on drivers' license applications and title applications before filming. Cameras will be retrofitted with bar code readers that will read the labels, using the bar code to update the Kodak Imagelink indexing file.
- *Accident reports.* These reports, which are processed by DMV, would be improved with bar code technology. Bar code labels, attached to reports, reduce manual keying and the inherent errors associated with manual data entry.
- *On-line dealer transactions.* DMV's on-line dealer department would benefit from data entry by bar code if bundles of dealer work could be bar coded with dealer name and date of work. Again, accuracy would increase and errors would decline because of less manual data entry.

Proposed Uses

Language relating to the study in the 1997 Appropriations Act (Item 86) suggests the use of bar codes on license plates or license stickers, vehicle inspection stickers, "or other similar forms that will permit the automatic electronic transmission of information pertaining to the vehicle for which they were issued."

Barcodes on License Plates. Currently, there is an abundance of evidence that demonstrates the impracticality of placing bar codes on license plates, and AAMVA does not currently recommend that bar codes be placed on license plates. In researching applications that employ placing the bar code on the actual license plate, DMV has found no reference to any current technology that produces a license plate with a machine-readable scan line or bar code as part of the license plate itself.

Bar code reading is based upon optical technology that cannot overcome the effects of rain, snow, or dirt and grease that result from driving. These elements would effect the bar code, license plate, as well as the optical window of any reading device that might be integrated into the front grill of a police vehicle.

Technology capable of reading AAMVA standard bar codes cannot work at distances greater than twelve inches. In addition, bar codes cannot be scanned from vehicles in motion. Officer safety is a major priority and requiring an officer to bend down to read the bar code on the plate is considered an unacceptable risk. Two Dimensional AAMVA standard bar codes have been typically placed on the registration document, the drivers' license, the insurance card, and the vehicle title. From these an officer can read this documentation while in the security of his/her vehicle.

Using bar codes on license plates has not been field tested or adopted by any other state. Therefore, the cost of this technology is hard to determine. However if DMV were required to replace all 5.8 million active license plates at a minimum cost of \$4.00/ pair, the cost would exceed \$23 million. This figure assumes DMV would have a one-year delayed implementation date and maintained existing license plate stock.

Use of Bar Code Technology

Section 46.2-208 of the *Code of Virginia* assigns responsibility to DMV for ensuring that only those who are specifically entitled to view personal and vehicle information may do so. Since bar code reading equipment is available to the general public, only limited vehicle-related information could be included in a license plate bar code. Currently, DMV maintains a record of all accesses made to citizen information to comply with the requirements of the Virginia Privacy Protection Act of 1976. The Act also specifies that citizens may make inquiries regarding access to their records check if they have been accessed inappropriately. The environment of high visibility and accessibility created by bar coded license plates would prevent anyone from tracking the entries made on a particular plate. Thus, the ability to monitor access to information would be eroded.

Bar coded license plates could also potentially directly affect DMV's customer service. Bar coded plates are vehicle-specific, and therefore the plate could not be transferred from one vehicle to another. Unless the bar code could be applied in the same manner as current decals, a new plate would have to be issued each time an owner acquires a different vehicle. The increase in transactions would potentially be very costly in time and resources.

Bar Codes on Emissions/ Inspection Stickers. Emissions/ inspections window stickers currently placed on vehicles are not completely effective because they can easily be transferred from one vehicle to another. The use of bar coded stickers would contain complete records on driver and vehicle information, thereby reducing tampering. Where required (currently only in Northern Virginia), emissions inspection stations could use bar code printed on vehicle renewal forms. Through bar codes, stations could be able to access and update DMV records with emissions testing information. This on-line entry feature would save time for DMV and provide faster and more efficient service for the customer.

Addition of a bar code to the window sticker requires the use of thermal printers at each inspection location at a cost of approximately \$1,500 per location. All of the vendors of emissions inspections systems servicing Virginia provide this capability as an option since it has already been implemented in several states. However, it must be considered whether this is an expense that all Virginia emissions inspection stations should be made to incur or whether the cost should be borne by the Commonwealth.

A number of benefits would accrue from the use of bar codes on emissions/inspection stickers. Their use, with appropriate data elements in the bar code, would be of tremendous value in law enforcement. A police officer could process emissions/inspections data from this bar coded documentation. However, this provides limited benefit unless emissions inspections are required statewide.

Bar codes would also help eliminate most of the errors typical in manual entry on accident reports, incident reports, citations, and commercial vehicle inspections. At the accident or incident scene of an incident scene or in applications such as auto theft investigation the window sticker can be read and then compared to the VIN bar codes installed on the vehicle by the manufacturer. Another advantage would be the resulting reduction to the time necessary for issuing parking citations.

V. DEPARTMENT OF STATE POLICE

Current Capabilities

In order to gain the full benefit of bar codes in public safety agencies, it would be necessary to ensure that all police vehicles in Virginia are equipped with bar code reading capabilities. The Virginia State Police Department is currently researching new technology methods to improve the efficiency and effectiveness of the Department. However, these new technology plans do not include adding bar code reading capabilities. Since the planned technology changes are still in the process of being researched, cost figures are not available.

Benefits of Bar Code Technology

Bar code technology could prove beneficial to public safety agencies in identity document authentication; i.e., ensuring that drivers' licenses and vehicle registration are authentic. Officers could also check compliance verification, looking for current and valid insurance, inspection and car tax documentation.

The greatest potential benefit of bar coding is in aiding in reporting. Officers typically spend 50% of their time on hand-written reports. Key data elements such as drivers' license and vehicle numbers can be written and key entered as many as fifty times for a single incident. Because of this, data entry backlog can be up to two years for accident reports between jurisdictions in the United States. Hand written reports also inherently stand a greater risk of being inaccurate.

As stated earlier, bar code technology could help public safety agencies read drivers' licenses, registration documents, insurance cards, inspection stickers, export stickers and VIN tags all with a single input peripheral. Therefore, reporting time would be reduced, increasing time dedicated to public safety and eliminating excessive data entry cost.

Associated Costs

Costs to public safety agencies would be incurred in equipping vehicles with bar code reading capabilities. There are a wide variety of options for public safety agencies requiring computing component technology in this environment. Laptop computers, *ruggedized* or off the shelf, are used by many public safety agencies. The preferred *ruggedized* laptop range in price from \$3,500 to \$6,000 per unit without radio, vehicle mount or installation. Total cost to equip a vehicle with computer, radio and mounting typically ranges from \$5,000 to \$7,000, plus software. Quantity appears to have little impact on the price of these laptop computers.

Scanners can be purchased that would read inside or outside of the vehicle. With the less expensive hand held scanners designed to be used outside the vehicle, there exists the question of officer safety. Having a police officer incapacitated by having to carry a scanner, losing free use of his hand, is a safety risk. The cost of purchasing bar code scanners for police cars would depend on the quantity of scanners purchased. The approximate list price of one scanner is \$2,000. The price per unit would be approximately \$850 to equip all 1,200 State Police vehicles with bar code scanners. Price per unit would drop to approximately \$650 if scanners were

Use of Bar Code Technology

purchased for all of the Commonwealth's 17,000 police cars. Readers attached to desktop computers in those quantities would have a similar approximate price per unit value.

VI. CONCLUSIONS AND RECOMMENDATIONS

Around the world, bar code technologies are setting new standards for identification. From drivers' licenses to social services and national ID cards, bar codes have become the preferred means of encoding ID information. There is no doubt that the technology has earned its place in the motor vehicle and public safety communities. However, bar code technology does require different agencies working together to meet their shared goal of maximum public service. By aggressively implementing the technology as opportunities are presented, DMV has paved the way for other agencies, particularly public safety agencies, to use DMV-produced bar coding. Such agencies would, however, have to commit the resources to acquire the appropriate supporting equipment and software to deploy programs effectively.

The Virginia Department of Motor Vehicles recognizes the usefulness of bar code technology and has successfully incorporated it into many of its current operations. Because the agency sees a bright future for the use of the 2D bar code, they intend adding more bar code capabilities as appropriate. Endorsement of the use of this technology at the national level and agreement by states to adopt a common 2D bar code increase the potential of the technology.

Placing bar codes on DMV documents to improve customer service is a plausible goal if proper standards are followed. Bar codes on drivers' licenses would also prove beneficial to DMV for performing internal agency work, and, because AAMVA standards will be used, public safety agencies could also potentially benefit. Addition of a bar code to window decals would also appear to be beneficial. However, the benefits of bar coding vehicle license plates would be problematic for both DMV and the Department of State Police and is, therefore, not recommended.

While DMV is implementing a system to produce many forms of bar codes, the Virginia State Police possesses no reading capabilities to benefit from applications of the technology. Therefore, the full potential of bar code technology cannot be met. Supplying only the Department of State Police with readers would also be of limited benefit without the existence of parallel capabilities in city and county police departments.

Although there is significant expense involved in furnishing all 17,000 Virginia police vehicles with readers, improved services could be rendered by the public safety community. It is recommended that, assuming the continued development of the use of bar code technology by DMV, the Department of State Police be directed to determine the cost and feasibility of acquiring the capability of employing the technology as opportunities are presented.

The Department of Motor Vehicles and the Virginia State Police both share goals and address many common issues. Each has expressed an interest in pursuing means by which they could work together more closely. It is recommended therefore that a joint technology committee, to include representation from the Council on Information Management, be created by the heads of

Use of Bar Code Technology

the two agencies. The purpose of the committee would be to jointly research and consider how existing and new technology opportunities can be employed to improve services offered by the two Departments to the citizens of the Commonwealth.

