

**THE BILL BLACKWOOD
LAW ENFORCEMENT MANAGEMENT INSTITUTE OF TEXAS**

**DIGITAL PHOTOGRAPHY
IN LAW ENFORCEMENT**

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by

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ABSTRACT

The role in law enforcement is in constant change. This is a requirement for the agency as society itself changes. As annual budgets are trimmed, law enforcement agencies are expected to become more innovative in how to handle the budget cuts while still providing additional services. Computer technology allows an agency to streamline its services by providing a more accurate data storage system at a lower cost to the tax payer. Digital photography and storage is a cost effective way to capture, process and develop images taken at the scene of a crime for court presentation.

The purpose of this research is to provide information about the savings to be realized, and the value of digital imaging (photography). This research addresses concerns, cited throughout the PRP by the use of documents, articles and journals regarding the integrity of digital images presented to court as evidence. Digital photography is a relatively new resource used by law enforcement. Preserving the integrity and evidentiary value of a digital image will be served through the proper implementation of a records management policy and procedure.

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Introduction

Within the United States, law enforcement agencies have been tasked to examine ways to cut back their budgets and streamline their operations while still fulfilling their mission of serving and protecting the community. In 1992, the National Executive Institute (NEI) questioned more than 100 law enforcement executives in the United States and Canada on ways their agencies either increased productivity or cut cost effectively within the prior year. Upon reviewing the survey results, the NEI found the area of automation to be one of the greatest opportunities for cutting costs (Ayers 2).

For decades, forensic imaging has been a benefit to law enforcement. Now, computer-assisted programs provide greatly improved capabilities at a fraction of the time similar imaging once took (O'Donnell 9). The purpose of this research will discuss issues such as costs incurred for converting a conventional photography and chemical lab to a digital photography imaging lab, including the necessities for finding proper equipment. This research will also address the legal issues surrounding the preservation of digital images as evidence.

Automation (Digital photography) is a conversion toward the future. Law enforcement executives must be committed to a long-term, well planned organizational and institutional change. They must believe in what they are doing and must combine these benefits with actions (Ayers 5). This research is intended to show the cost effectiveness, forensic advantages and records streamlining of digital imaging to the law enforcement executive.

Though the Federal Bureau of Investigations (FBI) is fully using this modern technology, digital photography is relatively unexplored on the local and state level. The research conducted on this issue will be explored by law enforcement and civilian journals, articles and sources written on the subject. This research will reveal convincing information as to the benefits of the conversion from

chemical to digital and the considerations needed before creating a standard operating procedure to ensure that evidence gathered will be accepted by courts of law.

Historical, Legal or Theoretical Context

Fully 25 years ago, some futurists began forecasting massive dislocations, calling for radical changes in education. Unfortunately, these early warning signs were ignored, and today's law enforcement agencies are struggling to pick up the pieces (Toffler 3). Though technology has advanced and been incorporated into the business world, law enforcement still lags behind the modem curve. Insurance companies, lawyers and private citizens have been increasing pressure toward records' units to provide information on a timely basis. Traditionally, records units use log books and 3 x 5 index cards to track reports (Arkenau 16).

In the last few years, technology has been incorporated by law enforcement at an increasing pace. The need for more advanced technology has brought us Automated Fingerprint Identification (AFIS) which allows law enforcement to enter latent prints into a state identification system connected to other participating agencies. "Live Scan Technology" is a revolutionary new process requiring neither inked cards nor chemicals. Live scan allows law enforcement to create and transmit electronic fingerprint images through AFIS directly to the state identification bureau (Brotman 2). A mug-shot imaging system, used to identify a suspect is a new investigative weapon in today's law enforcement technological arsenal. The traditional style requires photographing, processing of the negatives, and filing the pictures (Palvis 20).

When digital cameras appeared on the technological horizon several years ago, many believed it signaled the end of the film camera. The acceptance of digital cameras, though, has been slow and few have actually replaced cameras using film (Stockton 30). This technology allows law

enforcement the opportunity to enhance images taken at the crime scene, age photographs of missing persons, modify facial features and store file cabinets worth of data onto small writeable compact discs. One of the earliest adopters of the digital camera was the Newport Beach, California, Police Department (NBPD). They originally purchased the camera to photograph fingerprints on a piece of physical evidence and enhance it using a software program to improve the level of detail. NBPD's AFIS hit rates increased from 8% to 20% and more since using the digital technology. Photography has long been an important tool in forensic investigation but law enforcement has been slow in adapting new imaging technology that other industries have rapidly embraced. As a result, imaging is often underutilized (Blitzer 35).

While the initial cost for a digital camera is relatively high, users can recoup that expense over time since the cost of capturing images is reduced almost to nothing. Once a user downloads images to a host computer, the PCMCIA memory card can be used over and over and over to capture new images. Digital image files can immediately be downloaded to a computer, where they have all the advantages of a data processing system. Once in a computer, images can be accessed in seconds. Often, investigators will only need to view the images on their computer monitor. Nevertheless, if they need a hard copy, they can provide photographic quality 8 x 10 prints quickly using a color printer. Images can be written to CD-ROM discs for large volume, archival storage and to preserve evidence (Blitzer 35).

CD-ROM's (Compact discs) provide the best means of storing massive amounts of digital information. It would take more than 540, 3 1/2" floppy discs to equal the storage capacity of one writeable CD. In fact, digital imaging is impractical without them because one digital picture could fill several standard floppy discs (Law & Order, Vol. 42 pg 32). CD discs hold up to 650 megabytes

of information each, which is equivalent of several file drawers full of documents. CD's are individually numbered, expected to keep from 30 to 100 years, fully compliant with international standards and cannot be erased (Law & Order, Vol. 43 pg. 38).

Review of Literature or Practice

The capability to electronically enlarge photographs is a major advantage of the program. There is no wait to get photographic enlargements from the lab. Detectives can simply display a digital file on the screen, enlarge critical areas, and print what is needed. A search that used to involve hours of reading through files and tracking down evidence from different locations can be done in minutes without leaving the work station. One can digitize crime scene photos and store them in a data base to give investigators immediate access to case information. No more digging through files, sorting through scraps of paper, rummaging through desk drawers or hunting up lost photos. Computerized information is also more stable; it will not deteriorate like photographs can (Pilant 68).

Digital imaging tools can be important assets to the police department as it gathers and presents evidence. Nevertheless, as with any other tools, you must have standard operating procedures in place to ensure that evidence you gathered and present will be accepted by courts of law (Kammen 9).

Traditional 35mm film requires processing. You don't know until the film is processed if it has captured the artifact you need to document. Instant film (Polaroid) eliminated the delay, but is costly (8-10 times more than traditional color negative film), and is not as readily enlarged or enhanced (Blitzer 35).

Memory required to capture the information contained in a conventional 35mm photo is

tremendous, for surpassing the ability of most digital cameras to record. The greater the memory capacity of a digital camera, the more detailed image that can be captured. On a digital camera, there is no winding of film. Consequently, you must pay attention to know whether you have taken a photo. While a conventional camera can be outfitted with high-speed film or low light conditions, a digital camera is generally limited to an effective range of 80 to 120 (Stockton 30-33).

Image processing is an easier and more cost effective means to store data and records. The private sector has explored this technology more rapidly than law enforcement due to greater budget flexibility and no evidentiary storage concerns. Several law enforcement agencies across the country have proven brave and innovative by clearing the path to automation.

In 1989, the Cincinnati, Ohio, Police Dept. Started using the optical disk system due to an incredible back log of records. The process was labor intensive searching for documents and photographs on criminal cases and open record requests. After installing the system, the records unit was able to eliminate a back log of 6,000 reports in about four weeks (Arkenau 16-17).

The Temecula Valley, CA, Police Dept. and the Temecula Valley unified school district digitized the photos, fingerprints and personal information of almost 8,000 students. The information was written to digital compact discs stored at the school. Within minutes of a reported missing child, photos and personal information can be in the hands of law enforcement (Law and Order, Vol. 42 pg. 29).

In a criminal homicide case from Henrico County, Virginia, image processing was accepted by the court as a means to make a fingerprint more legible. A recorded fingerprint was scanned and converted to a digital image. The court noted that image processing did not alter the fingerprint, but only made it easier to see (Tiller 79-83).

The FBI's Special Photographic Unit of the laboratory division uses a Kodak digital camera system to speed the transfer of information in hostage rescues, ariel surveillance and aftermath of investigations. Ariel images are captured, enhanced on a computer and transmitted in real time to ground agents preparing to make arrests (Law & Order, Vol. 43 pg. 40).

The California highway Patrol recently (1997) completed a major study on digital camera use. The study resulted in four recommendations:

- 1) The department should adopt policies and procedures for existing digital cameras because their use is growing from experimental to operational.
- 2) Special applications should be investigated that take advantage of digital technology.
- 3) Field commands should be advised that conventional film can be processed to yield conventional prints as well as digitized images on disk.
- 4) When procuring digital cameras for large scale operational use, consideration should be given to the significant costs, the immaturity of the technology, and the anticipated role of the cameras (Stockton 32).

The Newport Beach and Anaheim, CA, police departments each have dedicated forensic support units. Both are currently using digital cameras in a limited capacity. The Newport Beach PD uses the digital cameras for all investigations except homicide scenes or fatal accident investigations. The proposed processing for usage of digital cameras and documentation of the images include:

- 1) A memory card for the camera is checked out at the beginning of a shift.
- 2) Pictures are taken during the shift and the memory card is turned in at the end of duty.
- 3) The memory card is downloaded by records personnel and stored on a department file server. The card is then returned for re-use (Stockton 32-33).

Chief Robert Ford of the Port Orange, Florida, Police Dept. States "It is clear from our organizational studies that computer technology has great promise for solving one of our greatest problems - keeping track of information" (Pilant 48). The Los Angeles PD have 25 field photographers deployed 24 hours a day and with the capability of digital photography, suspects and crime scene images are electronically transferred to detective work stations (Pilant 48).

Writeable CD's are ideal for storing images or information about evidence because they are not erasable media. Some digital cameras generate a uniquely written data file each time an image is captured. When you save the image, the data file can be stored as well. Digital imaging software can be used to control the contrast of images or to enlarge them. You can implement standard operating procedures using computer-based tools. It is possible to record the keystrokes used to perform a computer operation in a file called a "macro" (Kammen 10).

Technicians regularly employ software programs such as "Adobe Photo Shop" to enhance images. A criticism of digital imaging is that one can radically change the content of an image. However, digital images can be documented as original and untouched, giving them greater credibility for legal purposes than traditional images (Blitzer 36).

Image insertion is usually easier to accomplish than extraction. For example, if an individual person is removed from a crowd of people, it leaves an area devoid of background detail, which must be filled to match the surrounding background area. Inserting a person or object into a picture is easier because this operation doesn't require fabricating image details not already present in the background image (Hyzer 21).

Discussion of Relevant Issues

The size of image files has encouraged a whole sub-industry in computers dedicated to compression hardware and software. Fundamentally compression attempts to decrease file sizes through more efficient means of cataloging repetitious image information. The use of compressing files has concerned law enforcement because the data stored on a compressed file is only critical data (Mills 46-50). "Smart Compression" is being developed for the military, where important subjects in an image may be selected and preserved at full detail, leaving the rest of the image for compression

(McCarthy 61). This could be an issue to law enforcement as the image saved is not the actual image obtained from the scene.

The heart of image integrity is the ability to modify electronic image files easily, quickly, and in many cases without any record remaining of the color (Southerland 59-61). Procedures must be used to create a complete audit trail of how the computer files have been managed. Ensure someone can testify about who had access to any images used to support testimony as evidence. Password protect sensitive computer files and keep CD's in secure locations (Kammen 9-10).

The digital camera produces an archive data pak of each image when an exposure is made. It creates a complete record that should be written to a writeable CD. Each disc has a machine readable number that can't be altered, the result is an "electronic negative" that is the reference point for any further work. If an image needs to be enhanced, the technician uses a "macro" to document every step taken to enhance it in "Photoshop" software. Later, the macro can be used to show exactly what was done in each step, starting from the un enhanced file. This will show that the image was not altered by combining with another image, or that pixels were not painted to change photographic reality (Blitzer 35-36).

The possibility of creating virtually undetectable changes in an evidentiary photograph, should result in allowing into evidence only photographs that can be authenticated by the photographer. The photographer, who understands the technology involved, would be subject to cross examination or authenticity and any processing or alterations to the image. To admit a photograph into evidence, all that is needed is the testimony of a witness who saw what was photographed and can affirm that it is a true and accurate representation of the scene in question (Lake 24-30).

Photography has always been subject to manipulation through, exposure, camera angle, lens

selection, and other techniques. A wide angle lens used for a lawsuit photograph of a small hole in a sidewalk can make it look like the Grand Canyon (Goodin 3). All evidence in a police case revolves around the veracity of the witness, not the infallibility of evidence. The integrity of the investigator who lifted the print answers this concern. In the same manner, the veracity of the photographer will answer this concern regarding digital imaging (Reis 6-8).

In the case of *People v. Kopp* (1969), a photograph which supported a doctor's testimony concerning a wound on a victim's lip was found admissible under the pictorial testimony theory. In *Fisher v. State* (1991), photographs from a videotape recording at a store was ruled inadmissible under the pictorial testimony theory "since no person could verify that the videotape accurately represented what occurred." According to the case of *United States v. Stearns* (1997), photographic evidence may be admitted into testimony without direct testimony if the contents of a photograph by itself: together with other circumstantial evidence or indirect evidence, explains and authenticates the photograph sufficiently to justify its admission into evidence.

Other than initial costs to the purchase of digital imaging and forensic security, digital cameras are a mix of energy and high tech electronics, making them vulnerable to rough treatment and exposure to the elements. Increased exposure to the CCD (charge coupled device) to light can result in picture "noise" or electronic charges that render the image unacceptable. Digital cameras are also power hungry. Capturing an image and the writing to memory of the electronic file consume power quickly. Depending on usage, battery source, and temperature, a camera can go dead after the equivalent of one or two disks of film. When choosing a digital camera, carefully consider the intended usage. Regardless of the system you choose, do not limit yourself to traditional camera usage. Think of digital as a new tool on your belt, not just a replacement for existing equipment

(Stockton 35).

Initially, the purchase of a digital camera, supporting computer hardware and software can be costly. However, the long term benefits can be cost effective. The imaging needs of a police agency can be met with a handful of digital imaging tools and an investment of less than \$30,000.00. In fact, it is less expensive to purchase a digital workstation than to outfit a darkroom (Reis 6-8)

In 1997, the El Paso County Sheriff's Department purchased a complete digital photography imaging system and related software. The department also has a complete conventional photo processing lab. Before purchasing the hardware and software, the department compared its 1996 photo lab operations cost to that of a mock digital photography set up. A comparison of the labor hours and cost of supplies showed a savings of about 50% in favor of the digital imaging (see Appendix A). The department purchased about \$27,500.00 in computer hardware and software expecting a break-even point within two years (see Appendix B). This was based on the processing of 11,000 exposures sheets a year.

Conclusion/Recommendations

Though digital imaging technology is relatively new to law enforcement, agencies are incorporating this technology to the forensics field. Image processing is not the wave of the future; it is the technology of today. It is the process by which mug shots, fingerprints and written information can be stored in one data base and used for a variety of purposes. The process of electronically manipulating pictures has been around for several years. It is only recently, however, that it has come within the financial reach of police departments (Pilant 45).

Although initial purchasing costs are relatively high, the long term savings will help the department in managing under lower operating budgets. Evidentiary concerns may be addressed by

the use of proper operating procedures. Image integrity is comprised of two basis, (1) Maintaining the image file in a true and lasting form, and (2) protecting the computer system that uses the image from intentional or accidental compromise (Goodin 1). To admit a photograph into evidence, all that is needed is the testimony of a witness who saw what was photographed and can affirm that it is a true and accurate representation of the scene in question.

Standard operating procedures governing the use of digital imaging technology need to incorporate five key elements:

- 1) Images must be recorded in an unalterable, archival form soon after the records are created.
- 2) The images should include information regarding their creation.
- 3) The agency must control custody of all image records at all times.
- 4) All agency personnel who prepare exhibits for court should be trained in digital image processing and should understand which images might require a special notation to show that the changes are not prejudicial.
- 5) The agency must establish rigorous procedures for entering work-in-progress into proper file systems.

The use of a macro to record any changes or enhancements made to an image may be submitted to the court to provide information as to what changes were made. Lastly, before making any changes or enhancements to an image, the original image should be saved onto a writeable CD ROM. Before purchasing a digital camera, explore the possible uses of digital photography within your department and compare it to the costs to be incurred.

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Appendix A

1996

11,000 Case photos printed for 845 cases

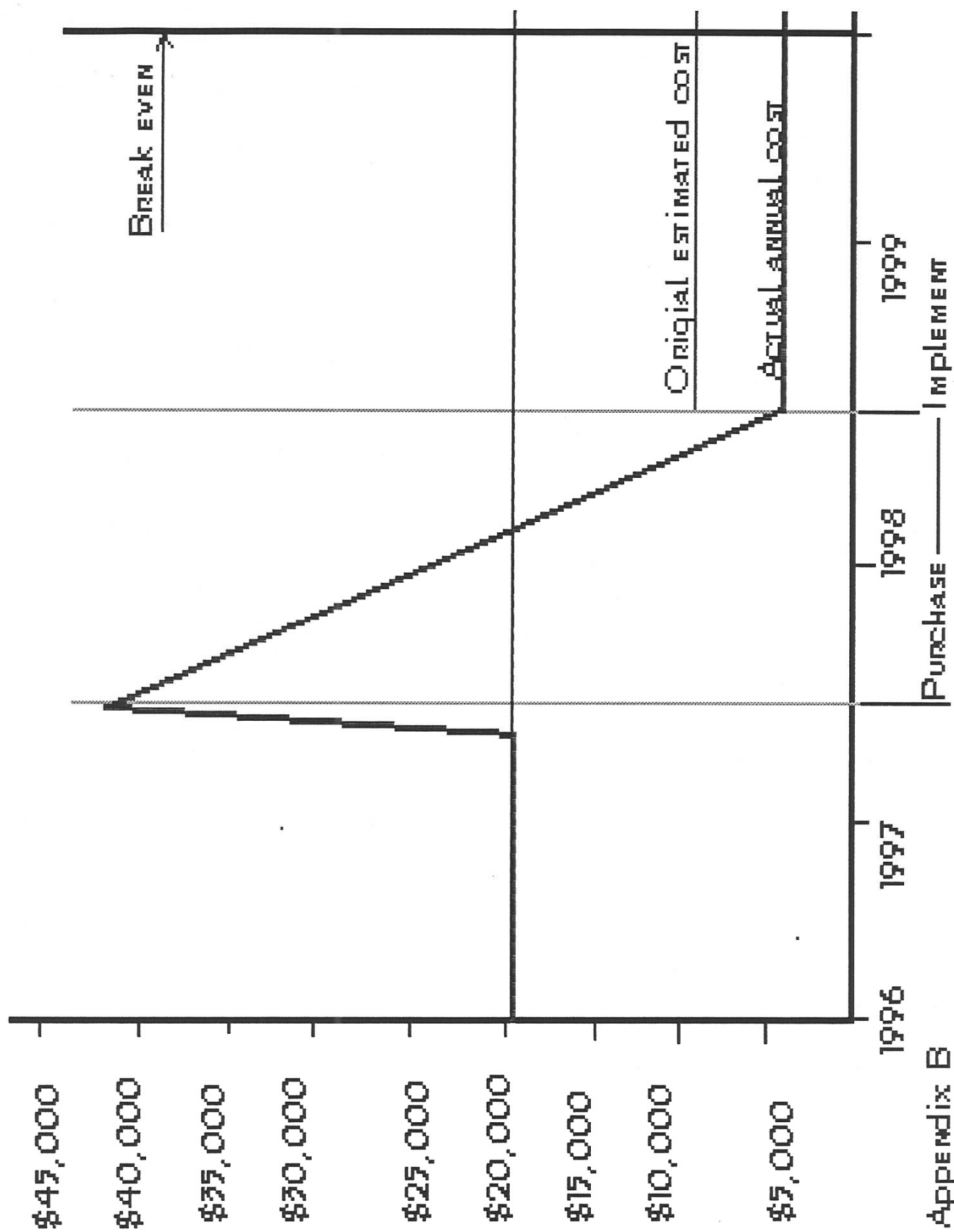
1996 annual cost and labor

Film (120 rolls @ \$3.90)	=	\$ 468.00
Chemistry	=	\$1,950.00
Film sheets (.58 per sheet)	=	\$6,438.00
Labor hours	=	<u>\$10,593.00</u>
Total	=	\$19,449.00

Estimate digital comparison

Reusable discs	=	\$150.00
No chemistry	=	\$0.00
Sheets (.76 per sheet)	=	\$4,218.00
Labor hours	=	<u>\$5,036.00</u>
Total	=	\$9,404.00

Savings of = \$10,045.00



Appendix B