

How e-Citation Systems Increase Productivity and Revenues While Improving Officer Safety

Executive Summary

Electronic citation (e-Citation) systems represent one of the most successful uses of mobile and wireless technology in public safety operations. Electronic citation systems have earned high user satisfaction ratings from state highway patrol agencies, police departments, parking authorities and campus security organizations across the country because of their well-proven ability to:

As mobile computing and communication technology has become more sophisticated, less expensive and more accessible, it has become harder for field service organizations to maintain a competitive advantage through these tools.

- Save time for officers;
- Improve safety while issuing tickets;
- Reduce errors and illegible tickets;
- Improve collection rates.

The only significant obstacles to more widespread use of electronic citation systems are insufficient awareness, understanding and budgets. This white paper will provide the background information needed to pursue an e-Citation initiative, plus benefit data and tips to help win funding for it.

e-Citations in Action

The Snohomish County (WA) Sheriff's Office experience with electronic citation systems is typical. Deputies in the traffic unit each used to write about 12 to 15 paper citations a day. Each citation took four to five minutes to write, and a similar amount of time back at headquarters to enter into the computer system. With 20 traffic deputies working on a typical day, the sheriff's office collectively spent between 43 and 47.5 hours daily writing and entering citations.¹

Snohomish County switched to creating citations on handheld computers, which use a vehicle-mounted printer to produce a copy for the offender and then automatically download the citation information to the headquarters' computer system – no manual data entry required. As a result, productivity – and citation revenue – has soared.

"Before, it took approximately four to five minutes to hand-write a ticket using pen and paper, and now it takes about two minutes to do a ticket with the handheld computer," said Snohomish County Deputy David Crandall. "It's equivalent to at least one extra traffic unit deputy on the road every day."

Deputies like the system because it minimizes their time on the roadside and allows them to pay more attention to the offender. And greater convenience has led to more citations: over a three-month period 41 percent more citations were issued with the e-Citation system than the paper-based process it replaced. Deputies went from averaging 12 to 15 citations per day to 18 to 25, yet now process the increased volume in less total time because of time saved at the vehicle and at the station, where typing information into the computer system is no longer required.

Snohomish County's results are impressive, but are not unusual for e-Citation system users. Police forces large and small have reported their e-Citation investments paid for themselves within a year because of the efficiency gains and revenue increases they produced.

Nationally, about 10 percent of citations are dismissed because they are illegible or contain errors.² Electronic citation software solutions prevent data entry errors, and there are no legibility concerns for computer data entry. By eliminating problems with accuracy and legibility, authorities can improve the number of enforceable citations and the resulting collections by 10 percent or more – without having to add staff or issue any more citations.

¹ A complete case study about the Snohomish County e-Citation system is available at: http://www.intermec.com/learning/content_library/case_studies/csSnohomishCountySheriff.aspx.
² Sources include "The Use of Electronic Citations: A Nationwide Assessment," a June 2003 joint report by the Bureau of Justice Assistance and U.S. Department of Transportation.

e-Citation System Basics

An e-Citation system works by having officers enter citation data on an electronic form on a handheld computer. The screen can look the same as a familiar paper-based citation, but the software saves time because it has drop-down menus, checkboxes and other features that eliminate the need to write data by hand. In addition, some fields can be filled out automatically by scanning the offender's driver's license (either with a built-in magnetic stripe or bar code reader).

A date and time stamp is also automatically applied to each transaction, and geostamps can be applied if the computer is GPS enabled. Automated date, time and location recording provides objective documentation that can prevent disputes. Once the citation is complete and computer verified, the computer screen can be signed to produce a digital signature image on the citation record.

Some mobile computers and e-citation software solutions are configured so they can be used with one hand – an important safety and convenience feature. Electronic citation software is also available for vehicle-mounted laptops; however, these systems do not provide the same time-saving benefits because they aren't used roadside and require an extra trip to the vehicle.

The computer may contain a database of drivers with outstanding violations or warrants, and also may have a wireless connection to access departmental or statewide computer systems. An e-Citation system typically features a wireless connection between the handheld computer and a mobile printer, which can be mounted in the patrol vehicle or carried by the officer to produce a paper copy of the citation for the offender. Small printers that can be carried or worn on a belt or shoulder strap are favorable because they allow the citation transaction to be completed without requiring the officer to make a return trip to his or her vehicle.

Citation records are transferred from the handheld to central computer systems either through a wireless connection from the road, or by placing the mobile device in a dock when the officer returns to headquarters.

e-Citation System Benefits

Electronic citation systems save time at every stage of the citation process, which provides many benefits. Organizations that have switched to e-Citations consistently documented numerous improvements. They credit the systems for increasing productivity and revenues, providing cost savings and efficiency gains, all while improving officer safety. The following sections

describe how these benefits are attained, with supporting examples from actual operations.

Increased Productivity and Revenues

The core benefit of e-Citation systems is time savings. Users typically report that it takes about half as long to issue a citation using a handheld computer as it does to write one manually. Snohomish County said its citation issuance time was cut at least in half, from between four and five minutes for manual citations to two minutes for electronic ones. In announcing it would implement an e-Citation system in July 2010, the Idaho State Police said it expected to cut the time needed to complete a citation from five minutes to less than one.³It takes approximately four minutes to issue a citation with the INcite cCWS e-Citation system that is used by more than 5,000 state local police officers throughout Indiana.

Improving convenience for officers to issue citations makes it easier to step up enforcement. As noted, the number of citations issued in Snohomish County increased 41 percent. The reliability of handheld computers is also a factor in Snohomish County and elsewhere – ruggedized computers remain accurate and easy to use when there is wind, rain and snow, which is not true for paper citations. The inconvenience of writing a ticket in bad weather may make officers reluctant to do so.

Electronic systems continue to save time after the citation is issued. With e-Citation systems, data only needs to be entered once – by the officer when the citation is written – for it to be recorded and shared among multiple computer systems and databases. Because the data transfer occurs automatically, there is no need to reenter citation records into a computer at headquarters. A side benefit to time savings is better job satisfaction – no one went to the police academy so they could sit in front of a computer transcribing information from a citation book.

Snohomish County's 20 traffic unit deputies each averaged between an hour and an hour-and-a-half spent each day entering citation records into the computer system. The aggregate time spent was 20 to 30 hours, the equivalent of putting several more officers on the streets each day. That's an important consideration for departments where budgets and manpower are tight.

"The officers absolutely love it," said San Jose Police Chief Robert L. Davis after the department deployed an e-Citation system. ⁴"They feel it's a great tool for them to use in the field

3 Idaho Statesman online news story accessed January 27, 2011 from: <http://www.idahostatesman.com/2010/06/24/1244567/idaho-state-police-set-to-begin.html#ixzz1CFYjOZ3I>.

because it's quick, efficient and helps eliminate the need for burdensome paperwork.”

Automated entry also prevents backlogs that occur when officers or clerical staff get behind on processing citations or are assigned to higher-priority activities. By getting citations into the system faster, public agencies can produce more tickets and collect on them sooner.

Cost Savings and Efficiency Gains

Increasing officer productivity through automation enables efficiency gains and cost savings. Most organizations that implement e-Citation systems significantly reduce their citation errors, which in turn reduces the unproductive time spent rechecking records and dealing with contested tickets. Additional cost savings come from producing the offender's copy of a citation on mobile printers, which use paper that is much less expensive than the multi-part forms prevalent in handwritten citations.

Although many law enforcement agencies have reported citation error rates of 20 percent or even higher, there is consensus that an average of 10 percent of citations are dismissed in court because of errors or illegibility. Numerous studies and testimonies have affirmed this figure, and the beneficial effect that e-Citation systems have for error reduction is also well documented.

“Accuracy is ensured at the front end when the officers are issuing the citation,” said Lt. Ruben Chavez the San Jose Police Department e-Citation project manager of the eCitation system. The San Jose Police Department reduced its error rate from 10 percent to less than 2 percent after transitioning from paper to electronic citations and expects to push the error rate even lower. “For efficiency, that is 3,800 tickets [per year] that no one has to complete a quality-control review or retype all the data. It is extremely efficient.”⁵

Entering offender data by automatically scanning the driver's license is time efficient and ensures there will be no spelling errors or transposed numbers that could potentially invalidate the citation. An e-Citation system helps eliminate legibility problems, which can result from poor handwriting, weak images on carbon copies, and smearing or damage from rain and snow. And e-Citation software has built-in safeguards to detect and prevent errors, including menus, check boxes and multiple-choice options that minimize the amount of free response information that must be entered. The automatic time and geostamps that handheld computers can apply to transaction records eliminate a major source of parking ticket disputes.

Not all errors occur when citations are written. The process of entering paper-based citations into a computer system introduces another opportunity for errors to occur. The streamlined, one-time-entry process enabled by an e-Citation system eliminates this source of errors.

Reducing errors improves revenues by increasing the number of citations that can be collected. This increase is extremely cost effective, because it does not require any additional labor time to write or process more citations. Plus, improved accuracy and legibility leads to fewer questions and inconsistencies, so officers and support staff spend less time researching disputed citations and defending them in traffic court.

“The San Jose Police Department can now spend more time on education and enforcement as opposed to citation entry and correction,” said Chief Davis of the San Jose PD.

Electronic citation systems also reduce supply costs, especially if thermal printers are used. Thermal printers do not require any ink or toner, because they print by applying heat to coated media. Durable thermal paper that is suitable for printing citations costs approximately 45 percent less than the multi-part forms used with manual citation systems.

Improved Officer Safety

In 2009, 12.8 percent of law enforcement officers that were accidentally killed in the line of duty died as a result of being struck by vehicles. By enabling officers to write citations in half the time paper-based processes take, e-Citation systems improve safety by reducing the time officers are exposed to oncoming traffic. This feature has proven very popular with officers who use automated systems.

“This can be the difference between life and death when standing on the road with traffic whizzing by,” said First Sgt. Larry Jenkins of the Indiana State Police.⁶

A secondary safety benefit for e-Citation systems is that their easy-to-use drop down menus, check boxes and one-hand operation enable officers to pay more attention to their surroundings when issuing citations.

“When I'm standing on the side of the road issuing a traffic citation, I'm not standing there holding a laptop that requires the use of both hands,” said Deputy Crandall of Snohomish

⁴ See the complete case study at www.intermec.com/learning/content_library/case_studies/csSanJosePD.aspx.

⁵ Digital Communities online news story accessed January 26, 2011 from: <http://www.digitalcommunities.com/articles/102472714.html>.

⁶ Indianapolis Star online news story accessed January 27, 2011 from: <http://www.indy.com/posts/e-ticket-software-issues-1m-indiana-citations>.

County, which uses Intermec by Honeywell CN3 handheld computers for its e-Citation system. “With the Intermec [by Honeywell] device, I hold it in one hand, which means my gun hand is completely free if I need to draw my weapon. My attention is not diverted down, so I can deal with what’s on my CN3 and still watch the violator.”

Advanced handheld computers with internal accelerometers and GPS can provide additional protection for officers by serving as an electronic “buddy system.” During normal usage conditions the accelerometer would detect movement by the officer. If no movement was detected for a pre-set time interval or a sudden impact is recorded, the computer can automatically prompt the officer (through a screen message, vibration or audible signal) to confirm he or she is OK. If no confirmation is received, the computer can send an alert message to headquarters from the integrated radio, complete with location information from the internal GPS. There is pending legislation in Canada and the U.K. to require safety features and processes like these, which are already being used to monitor field service workers.

Benefits Summary

Electronic citation systems enable organizations to simultaneously increase the number of citations issued while reducing the time needed to create and process them. They also improve citation accuracy and, therefore, collections. There are also hard-to-quantify benefits such as improved officer safety and morale.

The net effect of these benefits is that electronic citation systems often pay for themselves within a year, and then significantly enhance revenues in subsequent years after the hardware and software has been paid for. The revenue enhancement, efficiency improvements and staffing flexibility that e-Citation systems provide have helped departments win approval to implement them, even during times of staff and budget cuts.

Of course, the return on investment goes up considerably if the electronic citation system is subsidized or implemented at no cost to the organization. State and local authorities have been successful in winning grants for e-Citation projects.

For example:

- The Idaho State Police used a \$900,000 Federal Recovery Act Grant to purchase its e-Citation system.
- The San Jose Police Department used five different grants for its system.

- The Government’s Office of Crime Control and Prevention in Maryland makes grants for state troopers to implement the state’s E-TIX system.
- Massachusetts also has a state grant program for e-Citations.
- Indiana received more than \$2.4 million in federal grants for its extensive electronic reporting systems, including the statewide e-Citation system.

Use the following worksheet and simple calculations to get an idea of the time savings and financial benefits an electronic citation system could provide for your operations.

Metric	Impact of e-Citation System	Projected benefit
Time required to write a citation at roadside	Reduced by 50%	
Time required to enter citation data into computer system	Eliminated	
Citation error rate	Reduced to 2% or less	
Citation collection yield	Improved by amount equal to the error rate reduction. For example, if the error/dismissal rate was reduced by 8 percent, collections should improve by 8%.	

Figure 1: Calculating e-Citation System Savings Opportunities

Important Equipment Considerations

Because electronic citation systems must remain reliable in all kinds of conditions, they require specialized equipment. While e-Citation software can run on laptops or PDAs, these devices are not optimized for the processes involved in issuing citations or the environments in which they are issued. For example, laptops require two hands and are not practical for use at the offender’s vehicle, which negates the key time savings and convenience benefits that e-Citation systems should provide. Laptops are also not an option for officers on motorcycles, bicycles or foot (an important consideration for parking enforcement). PDAs and smartphones provide portability, but they will likely need to be repaired or replaced within a year unless ruggedized models are used. The same is true of

printers – ruggedized models that are purpose-built for mobile operations will outperform and outlast general-purpose printers that have been retrofitted for use in a vehicle.

Independent research has found that total cost of ownership (TCO) for consumer- and business-grade PDAs and smartphones used in public safety and similar environments is 42.6 percent higher than for ruggedized handheld computers.⁷ The research also showed that more than 80 percent of non-ruggedized devices need to be replaced within three years, compared to just 18.2 percent of ruggedized devices. Annual replacement rates are shown in Figure 2 below. See the Intermec by Honeywell white paper [How Ruggedness Reduces TCO for Mobile Computers](#) for more data and insight about the value of ruggedized equipment.

	Year 1	Year 2	Year 3
Non-ruggedized	18.0%	38.5%	82.6%
Ruggedized	3.3%	7.8%	18.2%

Figure 2: Yearly Replacement Rates for Handheld Devices

The features and specifications that indicate whether or not computers and printers can be considered rugged include their drop rating specifications, Ingress Protection (IP) rating and MIL-STD certifications, screen material, keyboard type, and whether cables and peripherals are required. For printers, print technology is also a key variable. Direct thermal printers have fewer moving parts and are considered much more reliable than inkjet and laser printers. Plus, direct thermal printers do not require ink or toner to be replaced, which supports ease of use and uptime.

Here is a brief guide of the ruggedness and reliability features to look for in mobile computers and printers for e-Citation systems.

- Drop Ratings** – Because they are used by officers standing beside a violator’s vehicle, mobile computers and printers should be certified to withstand repeated 5-foot drops to pavement and remain operational. Drop ratings are listed in spec sheets, but it is important to check what type of surface the tests were conducted on (some devices, especially business- and consumer-oriented PDAs and smartphones, are tested on drops to carpeted floors) and if the device is rated to withstand a drop regardless of how it lands. Some tests are conducted so the device falls flat and/or only lands on reinforced areas.
- Ruggedness Ratings** – There are several credible, standardized and practical measures of ruggedness that are good indicators of how smartphones can withstand the rigors of enterprise operations. These include MIL standard (MIL-STD) certifications and Ingress Protection (IP) ratings. Unfortunately, there are also non-credible, subjective measures that manufacturers use to suggest ruggedness. These include inappropriate drop tests and other ratings and claims that are difficult to verify. “Rugged,” “durable” and “enterprise” are subjective terms; IP ratings, MIL-STD certifications and UL listings are not.
 - MIL standards** – MIL standards are designated as MIL-STD followed by a number. There are numerous MIL standards for resistance to shock, vibration and other conditions. MIL standards are set by the U.S. Department of Defense for equipment to be used by military agencies. MIL standards are useful, but there are many of them, so it can be difficult to determine which standards are appropriate to the work environment. The 810 series is applicable for mobile computers and printers to be used for e-Citation systems. MIL-STD 810F is the latest and most rigorous MIL standard for mobile equipment. There are 24 test components for this standard, which certifies a product’s ability to withstand vibration, shock, environmental exposure, humidity and other conditions.
 - Ingress Protection ratings** – IP ratings are typically expressed by the letters “IP” followed by two numbers. The first digit, which ranges from 0 to 6, indicates the device’s level of protection against particles; the second digit, which ranges from 0 to 8, indicates the level of protection against water. Devices used for e-Citation should have an IP rating of at least 54, which is considered dust protected and able to withstand splashing water regardless of orientation.
- Screens** – Screen damage is a leading source of repairs to mobile devices, so models with scratch-resistant screens are advantageous. A tethered stylus is advisable, because it helps prevent the stylus from being lost, and a plain pen used in its place will cause damage to touch panels. Screens are also prone to cracking when dropped, so crack- and scratch-resistant models are beneficial. Specialty screens can also remain readable in bright sunlight, and those sealed against moisture don’t fog over when users move among different temperatures, such as from a heated patrol car to the cold outdoors.

⁷ “Total Cost of Ownership (TCO) Models for Mobile Computing and Communications Platforms,” VDC Research. July, 2007.

- **Keypads** – Keypads can be fully sealed so dirt, dust and liquids can't penetrate the gaps between keys and cause damage to the computer. For added durability, legends can be etched (rather than printed) so keys remain legible after millions of uses. Rugged computer makers often offer customers a choice of keypad configurations, which can enhance ease of use. In colder climates, ensure the keypad can be easily used with gloved hands.

Mobile computers and printers must not only be optimized for the work environment, they should be optimized to work together. Testing has found major performance differences and print variations when different models of mobile computers and printers were used together.⁸In one case, outputting a form took 2.4 seconds on one printer but 28.8 on another using the same mobile computer. In many cases, the printers were unable to attain the top print speeds listed on their specification sheets. Print speed is a very important consideration for e-Citation equipment, because it has a direct bearing on how long the citation process will take to complete, and how long the officer will be exposed to traffic.



These are just a few of the important performance considerations and differentiators among the mobile computers and printers used with e-Citation systems. The following white papers provide a good overview of mobile technology considerations:

- [Top 5 Tips for Choosing Mobile Computers](#)
- [Top 5 Tips for Choosing Mobile Printers](#)
- [Top 3 Questions for Mobile Computer Purchases](#)

For more detailed information about functionality, understanding product specifications, product comparisons and purchasing considerations, refer to the following:

- [How Ruggedness Reduces TCO for Mobile Computers](#)
- [Future Proofing Your Mobile Computers: How the Features Use Select Now Can Protect & Extend Your Investment Years into the Future](#)
- [Understanding and Evaluating Mobile Printer Performance](#)

Conclusion

Electronic citation systems are proven to increase productivity and revenues, to create cost savings and efficiencies, and to improve officer safety in the real world. They do this by using computers and printers to take time, effort and errors out of citation issuing and processing. The result is more time spent on public safety, and less on paperwork. These benefits are available to police forces and other traffic and parking authorities regardless of their size or citation volume. In recognition of the manpower and cost-saving advantages that e-Citation systems provide, numerous departments across the country are implementing or investigating them, and grant money is being made available to facilitate the process.

To maximize the time- and cost-saving benefits of electronic citation systems, they should run on rugged equipment that's built for use by officers in outdoor operations. The computer and printer features that ensure reliability and provide value in e-Citation operations include drop resistance, resistance to rain, snow and temperature variations, convenient operation, ample battery life, plus a screen, keypad and other components optimized for outdoor use. Ruggedized devices can last four years or more in the field; settling for something less will limit the benefits the e-Citation system can provide.

⁸ The test results and additional information are available in the Intermec by Honeywell white paper "[Understanding and Evaluating Mobile Printer Performance.](#)"

About Honeywell Scanning & Mobility

Honeywell Scanning & Mobility (HSM) is a leading manufacturer of high-performance image- and laser-based data collection hardware, including rugged mobile computers and bar code scanners, radio frequency identification solutions, voice-enabled workflow and printing solutions. With the broadest product portfolio in the automatic identification and data collection industry, HSM provides data collection hardware for retail, healthcare, distribution centers, direct store delivery, field service and transportation and logistics companies seeking to improve operations and enhance customer service. Additionally, HSM provides advanced software, service and professional solutions that help customers effectively manage data and assets. HSM products are sold worldwide through a network of distributor and reseller partners. For more information on Honeywell Scanning & Mobility, please visit www.honeywellaidc.com.



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