

White paper

**Transportation Operations:
Clear Cash Flow Roadblocks
with Enhanced Mobile
Document Imaging**

Many transportation companies and other businesses that perform pickup, delivery or other services at customer sites have an excellent opportunity to improve cash flow -- without having to add customers or sell more to existing ones. Shortening the collection cycle is a proven and powerful way to improve the balance sheet, and now it is becoming convenient and cost effective for trucking companies to do so with a simple, technology-enabled change to driver operations. Mobile computers

Key Definitions

Document imaging and enhanced mobile document imaging refer to systems that capture documents and save them in formats that can be processed automatically.

Document photography refers to systems that capture a raw image of the document, which can be viewed and stored, but data on the document image must be entered and processed manually. Legacy imagers in the field today perform document photography.

Document imagers can be used as cameras, but cameras can't provide true document imaging.

with enhanced mobile document imaging are easier to use than digital cameras. In just seconds drivers can create legible, secure electronic images of bills of lading, manifests, invoices and other documentation. Unlike digital camera-based systems, the images captured with enhanced imagers are compatible with common electronic file formats so they can automatically be managed by

document management systems, indexed and processed by accounting, payroll, vehicle maintenance, driver management and other software applications. The image files are also small enough to transmit wirelessly from the field, which means invoices can be presented for processing immediately after service is performed.

Besides compressing the payment cycle, electronic document capture and processing lowers operating expenses, because electronic forms are less expensive to process than paper ones. For example, recent research¹ found that best-in-class firms are nearly twice as likely as laggards to use electronic presentment for transportation invoices, and are also much more likely to use automated data conversion (e.g. document scanning) to input freight invoices into accounting systems. The same study found that technology and process laggards spend almost \$24 to process each paper invoice; more efficient organizations process transportation invoices for less than half that much. Electronic processing not only results in much lower costs, but also produces more accurate work, which reduces errors, expenses and payment delays related to problem resolution.

This white paper describes how enhanced mobile document imaging processes work, highlights the cash flow, expense reduction and efficiency benefits to scanning invoices and other transportation documents, presents the benefits and drawbacks of different technology and outsourcing options, and explains how enhanced mobile document imaging technology that has recently been commercialized overcomes some limitations of traditional image capture techniques and provides additional benefits.

Benefits of Mobile Document Imaging

Improved cash flow is the clearest, strongest and easiest to attain benefit when introducing true document imaging into driver operations. With mobile computing, wireless communication and enhanced mobile document imaging, billing can begin when the work is done, not when a driver gets back to the office or a drop-off center. Other benefits to enhanced imaging and real-time processing include improved customer service, better invoice accuracy, time savings for drivers and back-office staff, and lower overall billing costs. In addition, the hard costs associated with stopping a truck at a drop off point or terminal for the sole purpose of dropping off paperwork. The stop made at the drop-off facility is a stop that adds costs to operations and replaces a revenue-producing stop that could have been made at a customer facility. Adding a load per day per truck would add up to nice improvements in cash flow, productivity and asset utilization.

Speed

The cash flow improvement opportunity exists for virtually any carrier, but varies depending on operations. Typically, the earliest paperwork is received at the end of the day after the shipment has been completed, but several days may pass if the truck is on an overnight run. Once received, paperwork isn't instantly entered into the billing system, but instead goes into an in-box for processing, where it may sit for hours or days before clerical workers manually scan documents and index the images. At a minimum, the invoice is issued one day after delivery, though lags of three days to a week or more are very common. Much longer delays are possible if paperwork or information is missing, which can go undetected for weeks.

Contrast this process to invoicing initiated by document capture in the field by drivers who carry hand-held computers. When the pickup or delivery is complete, drivers have customers sign on the mobile computer touchscreen, and the digitized signature is stored with the time-stamped transaction record. Location stamps (a.k.a. geostamps) can also be applied. Drivers then use the imager integrated in the handheld to scan any bar codes on the shipment labels and documents. The driver also creates a secure, processable electronic document image simply by pointing the imager at the document -- with no need to manually feed the paperwork into a scanner. From the driver's perspective, it's as easy as 1 - 2 - 3: pointing the imager, pressing the scan button and listening for the confirmation beep.

Once all documentation is collected, the handheld computer automatically sends transaction information and relevant documentation to headquarters over a wide-area wireless connection, which enables shipment tracking, customer service, routing and scheduling and other systems to be updated in real time. Because documents are captured in standard electronic formats, the accounting system can also begin generating invoices as soon as electronic images are received, with no need for a worker to print, view and key-enter data from the document, or index the document for reference to database records.

The process even benefits companies who outsource their billing, because document images can be sent to the service provider in real time for processing. The table below summarizes the cash flow improvement opportunity for typical LTL operations.

¹ Transportation Procurement and Payment: Righting the Ship in the Middle of the Storm" Aberdeen Group, March 2009.

Action	Manual/ Paper-based Process	Enhanced Mobile Document Imaging Process	Time Saved with Mobile Imaging
Delivery completed	–	–	–
Documentation delivered to office	Mid-day or end of day	Instant	1 day
Documents are indexed and available for processing	1 - 3 days	Instant	1 - 3 days
Total time savings	–	–	2 - 4 days

Longer trips mean longer delays. Drivers for truckload carriers and private fleets may not return to company facilities with paperwork for several days or for more than a week. Drop-off services can cut the delay but do not eliminate it, as a day or two usually elapses while documents are taken to a drop box, picked up, and delivered to the processing location. Now consider the time savings mobile imaging can provide compared to drop-off services for truckload, private fleet and other carriers who make overnight and extended runs.

Action	Drop-box service	Enhanced Mobile Document Imaging Process	Time Saved with Mobile Imaging
Delivery completed	–	–	–
Documentation delivered to drop box	1 day	Instant transmission to host computer system	1 day
Pickup from drop box	1 day	–	1 day
Courier delivery to office	Next day	–	1 day
Documents are indexed and available for processing	1 - 3 days	Instant	1 - 3 days
Total time savings	–	–	4 - 6 days

Cost effectiveness

Enhanced imaging not only helps trucking companies collect their money faster, it lets them keep more of it by reducing operating costs. Because images are captured in a processable format, no additional manual labor is needed to feed documents into a flatbed scanner in the office, or to index the resulting images and match customer orders to bills of lading, pickup and delivery locations, drivers and other documented needed for accurate billing and

record keeping. Eliminating manual processing also eliminates data entry errors that result in costly exception handling.

Here's an illustration of the labor cost associated with manual document imaging and processing. Assume a midsize carrier has one full-time equivalent (FTE) responsible for receiving bills of lading and other paperwork and scanning it into the system, and another who reads the scanned images, indexes them, and enters or flags the data needed for processing by customer billing, driver payroll and other software. Even though these positions are close to entry level, salary and benefit costs can easily reach \$15 per hour per employee, for a total of \$62,400 per year.

Research provides additional measures of the costs of processing freight paperwork. One leading transaction processing service provider to the trucking industry says it can process freight bills for customers for between \$10.50 and \$14.00 per invoice², saving customers up to 60 percent. The quoted figures and savings indicate typical internal processing costs range between \$17.50 and \$23.33 per invoice, which is in line with \$24 processing cost per invoice identified for poor performers in the previously referenced research. That study found a strong correlation between low operating costs and the use of technology. It noted:

“The manual labor needed to manage paper processing of invoices is driving up the cost.... For companies that are managing their own audit and payment process, almost 60 percent are using electronic processing to minimize the time and resources necessary for manual processes. This gets more critical when you add in the complexities of tracking Sarbanes-Oxley compliance.”

“In almost every instance, companies that are able to leverage technology to manage processes and remove the manual components of everyday tasks are able to focus more on delivering value versus entering data.³”

Automated processes also help companies maintain consistent operating costs, performance and customer service levels when business volumes and conditions change, because they can scale much more easily than manual paperwork processing operations. For example, consider what would happen if a business picked up for a trucking company and it carried 20 percent more loads one month than it did the month before. The increased business would also result in 20 percent more bills of lading and invoices to be processed. The company would not hire 1/5th of a person (20%) to handle the extra documents, but instead would add it to the existing staff's workload. Since most staffs are already working at close to capacity, processing delays would likely result and the payment cycle would get longer. When these factors are considered the extra business gained may not appear as profitable as first thought, especially if overtime or temporary staffing is used to keep billing and record keeping up to date.

Cost reduction has a powerful effect on profitability. Consider a company whose average revenue per load is \$1,000, has a profit margin of 10 percent, and its costs to process bills of lading and prepare invoices total \$20 per load. At these levels the company makes an average profit of \$100 per load, and paperwork processing costs account for two percent of the revenue generated

² API Outsourcing. Viewed April 15, 2009 at <http://www.apifao.com/solutions/freight.html>

³ Transportation Procurement and Payment: Righting the Ship in the Middle of the Storm” Aberdeen Group, March 2009.

from each load (\$20 in expenses ÷ \$1,000 revenue per load). Eliminating the paperwork processing expense (\$20) would raise the per-load profit by 2 percent, from \$100 to \$102.

Here's another way to consider how paperwork processing relates to profitability. Consider if the company in the first example could eliminate just one of its two full-time equivalents by automating its paperwork processing. The decision would reduce salary and benefit expenses by \$31,200. At a 10 percent profit margin, the cost reduction would be equivalent to gaining the profit from an additional 312 loads, without actually having to run any trucks.

Companies are recognizing the cost of paperwork processing and increasingly are doing something about it -- although more than half still input invoice information manually. Outsourcing has been tried but hasn't flourished, because it only provides some time and costs savings but does not optimize operations. For example, the provider that claims to save customers 60 percent still makes a profit, so actual processing costs can go lower. Technology and process improvements at carriers are what will drive invoice processing costs to lower levels.

Accuracy

Mobile document imaging is used in conjunction with mobile computers, which are generally acknowledged to produce more accurate data and more complete forms than manual, paper-based procedures. Software running on the mobile computer prompts drivers to fully complete forms and enter information that is missing, and can prevent basic data entry errors by pre-populating fields with customer ID numbers, addresses, activity codes and other information. Other features and complementary technologies enhance operational accuracy. For example, handheld

computers with integrated GPS receivers can provide location stamps to enhance transaction records, and electronic signature capture provides additional documentation. The same imager used to scan documents can also take pictures of freight at pick up and delivery, so the carrier can prove it is not liable for damage that occurred when goods were in its possession (remember, imagers can be used as digital cameras, but digital cameras can't perform true document imaging). Preventing these kinds of errors and disputes improves customer service and saves operators the time and expense of researching and resolving them.

Processing Options

Improving paperwork processing operations is a growing area of emphasis in the trucking industry. However, paperwork has remained a problem because suitable processes and technologies haven't been developed to meet industry needs. Enhanced mobile document imaging is changing that, but the technology is often confused with common digital imaging and document photography, which is not a good comparison because common digital imaging and photography do not produce images that can be processed electronically. The following sections highlight the advantages, disadvantages and opportunities for the leading approaches to automated transportation document processing.

The traditional approaches used to streamline transportation paperwork processing have either shifted bottlenecks from one point of the process to another, have not done enough to save time and reduce cost, or have not proven to be reliable in real-world usage environments. The following table summarizes the advantages and shortcomings of different approaches to paperwork processing. As you will see, most address only part of the problem, but don't provide a complete solution that saves time and money without adding cost or lowering productivity elsewhere.

Approach	Approximate Cost*	Pros	Cons
Outsource document processing	\$10 - \$15 per document	<ul style="list-style-type: none"> Reduces internal labor requirements Reduces needed technology infrastructure Service levels can be consistent and contractually guaranteed 	<ul style="list-style-type: none"> Does not eliminate processing time lags Adds variable costs Contracts may limit flexibility Loss of internal control and expertise
Document drop-off services	\$10 to \$15 per vehicle per month; scanning and processing services extra	<ul style="list-style-type: none"> Cuts time to receive paper forms from drivers who do not return to the terminal daily Optional scanning services can reduce document prep time 	<ul style="list-style-type: none"> Some document receipt lag still occurs Paperwork still must be processed (unless additional scanning services are contracted) Adds a daily stop for drivers, taking available service time away from customers Adds ongoing operational expense
In-cab document scanning	Scanners range from \$100 for low-end models to more than \$1,300 for flatbed models with image processing software	<ul style="list-style-type: none"> Documents are received at the office ready for indexing Images can be compatible with document management systems and support electronic processing by accounting and other software Electronic submission is typically faster than drop-off services (if driver has modem access) 	<ul style="list-style-type: none"> Additional equipment procurement costs Scanners must be commissioned, installed and maintained by the IT department Scanners are not optimized for mobile, rugged, in-cab use and must be frequently repaired or replaced Driver productivity
Document photography	No incremental cost to handheld computers with integrated imagers; selecting imager instead of laser bar code reader adds \$100 to \$150 for image processing software.	<ul style="list-style-type: none"> Images can be submitted wirelessly as soon as the transaction is completed Handheld computers can be leveraged to provide imaging; no additional equipment required Imager can also scan signatures, document proof of delivery and other conditions 	<ul style="list-style-type: none"> Image files can't be processed electronically; manual data entry and indexing required Drivers can't quickly photograph documents using digital cameras or viewfinder-based imagers. Basic imagers that lack image control features produce dark, out-of-focus, hard-to-read, skewed and otherwise unusable document images
Enhanced mobile document imaging	No incremental cost to handheld computers with integrated imagers; selecting imager instead of laser bar code reader adds \$100 to \$150 for image processing software	<ul style="list-style-type: none"> Document images can be submitted wirelessly in real time Image files are ready for processing immediately upon being received; lag time eliminated Single-device solution Imager can also scan signatures, document proof of delivery and other conditions Process is "de-skilled" to eliminate training issues related to photography or separate scanning equipment. 	<ul style="list-style-type: none"> Limited device options Image processing software license required Some driver intervention required

* Costs for some options (e.g. drop-off services, document photography) do not reflect internal document processing costs, which are estimated at between \$17 to \$24 to manually scan and process the documents needed to generate an invoice.

The following sections provide more details about these options.

Outsourcing

On a per-document basis, outsourcing allows many trucking companies to have their documents scanned and processed less expensively than they could do it themselves. The primary benefit to outsourcing is that it reduces employee requirements and labor costs, and eliminates the need to add and cut staff as transaction volumes increase or decrease. Outsourcing may have limited effect on reducing the lag between when service is performed and when the invoice is issued, because documentation must still be delivered (either by paper or electronically) before the invoicing process can begin. Effectiveness and value therefore depend on the client organization's efficiency in collecting and completing paperwork in the field and delivering it to the service provider.

Drop-off Services

Drop-off services in some ways are the opposite of outsourcing: they can reduce the billing lag by making documentation delivery more efficient, but do little or nothing to reduce processing costs plus labor and equipment requirements. The value of drop-off services relates directly to how much faster they can get documents to the processing facility than the customer could itself. Basic drop box pickup-and-delivery services cost around \$10 to \$15 per driver per month, which builds ongoing cost into operations. Some drop-off operators now offer scanning and document processing services, which positions them more as outsourced service providers.

Drop-off services also add a hidden cost to operations. They require drivers to make a stop each day to drop-off the paperwork, which is time that could have been spent making stops at customers. To get an idea of this cost, consider how your key metrics (network capacity, loads per day, delivery time, etc.) would improve if each driver made one more pickup or delivery per day, or simply used the time spent on a paperwork drop-off stop to cover more miles. Stopping at drop-off facilities eats into hours of service and limits the time available for drivers to perform revenue-generating activity.

In-cab Document Scanning

Document scanners are suited for the work of processing transportation documents but not for the environment. Capabilities range from low-end receipt scanners that can be manually fed with bills of lading and other shipment documentation, to professional models with automatic feeders and integrated software that formats scanned documents so they can be indexed and stored and the data within them can be processed automatically. Regardless of the type, durability and reliability are significant issues for scanners used in cabs. The movement and vibration that occurs within a truck, plus sometimes rough handling by drivers, makes scanners prone to frequent breakdowns, which often occur far from where the devices can be fixed or replaced.

Scanners themselves do not solve the problem of getting documentation to where it can be processed. Scanned images still need to be transferred to the processing location, which necessitates a modem or wireless connection, making document scanners inconvenient for drivers to use. Time drivers will spend searching for connection points, and for scanning documents and troubleshooting, must be considered assessing the productivity implications of using in-cab scanners.

Document Photography

Some trucking companies have started getting digital images by having drivers take pictures of documents using cell phone cameras or cameras integrated into handheld computers. There are important distinctions between this type of document image capture (document photography) and true digital imaging. The most important difference is that document images taken by cell phones, digital cameras and most handheld imagers are not high enough initial quality, (or even after post processing) to make the document optimal for posting to internal systems or Web services, nor are they saved in a format that allows the image and document data to be processed electronically. Manual indexing and data entry are still required. Generally, a photograph is not commonly usable for business because it can't be printed on paper to clearly resemble the original document. You can verify this yourself using a cell phone or digital camera to take pictures of documents in your office. Since photography skills vary greatly from one untrained person to the next, the quality of resulting document images will vary among users.

Document photography does provide the benefit of quickly capturing images and delivering them for processing. Imagers integrated with handheld computers provide the added advantage of being a single-device solution, so the enterprise only has to support one set of devices, and users don't have to worry about keeping separate computers and cameras charged. Document images are safely stored so they don't get damaged, which is an advantage compared to paper forms. Integrated imagers can also take advantage of wireless capabilities in the mobile computer to transmit images to headquarters, printers or other peripheral devices or client computers using Bluetooth, wireless LAN or wide-area wireless connectivity. (For more information on these and applications and their benefits, see Intermec's white paper [Imaging Adds Visibility to Transportation.](#))

Enhanced Mobile Document Imaging

Enhanced mobile document imaging combines the benefits of professional document scanners with mobility and real time communications. but the devices differ from legacy mobile imagers in that they include image quality controls and image processing software. Document images that are captured can be integrated directly into document management systems, and data from the documents can be processed with software applications without further image processing, indexing or manual data entry required. Because the imager is integrated with a mobile computer, captured documents can be transferred wirelessly for real-time processing. Mobile document imaging is highly beneficial for trucking operations, because it eliminates the lag between when work is performed and paperwork can be processed -- without incurring the costs associated with document drop-off or processing services, and without requiring the back-office clerical support needed to process documents captured with in-cab scanners or digital photography.

Enhanced mobile document imaging does require an investment in image processing software for the handheld, and for high-quality imagers. The necessary software adds \$100 to \$150 in incremental cost to a handheld computer with an imager that supports it. The cost is in line with low-end document scanners, and costs less than a one-year contract with a document drop-off service, but neither of these options processes the scanned document. The entire process can be integrated into the drivers work flow to eliminate process failure and automate document indexing

and transmission. Mobile document imaging does require drivers to capture images of documents, so ease of use depends on the imager's design and features. The main drawback to enhanced mobile imagers is limited availability. Because the technology is relatively new to handheld computers, product options are limited.

Enhanced Mobile Document Imaging from Intermec

Intermec is introducing enhanced mobile document imaging to the transportation market with a new range of handheld computers with integrated imagers that support advanced document capture. Initially available on the newest Intermec handheld computers with EA21 scan engines, the optional enhanced mobile imaging (eMDI) feature allows users to capture full-size (8½ by 11-inch or A4) or smaller documents. Half-sized images can be saved in *.TIFF or *.JPEG formats and full-sized images can be saved as *.JPEGs for easy integration into document imaging systems. Solution software embedded in the handheld computer manages image quality and enables data from documents to be processed electronically by accounting, customer service and other enterprise software applications.

Image quality, ease of use and software capabilities set the Intermec solution apart from mobile imagers on the market. Scanning images is a point-and-click experience that is easier than taking a picture with a digital camera. The imager projects a laser framer onto the target document, so drivers simply have to line up the corners to capture the image -- rather than having to look through a small view finder to determine if the needed document fields are in the picture. Images can be taken from up to 35° off of rotation and 10° off of vertical, and the keystone feature automatically aligns the document within the image frame to correct skewing. Integrated lighting and contrast controls enable drivers to create usable images whether scanning occurs indoors, outdoors or in the cab. In testing, users captured up to 12 documents per minute, which is better throughput than photography/viewfinder-based imaging approaches and sheet-fed scanners, which alleviates productivity worries.

Document images can be appended with time stamps, geostamps and data from the document itself (e.g. PRO number, customer name, pickup & delivery locations, etc.) to support common document indexing schemes. Image files are automatically compressed to sizes (typically around 120K) that can easily be transferred over wireless networks.

Conclusion

For trucking companies and other business that perform pickup, delivery or other services at customer sites, paperwork processing no longer has to be the bottleneck to cash flow. Enhanced mobile document imaging enables invoice generation to begin immediately after service is completed, which cuts days out of the cash cycle for most operations. Unlike other technologies and processes promoted to improve transportation paperwork processing, enhanced mobile document cuts costs and time requirements, rather than shifting them. For example, drop-off services cut time from the billing cycle, but build an ongoing monthly expense into operations and do nothing to reduce the cost of processing paper; document photography saves time, but still needs clerical labor to prepare images for processing; high-end in-cab scanners can reduce labor support requirements, but require an investment in technology rather than leveraging what drivers already use. Enhanced mobile document imaging is the only approach that captures and communicates ready-to-process document images in a single step.

Intermec, the innovator of imaging technology in data collection, provides a full range of bar code, image capture, mobile and wireless computing and other technologies, and has worked with thousands of distribution, delivery and warehouse professionals to find the right mix of technologies and processes to improve their businesses. Intermec is the first company to offer enhanced mobile document imagers to the transportation market. Our pioneering products combine the ruggedness and ease of use needed to perform reliably for drivers with advanced imaging technology and software support to integrate with enterprise software applications, document management systems and storage environments.

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