

Kofax White Paper

Executive Summary

To cope with increased workloads and added responsibilities, AP departments are looking to streamline as much of the invoice process as they can. This white paper discusses how the latest intelligent recognition technologies can be used to automate the capture of paper and electronic invoices to reduce costs, increase speed and improve data quality.

Best Practice for Automatic Invoice Capture with Intelligent Recognition

Business Problems

Over the past five years, the role of the accounts payable (AP) department within all sizes of enterprises has dramatically changed. Previously, an AP department was managed as a cost center that only processed and reviewed transactions, coordinated with other departments, responded to inquiries, reconciled accounts and generally performed paperwork. Now, primarily due to compliance requirements and regulations regarding fraud, the AP department must also play a larger support role by helping to control, coordinate and analyze key business processes.

This means the AP function is more visible within the organization and its main responsibilities now lie in quality assurance, contract/policy compliance, reporting and analysis. With this change comes an increase in workload and added responsibilities. AP departments need to redeploy their skilled knowledge workers from back office administrative tasks, such as invoice processing, to more business critical management activities. To achieve this, AP departments are looking to automate as much of the invoice process as they can, thereby reducing the cost of invoice processing, increasing both process speed and data quality, and allowing them to redirect their skilled resources to address more pressing issues.

High Costs

Processing an invoice involves capturing key data, entering it into the ERP system and kicking off the process for review, approval and finally payment. Although straightforward, this process needs to scale to handle the large numbers of invoices that a medium or large sized business receives each day, which can be many hundreds or even thousands. Accuracy and efficiency, therefore, are major concerns. Costs associated with managing this volume of data, the human labor typically required and the need to catch and fix errors along the way can all grow quickly.

The ongoing drive to reduce AP invoice costs is fueled by the belief that there are significant savings to be found. The Hackett Group—a strategic advisory firm specializing in best practice research, benchmarking and business transformation services that enable world class performance across selling, general and administrative (SG&A) and supply chain activities—confirms that belief. In their February 2011 research of AP costs, they found that top performers have a process cost of \$1.14 per invoice, compared to the non-top performer cost of \$3.90. In other words, a top performing company processing 5,000 invoices per month saves almost \$14k per month. Actual costs depend on the level of process automation that is implemented.

Slow Speed

The quicker an invoice is entered into the ERP system, the quicker a decision can be made about payment timelines. Rapid entry provides faster visibility of liabilities. Slow entry can prevent a company from paying invoices when it suits them on their own timelines. Most vendors charge penalties for late payments on outstanding invoices. Not only does this cost money, it can damage the company's relationship with the vendor. On the other hand, most vendors offer discounts when invoices are paid early.

Without efficient processes in place, a company not only risks paying late fees, but also misses the opportunity to take advantage of early payment discounts.

The loss of cash in such cases can be significant. Consider a typical discount of 2/10 NET 30. Here, the buyer receives a 2% discount if the invoice is paid within 10 days instead of the 30 day term. Admittedly, these savings are offset by the loss of 20 days of interest. However, if we extrapolate the savings over about 18 20-day periods each year, the result is a 36% annual return (see sidebar for details). This is a far better return than the interest earned from leaving the money in the bank.

Example of the annual return on early payment discounts:

$$\begin{aligned} & \text{2/10 Net 30} \\ & \text{2\% for 20 days} \\ & \text{Year} = 18 * 20 \text{ days} \\ & 2\% * 18 = 36\% \text{ p.a.} \end{aligned}$$

Poor Data Quality

Correct data is vital for the smooth running of downstream invoice approval processes. Issues can arise from a number of sources, including:

- Extraction related issues, where an error is made in transcribing the data from the invoice into the ERP system;
- Invoice conformity difficulties, where the data on the invoice is different from the information on the original purchase order;
- Data errors, where the supplier has made an actual mistake in the invoice, such as a wrong address; and
- Business logic errors, such as a wrong payment term, discount rate or tax rate.

In too many cases, it remains a manual process to fix these problems, resulting in higher invoice processing costs. AP personnel need to place outbound phone calls to correct mistakes on the invoices. With average customer service calls running upwards of \$10 per call, resolution costs can easily run up to \$100 per disputed invoice. This process flow holds the AP department accountable for fixing errors that could have been avoided.

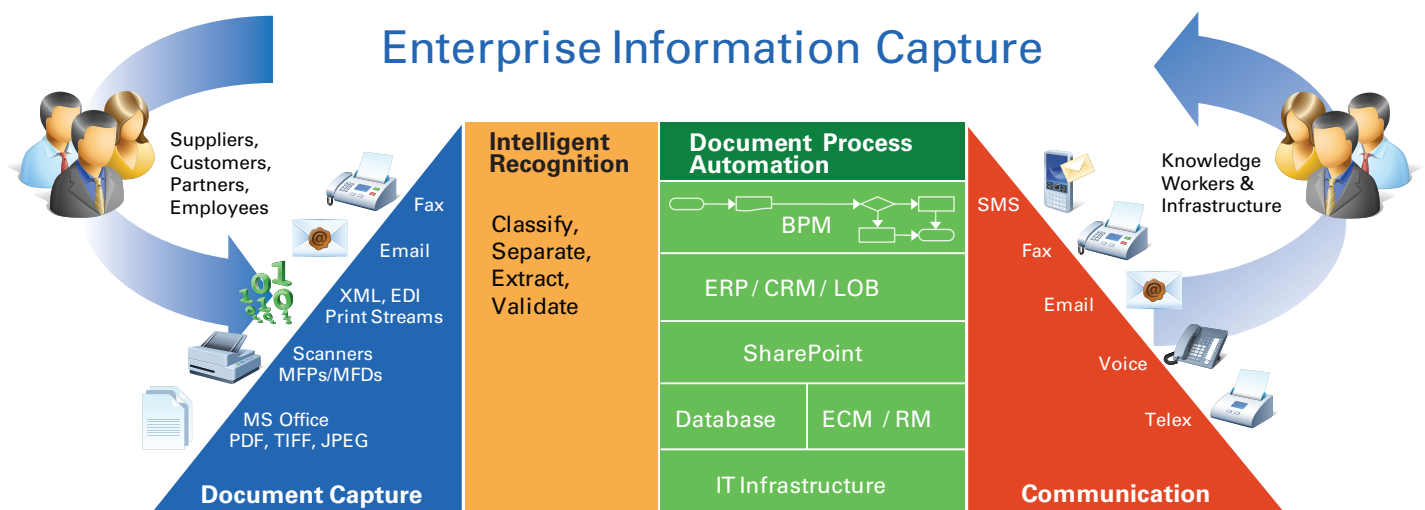
Automatic Invoice Capture

To dramatically reduce or even eliminate the impact of all these issues, automatic invoice capture enables organizations to automate their AP processes by:

- **Collecting** all incoming invoices in whatever format they arrive. This is the capture of paper and electronic invoices for conversion into electronic information and delivery into an ERP system. Paper invoices are captured using devices such as scanners, digital copiers and multi-function printers (MFPs). Electronic invoices can be captured from fax and email servers. Invoices can be captured at any location that has an electronic connection

to the business: in a single department, a central office, a remote office or even at the supplier's site.

- **Transforming** invoices so they are easy to understand and process in a cost saving, faster and more accurate manner. This is the conversion of collected invoices and data into structured electronic information that is ready for delivery into ERP systems using automatic recognition technologies. Transformation uses intelligent recognition (IR) technologies that can classify and extract any invoice, regardless of content or format.
- **Validating** invoice information to ensure the highest accuracy, such as against PO details in the ERP system. The detection of errors in the captured invoice information significantly reduces risk and ensures that only accurate data is submitted to the ERP system, reducing the number of processing exceptions.
- **Delivering** invoice information to the right people and systems for appropriate action. This is the transfer of the newly captured and validated information into the ERP system of record, making the information available to the people who need it within the AP process as quickly as possible.



By implementing automatic invoice capture, companies increase their processing speed. Simply put, computers process documents substantially faster and more accurately than people, and at lower cost. Payback from high performing automatic invoice capture solutions is typically achieved in less than 1 year.

A key factor in determining the payback time is the power, accuracy and ease of use of the recognition technologies used to automatically transform invoices into structured electronic information.

Recognition Technologies

OCR/ICR and Forms Processing

Automatic character recognition technologies have been available for more than 30 years. At their heart lie algorithms that convert pictures (bitmaps) of individual characters on a scanned page into electronic text. Algorithms for processing machine printed characters are generally called optical character recognition (OCR) algorithms, whereas those for processing hand printed characters are called intelligent character recognition (ICR) algorithms. There is often a misconception that OCR and ICR are the same as data extraction. OCR and ICR simply deliver the individual characters and words that are found on a document image. Information extraction, on the other hand, associates the correct words with the correct metadata, such as determining that a particular piece of data is an invoice number or an invoice date.

For documents of a known layout, such as standard application forms issued by banks or claim forms issued by insurance companies, the location of each piece of metadata is predictable, so information extraction simply involves using a “template” that tells the system where to find the data. However, as the number of known layouts increases, defining a template for each layout

becomes more and more impractical. In the case of invoices, even though each supplier has a fixed layout, the number of suppliers that a typical company deals with can run into the hundreds or thousands. Instead, more intelligent recognition methods are required that automatically locate the required data on the invoice.

The Great Little Closet Co. Phone (520) 823-5423
Preston Insulation Fax (520) 798-1054
 602 F. 24th Street Tucson, AZ 85713 License# 140086 K-40

Invoice

Customer No. KLIN
 Invoice No. 58529

To: Kline Custom Homes Inc 4525 E. Skyline Drive Suite 125 Tucson AZ 85718

Ship To: 3187 E. Via Palomilla

Date	Ship Via	FOB	Terms	
Purchase Order Number	Order Date	Sales Person	Order Number	
08/18/06	08/18/06	ALL AN ANDERSON		
Quantity	Item Number	Description	Unit Price	Amount
26	OU38-10-43	12" R-38 16x48 UF	0.000	0.00
11	OU30-24-80	10" R-30 24x48 UF	0.000	0.00
10	OU-9-15-77	6" R-15 15x93 UF	0.000	0.00
14	OU13-24-192	3-5/8" R-13 24x90 UF	0.000	0.00
9	OU13-15-108	3-5/8" R-13 15x93 UF	0.000	0.00
4	OU19-24-128	6-1/4" R-19 24x96 UF	0.000	0.00
18	OU30-10-53	10" R-30 16x48 UF	0.000	0.00
	MSC	INSULATION COMPLETE IN PLACE	4855.000	4855.00
Invoice subtotal			4855.00	
Invoice total			4855.00	

Pay: 08/26/09

Thank You

Invoice
 Invoice Number: 65799
 Invoice Date: Dec 13, 2006
 Page: 1

SIERRA TILE SUPPLY, INC.
 4155 E. SPECTRUM BLVD.
 TUCSON, AZ 85717

Voice: (520) 327-7324
 Fax: (520) 327-6108

Sold To: JOHN W. KILMER HOMES, INC.
 4525 E. SKYLINE DR, #125
 TUCSON, AZ 85718

Ship to:

Resale No. 10-15-300-K
 Sales Rep ID: 8504003

Shipping Method: Customer Pickup
 Ship Date: 12/15/06
 Due Date: 12/15/06

Quantity	Item	Description	Unit Price	Extension
35.00	CALAVERA 10	BLANCO 4X4	0.27	12.95

Subtotal: 12.95
 Sales Tax: 0.00
 Freight: 0.00
 Total Invoice Amount: 12.95
 Payment Received: 0.00
TOTAL: 12.95

Check No:

Intelligent Recognition

Intelligent recognition (IR) automatically extracts information based on keywords, knowledge of the expected data format and the data's position relative to other data items. IR is vital for the automatic extraction of invoices, since the high number of different layouts makes defining a template for each prohibitively costly and time consuming.

The figure shows two typical invoices. Each invoice has groups of data that are generally in the same area as on the other invoice. For example, the invoice data, number, PO details and vendor details are in the top third of each invoice, the line item data is in the middle third, and the amounts are in the bottom third. But within these areas there are considerable differences in the exact position of each data item and the keywords surrounding them. For example, the invoice date is preceded by the word "DATE" in the first invoice but by "INVOICE DATE" in the second.

Before the development of IR technologies, automatic invoice extraction solutions were difficult to configure and costly to maintain. This was due to the need to define templates to indicate where the information is located on each supplier's invoices, or the need to implement rules that define expected keywords around the required information. However, modern IR technologies have made invoice extraction solutions practical and cost effective, delivering ROI to thousands of organizations around the world. The key technology elements of IR are:

- Supplier detection,
- Data extraction using learn-by-example techniques,
- Online learning to enable the solution to keep track of changing invoice layouts and new suppliers, and
- Robust data validation, in particular matching of invoice data to PO data held in the ERP system.

These are discussed in more detail below.

Key Invoice Recognition Technologies Supplier Detection

All companies hold records of their supplier details within the ERP system, often with a unique ID allocated to each supplier. However, detecting which supplier has sent a particular invoice is often difficult because:

- The supplier ID is rarely printed on the invoice;
- The supplier name might be hard to read, especially if it is part of a graphical logo;
- The supplier details in the ERP system might not match the invoice exactly due to blank fields or incorrect/outdated data in the ERP or supplier name changes resulting from acquisition or rebranding; or
- Duplicate supplier entries exist in the ERP system master data.

The figure below shows a typical example of an invoice, highlighting the issues above.

To accurately determine the vendor, a multi-step approach is required that develops a list of possible alternatives for the vendor. This multi-step approach considers the following information:

- The supplier ID is searched for on the invoice, and if it is found it is considered a strong indicator.
- The layout of the invoice is compared to the layout of previously seen vendors to determine if there is a close match.
- The tax ID and bank details are searched for on the invoice, and if they are found they are compared to the details held in the ERP system to find a close match.
- The text content of the invoice is compared to supplier details in the ERP system such as name, address and telephone number. Allowances are made for variation between invoice text and ERP details, for instance to account for missing postal code details. This is called fuzzy matching.

PC Mall
Business Solutions

MacMall

Corporate Credit and
Collections Department
800-739-3282

PLEASE SUBMIT PAYMENT TO:
File 55327
Los Angeles, CA 90074-5327

PC MALL

SHIP TO: (If other than sold to)

KOFAX IMAGE PRODUCTS
ATTN RECEIVING
16245 LAGUNA CANYON ROAD
IRVINE, CA 92618

SOLD TO:
KOFAX IMAGE PRODUCTS INC
ATTN ACCOUNTS PAYABLE
16245 LAGUNA CANYON ROAD
IRVINE, CA 92618

ACCOUNT NO.
0071895221

20036024

PURCHASE ORDER NO. DATE

Payment Due by 02/27/03

INVOICE/ORDER NUMBER	INVOICE DATE	SHIPPED VIA	DATE SHIPPED
P89920980101	01/28/03	UPS	01/28/03

ORDERED	SHIPPED	ITEM NO.	DESCRIPTION	UNIT PRICE	EXT. PRICE
10	10	U DRT 01541895TD ST320014A	U SERIES X 20GB ATA/100-HD 3.5LP 5400RP SEAGATE	59.00	590.00

Serial # 5178NVTX

36861

Each alternative is ascribed a confidence level. If the top alternative has a substantially higher confidence level than the next alternative, then the supplier is detected automatically. Otherwise, a ranked list of alternatives is displayed to the user for manual selection.

Without a multi-step approach, the accuracy of vendor detection is severely compromised. If the information is missing, invoices simply cannot be paid. If the information is wrong, then at worst the wrong vendor will be paid, and at best there will be severe delays in payment, impacting supplier relations.

Fuzzy matching:

Acocdrnig to a reschearer at Cmabrigde Uinervtisy, it deosn't mttar in waht oredr the ltteers in a wrod are, the only iprmoatnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The huamn mnid atclluay cnovrets "fzzuy" inupt to prfecet outupt. And you awlyas tghuhot slpeling was ipmtorant..

Learn-by-Example IR, not Rules

The use of learn-by-example IR technologies for automatic invoice extraction is essential to providing an accurate and easy to use solution. For documents with varying formats such as invoices, the traditional approach is to use rules to classify the document or to locate data based on the presence of keywords, phrases or graphical features on the document. However, rules are difficult to configure and costly to maintain, making it difficult for IT and AP staff to change the system to handle new document types quickly and efficiently. In many cases, rules mean programming.

For instance, consider the problem of locating an invoice number by searching for one of a list of possible data labels near the number. There are many such labels—

Invoice Number, Invoice No, Inv. No., Invoice Num., Invoice # and so on—but no list can be complete. If a particular supplier's invoice includes a new phrase, then this needs to be added to the list. Every time the list of phrases changes, the system's performance must be retested and there may be unforeseen effects. The issue is exacerbated when multiple languages are involved.

In contrast, learn-by-example techniques automatically learn the key features of each document type through a training process which involves gathering samples and "showing" the system which documents fall into which class. Once the key features have been learned for a sufficiently broad set of documents, previously unseen documents can be classified, separated and extracted to a high degree of accuracy. No manual extraction of keywords, key phrases or document features is required, so the configuration process is quicker and less error prone.

Multiple Complementary Extraction Technologies

It is a simple fact that there is no single approach to data extraction that is optimal for every document that a business needs to capture. This is particularly true for semi-structured documents such as invoices. In most companies, the 80:20 rules applies: 80% of invoices are received from 20% of suppliers. To achieve the highest possible accuracy overall, it is essential that extraction performs well on these top suppliers, but good accuracy must also be achieved for the other suppliers without excessive configuration or maintenance effort. As such, different approaches must be used for each set of vendors:

For the **top vendors**, the system should learn the layout of each invoice and store information regarding the location of each data item on the invoice. Subsequent documents are then compared to each learned layout, and if a match is found, the data is extracted from the

same locations. The technology should tolerate shifting and rotation of the data on a document caused by the scanning process, which is necessary to achieve high performance in real life situations. A 90%+ field recognition rate should be achievable for a given layout after training on 1-3 samples.

For the **other vendors**, a layout agnostic approach is best. In this case, a trainable pattern recognition system builds on a model that defines the generic structure of documents such as invoices. Such approaches do not learn the absolute position of data on the document, but rather learn the relative position of each data item, its format, surrounding keywords and other features. A field recognition rate of approximately 70% should be achievable after sufficient training, usually on 500-100 samples.

This combined approach very much mirrors how humans recognize objects we see more or less often. For example, we store specific information on the features of a friend's or relative's face and can recognize them instantly in a crowd, but at the same time we can recognize the gender or ethnicity of a person based on generic knowledge of their features.

Online Learning

To maintain system performance and deliver a consistent return on investment, it's vital that learning continue as documents are processed. Online learning technology allows new document types to be incorporated into the solution without having to take it offline. For example, it should be possible to add the layout of invoices from a new supplier and to increase the accuracy of extraction for a known supplier. Such learning is impossible with rules based extraction solutions; they are essentially static and require human intervention in order to make changes and improvements.

The learning process needs to be simple and straightforward. Learning is triggered once all data on a document has been extracted and validated. The user can tag individual documents for learning or send all documents by default. Training commits the details of the document to a specific or generic knowledge base so they can be used to classify and extract documents of the same type when the next batch is processed.

While learning is an ideal way to maintain system performance, it must be implemented carefully. In particular, tolerance of training errors is vital because users who process large volumes of documents are prone to making mistakes. For instance, they may misidentify the subtotal on an invoice as the grand total. Robust learning technologies require that a field is trained twice before the learning is committed to the knowledge base, so sporadic errors are filtered out and system performance is maintained.

Validation and Purchase Order Matching

The detection of errors in captured invoice information helps to ensure that only accurate data is submitted to the ERP system. This significantly reduces risk, as well as the number of processing exceptions, the cost of placing outbound calls to suppliers to gather additional/correct information and the cost of handling inbound calls from suppliers concerned about payment delays.

At a minimum, the system should validate:

- Supplier details extracted from the invoice against supplier tables held in the ERP system,
- Invoice date formats using local rules (for instance, 01/10/10 is Jan. 10 in the U.S., but Oct. 1 in the U.K.), and
- The sums of the amounts on the invoice (for example, to ensure that the line item subtotals, tax, freight and discount all add up to the invoice grand total).

In addition, if the system can match invoice line item data against purchase order (PO) details held in the ERP system, then PO-based invoices can be processed “straight through” (to posting) with no human touch required. Usually this operation is performed manually in the ERP system by an AP clerk. If a match is found, the invoice can be paid without further approvals. At first glance this seems like a simple problem to solve, since PO details are always in the buyer’s ERP system, but in practice there are a number of issues that need to be addressed:

- The line item order might be different on the invoice than on the PO.
- The descriptions and item codes on the invoice might not match those on the PO.
- A single invoice might span multiple POs.
- An invoice might cover only a subset of the items on the PO because there are multiple deliveries at different times.

As with supplier detection, the answer is to compare the extracted text from the invoice to PO details in the ERP system to find a close match. In this way, it is possible to obtain high automatic matching rates even in the face of the issues described above. The higher the automatic matching rate, the greater the labor reduction and ROI.

Case Study

Each year, Flight Centre GP processes over one million invoices and travel documents in over 20 currencies from over 5,000 suppliers operating in 30 countries. Incoming invoices contain product and service offering line items that include more than 15,000 different options for hotels and accommodations, tours, car rentals and more. Catering to both corporate and individual consumers, some invoices have as many as 2,000 line items (one line for each booking).

Along with these challenges, Flight Centre GP’s suppliers and vendors vary widely in their invoicing sophistication. For example, a five star hotel’s invoices differ significantly from those of a small bed and breakfast. This required the agency to manage different document formats, fonts and languages. On top of that, the organization had to process both physical documents received at their retail locations and invoices arriving as email attachments.

In addition to manually keying the data from each invoice, Flight Centre GP’s processing staff also had to physically compare and match invoice details against customer confirmation slips and booking forms. To handle all these activities, the company had nearly 30 AP clerks at its Sydney processing center to manage the massive volume of paper and the time intensive tasks to collect, input, validate and then process the invoices.

To address these challenges, Flight Centre GP implemented an automatic invoice capture solution. This solution is based on advanced automated extraction and validation of invoice data arriving on paper and by email as attachments. The capture solution interfaces to an electronic workflow system and Flight Centre GP’s booking system to match invoices. This solution also enables AP staff to better manage booking exceptions.

The capture solution was initially rolled out to Flight Centre GP in Australia within nine months. Following this successful implementation, a second phase was completed in the U.S. in less than three months. The organization now operates two primary scanning stations—one in Sydney and the other in New York—to scan all incoming travel related invoices. The overall solution not only enables the company to automatically capture its vast mix of vendor invoices, but also allows data to be extracted from complex unstructured table layouts. This includes the ability to extract and identify

travel tokens and booking references within line items, with scan operators performing validation on these documents as required.

To manage this new system, Flight Centre GP established two AP teams in its Sydney and New York offices.

Comprising 46 people, the teams were initially tasked with automating their top 10 vendors, which accounted for approximately 25 percent of the organization's invoices.

Further extending the system to the top 15 suppliers addressed 35 percent of the invoices. Flight Centre expects to have more than 75 percent of its global invoice processing system automated within a year.

With the automatic invoice capture solution in place, Flight Centre GP's AP team can now deal with qualitative aspects of their jobs instead of being tied up with data entry and matching work. With immediate electronic access to high quality data, staff can quickly address and resolve customer and supplier issues, often within minutes rather than days or even weeks. The solution also enables Flight Centre GP to better manage business volume fluctuations due to travel seasonality. This means that the company does not need to increase staffing during the busy holiday or summer travel seasons, thanks to an automated solution that can be readily extended to handle varying capacity needs.

Is Automatic Invoice Capture for You?

Modern IR technologies have made automatic invoice capture solutions practical and cost effective, and are delivering ROI to thousands of organizations around the world. Before implementing their solutions, all these organizations had identified one or more of the following symptoms within the AP department:

- AP staff were spending a considerable amount of time performing invoice data entry into the ERP system.
- Slow invoice processing speeds due to slow invoice capture were resulting in late payment penalties.
- Invoice data was difficult to access due to lost or misfiled invoices.
- Paper storage costs were excessive.
- AP staff were forced to handle a large volume of calls with suppliers due to incorrect invoice data in the ERP system.

If you currently experience similar issues, there is a good chance that automatic invoice capture will enable you to drive your cost per invoice down closer to the \$1.14 range of the top performers, and also enable you to capture more early payment discounts and avoid late payment penalties.

About Kofax

Kofax plc (LSE: KFX) is the leading provider of document driven business process automation solutions. For more than 20 years, Kofax has provided award winning solutions that streamline the flow of information throughout an organization by managing the capture, transformation and exchange of business critical information arising in paper, fax and electronic formats in a more accurate, timely and cost effective manner. These solutions provide a rapid return on investment to thousands of customers in financial services, government, business process outsourcing, healthcare, supply chain and other markets. Kofax delivers these solutions through its own sales and service organizations, and a global network of more than 700 authorized partners in more than 60 countries throughout the Americas, EMEA and Asia Pacific.

For more information, visit www.kofax.com.