Kofax Transformation Projects

Best Practices Guide

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Version 1.0 / May 2014

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Who Should Read This Book?

This book was written for sales engineers and implementation consultants at Kofax and its business partners. It will help them understand their customer, identify requirements and design and deliver great solutions based on Kofax Transformation Modules (KTM). The design principles offered in this book will help deliver a superior user experience when validating documents and yield savings in time, money and effort.

Cautions and Disclaimers

This book is called a Best Practices Guide**.** A best practice is a method or a technique that has consistently shown superior results over other possible approaches. The suggestions and guidelines contained in this document should help you build a better KTM project but the nature of this technology means there are many other design options that are not detailed here. Readers are encouraged to explore all of the choices available to them when working on such projects.

In making this book available, neither Kofax nor the individuals who participated in its creation make any representation regarding its content and the value of the guidance offered. Each user of this document is solely responsible for the information contained within it and assumes all risks in connection with its use.

Version History

Version 1.0, April 24, 2014. Launch Version

Introduction

Many market-watchers are saying that we have now entered the age of the customer. Prior to this transition all of the power was in the hands of the seller. Recent technological advancements like the internet, mobile and social media have dramatically changed landscape. Consumers are now much more empowered and are able to make informed decisions on what they buy, when and from whom. Many companies find these new technologies very disruptive regarding their traditional way of doing business, and see themselves confronted with tough competition, fierce price pressure and an eroding customer base. Market leaders have understood that they need to offer more communication channels to their customers, improve their communication (both speed and relevance) and make business processes more transparent – in other words, improve their customer service and interaction.

You may ask: “Ok, but what has this to do with Kofax transformation projects?”. The response is “quite a lot”. The true mission of Kofax transformation is not related to bits and bytes, but to help improve communication, relieve employees from boring repetitive tasks and make them more productive, resulting in an improved customer experience. However, to unleash the real power of KTM, it is important to not only look at technical aspects, but follow an implementation methodology that focuses on productivity gains and happy users.

This book is:

- a best practices guide for conducting customer workshops and using Kofax Transformation Project Builder.
- a compilation of content you need to be familiar with before building a KT project – any advanced and optional content is in the Appendices.
- a living document that you can contribute to. Email changes or suggestions to field.enablement@kofax.com.

- the result of materials produced in numerous KTM workshops conducted in North and South America, Australia, Asia, and Europe throughout 2013 with nearly 200 participants from Kofax and Partners presales and professional services.

This book is not:

- a substitute for Kofax Transformation product training – it assumes you understand what locators, fields, classes, formatters, and validation rules are.
- a substitute for the KTM Wiki, which contains code snippets and techniques http://knowledgebase.kofax.com/faqsearch/results.aspx?QAID=17911
- a guide for installing and configuring Kofax Transformation Modules and Kofax Search and Matching Server. It does not refer to Kofax Capture or KCNS.

The content of this book applies to all four Kofax Transformation Products, despite the use of the term "KTM" throughout.

- Kofax Transformation Modules 5.5 and 6.x
- Kofax Transformation Toolkit
- Kofax Total Agility 7.x
- Kofax RealTime Transformation Interface (RTTI), which hosts a KT project in a webservice.

Highlights

1. KTM projects are about improving human productivity, not automating tasks.
2. Analyze your customers' corporate vision, organizational goals, and departmental needs and pains before anything else.
3. Conduct a Customer Walkthrough, following the paper, looking for "process crimes" to completely understand the context of your project.
4. Run a Document Analysis Workshop with your customers to teach them how to "do KTM" with pen and paper.
5. Your customers do their own Data Collection to build a Representative Document Set and an Excel Sheet of field values.
6. Run a Field Analysis Workshop to agree on all document classes, fields, processes and data across the organization.
7. Write your Statement of work based on the representative documents and field data collected and human performance metrics.
8. Build your project's classes, fields, user Interface, formatters and validation rules in Project Builder focusing on human productivity.
9. Build, test, and tune locators on benchmark sets, not on individual documents.
10. Teach your project with lots of examples and databases. Don't program it with rules.
11. Install a high performance project at your customer on Day One and expect great results.

Principles of Success in KTM

You want to have a successful KTM project with happy users, who love your solution because it helps them do their daily jobs. If your users can come to work in the morning, turn on their computers, see the Kofax Splash Screen and smile, then you have been successful.

A true story. A user had 24 clerks manually processing 800 invoices per day - each. They bought a KTM solution which was technically well planned, benchmarked, and built over three to four months. The clerks were now processing 1200 invoices per day and unhappy with only 50% improvement. After two weeks of further effort focusing on the user experience, the clerks were processing 2500 invoices per day each – an additional 100% improvement. Focusing on human productivity in KTM was ten times more effective than focusing on accuracy in KTM.

Stage	Productivity	Improvement	KTM Project Effort
Manual data entry	800	-	-
KTM “Accuracy” solution	1200	50%	3 months
KTM “Productivity” solution	2500	100%	2 weeks

The Goal of every KTM Project is Human Productivity

The goal of every KTM project is to reduce costs of document processing by improving human productivity. The “enemy” or “competition” of a KTM project is people doing work manually.

Productivity in a KTM project is easy to measure.

- **Documents/Persons/Day**
  - This metric is used when the goal is to make people more productive.
  - A person may be able to process 800 documents a day manually, but KTM could enable them to process 2500 per day.
- **Persons/Project**
  - This is used when a team is trying to downsize or reallocate staff. The document processing might require 30 people, and they would like to require only 8-10 people.

Both of these metrics are easily and accurately measurable and convertible into money-saving and hence ROI. You do not even need any technical specifications to calculate such numbers.

$$Payback = \frac{Productivity\ improvement * Wage}{Project\ Cost}$$

If you always focus on the people in your project, you will be able to manage expectations better and it will be easier to sell. You will have more acceptance criteria that you can fulfill, and you’ll have better good will.

The Goal of a KTM project is Not Accuracy

KTM projects that focus on accuracy have more problems and a higher risk of failure and user dissatisfaction.

1. Accuracy does not solve the problem of the user.

There are many reasons why accuracy is a poor goal of a KTM project. It masks the real problem - users do not have an accuracy or speed problem. These can be fixed by adding more people to the team. Users have a people and money problem.

If you identify the real problem that needs to be solved, you can build a better KTM project that meets the real need of the user.

A customer may say, “We need to OCR documents,” when they actually mean, “We need to get accurate and timely data from our documents into our system of record.” Their problem is about accuracy and time, but the conversation is about OCR, which they think is their solution.

To find what is really needed, find out what is behind the customer’s technology request. If you focus on accuracy, you will focus on technology and not on people.

2. Accuracy metrics cannot be converted into ROI.

There are many accuracy metrics – most are not helpful, and none convert into ROI. Here are some common accuracy metrics:

- Character accuracy
- Field accuracy
- Straight-through processing rate (document accuracy)
- Classification accuracy

None of these metrics can help you determine the human cost of the remaining documents, because you will always have to guess the human cost of correcting the errors.

Accuracy metrics don’t consider the difference between False Negatives, True Negatives and False Positives True/False Positives/Negatives.

3. Everyone will be focusing on the wrong goals.

Accuracy metrics often come with arbitrary targets – and great effort is directed at improving these scores rather than making people productive. If the Statement of Work says 80% field accuracy and you have 76.5% field accuracy, should you be expending effort for that last 3.5%? Probably not. The effort to remove the last 3.5% probably produces diminishing returns, while effort spent in productivity gives far greater gains.

You will see later that accuracy is only priority #4 in a KTM project. Your users, however, often have strong accuracy expectations. The next section will prepare you to counter these arguments, and also educate your customers on valuable priorities and metrics that will benefit them in their KTM Solution

4. Kofax builds Smart Process Applications

In today’s world, it’s not IT departments – it’s business units that focus on customer value - that drive software solutions. Our metrics need to focus on this as well. Productivity, user experience, and transparency are more important than metrics that are easy for IT to set and measure.

Focus on Kofax Core Business – helping people communicate

Kofax is in the business of helping companies communicate with each other and their customers, regardless of the medium of communication (it could be paper, phone, fax, SMS, mobile app, email, social media….). KTM doesn’t care about the medium, and neither should you.

KTM’s job is to understand data and make it actionable

A Customer, Fred, is sending a message to a company. KTM’s job is to:

- Read the message
- Understand the message
- Interpret/translate the message into the language of Person B so that they can act upon it.
    - *Fred says “I am Fred Smith”.* company *needs to hear “Customer=45693”*
    - *Fred says “29th October 2010” and* company *needs “Date=20101029”*
    - *Fred says “I am disappointed…” and* company *hears “Complaint=true”*
- “Fred Smith” is not actionable data. There may be one or more Fred Smiths or even “Frederick Smiths.” The customer number 45693 is actionable – and this is KTM’s job – make people’s work easier and help them find what they need to know to do a job.

Your job with KTM is to make it easier for Person B to understand and act on Person A’s information. Don’t think about your job as locators, databases, formatters or OCR – think of it always about decrypting and transforming a message.

KTM is not like any software you know.

Most software is deterministic – certain input produces certain output 100% of the time. SQL, Web, JavaScript, DMS, ERP are all examples of deterministic software.

KTM is non-deterministic software - you cannot be 100% sure which results will be produced.

Probabilistic learning software is critical to the success of software used in speech recognition, machine translation, robotics, genetics, astronomy, weather, earthquakes and many other areas. It is increasingly being used in business software – “Big Data,” “Business Analytics”.

In later chapters we will look at how to build your KTM project non-deterministically.

Definition of Deterministic and Probabilistic Software

Deterministic Software	Learning Software
Definition. Software that produces predictable results using rules and logic.	**Definition**. Software that produces probabilistic results using training data.
SQL, HTML, javascript, DMS, ERP, Yahoo. Most software until 2010	OCR, Speech Recognition, Diagnostic Systems, VRS, KTM, Google Search/Translate/Car, Analytics, Big Data, Genetics, AI, Neural Networks. Software after 2010.
Logical, predictable, “easy” to fix bugs, programmable, rigid, “slow”	Learning, big-data, knowledgeable, statistical, probabilistic, flexible, “fast”
Many rules	Few or no rules
Tends to be **complicated**	Tends to be **complex**, and can allow **emergence** (http://en.wikipedia.org/wiki/Complexity#Study_of_complexity)
Programmable with rules. *convert human behavior to a set of rigid rules*	Trainable with data, lots of data. *mimic human behavior.*
High development effort.	Low development effort.
You studied this at university before 2010	You studied this at university after 2010
Handles clean input well.	Handles messy input well (such as OCR, written language) Always performs better than deterministic software on messy data.
Developers need to improve it. Cannot learn.	Can improve itself with user feedback.
Cannot cover all scenarios. Will eventually fail. **Gödel’s Incompleteness Theorem** *“A rules-based system cannot demonstrate its own consistency”*	Not trying to be perfect. Trying to be useful. Like a human.
Focus on perfection, no compromise.	Focus on productivity and compromise. *Google Search is not a failure if what you are looking for is*

	occasionally on page two of the search results
Acceptance criteria are based on perfect technical performance	Acceptance criteria are based on usefulness and productivity

Software for language translation, speech recognition, Search, Natural Language Processing progressively abandoned deterministic approaches in the 1980s and 1990s for training data-based approach.

The advantages for you with your KTM project

- You don't need to spend time configuring lots of rules and locators in KTM.
- Your users can be more involved in building your project – you can share the burden.
- If you use the learning systems and data from your users, you can build high quality, accurate, transparent, fast and manageable projects.

The following sections will teach you how to use probabilistic techniques for project success.

Business Analysis

Here we will go through the six steps required to completely understand a customer's requirements and collect everything you need to build a KTM project.

1. **Customer Research Qualification** – understand your customer completely.
2. **Customer Walkthrough** – meet the people, understand their processes, and analyze the "crime scene" of their workplace.
3. **Document Analysis** – help your customers understand their documents completely.
4. **Representative Document Collection –** your customer provides all documents needed for the project.
5. **Data Collection** – your customer collects all of the data needed for the project, mostly from databases.
6. **Field Analysis** – understand together with your customer what the KTM project should do.

Before every KTM project, you should have thoroughly completed these steps before starting to build the project. That means you have effectively "completed" the proof of concept using paper and Microsoft Excel before you actually start to build the real Proof of Concept in Project Builder.

If you follow these three steps you will have a project that fits your customers' requirements, your customer will be happy and engaged in the KTM solution, and you will have a straightforward implementation with excellent productivity from Day One.

Customer Qualification[1]

This chart is a summary of more than 100 KTM projects throughout the world in 2013. Use it to discover the vision, goals, needs, and pains of your customer. It also helps you to understand your customer, prioritize project goals, and communicate to different stakeholders in your project.

[1] The foundation and the approach to customers of this section were inspired by a "Competitive Communications" Workshop conducted by Ralf Greis from St. Gallen Institute. http://www.stgallen-institute.ch/partner/ralf-greis/

Do this research before you visit the customer and take it with you to lead your conversation with the customer. Use this table as a checklist of topics to talk about with your customer to uncover needs and pains you might have missed.

Corporate Level	Focus	Explanation and checklist.
Executive	**Vision**	*why the company exists, purpose, mission*
	Simplify, best in field, best services, innovate What is the corporate vision on the website?	
Operations	**Goals**	*what the company is trying to achieve*
	Improving speed, quality, service, growth, efficiency, market position, trust “Automate”, transparency, customer satisfaction, prioritize Save money, create value	
Department	**Needs**	*what they need to do in order to achieve a goal*
	Comply, digitize, migrate, simplify, integrate, secure, retrieve, track, streamline, achieve “touchless”, measure Keep employees happy and content, failure is not an option	
Department	**Pains**	*prevents them from reaching a goal*
	Slow, not transparent, lost, wrong, complaints, increasing costs, complex, wasteful, no resources Ask the discovery question, “What happens if we do nothing at all?”	
Product	**Features**	*What can the software do*
	Confidence, Fields, OCR, Scanning, VRS, Databases,	

Knowledge of the customer’s needs and pains is critical to the success of your project, and not just for the sales team. Every person configuring, coding, and working on a KTM project needs to consider the needs of the customer at all times to guide communication and good decision-making.

Goals are *always* business-oriented and have nothing to do with technology. Here are some possible goals:

- Double the productivity of the finance organization within one year to support the expansion of our business.
- Consolidate all processes and tools across all acquired companies within two years to unify the company, save money, and to increase efficiency, reporting, and transparency.

These are not goals (they are either needs or product features):

- Automate processes.
- Achieve 85% OCR accuracy on scanned documents. *There is a false belief here that this will produce certain productivity targets.*
- Scan all incoming documents.

- Avoid losing documents

A need leads to a goal. A pain prevents a goal.

Always ask the pain discovery question:

"What happens if we do nothing at all?" These are needs:

- Digitize document processing to reduce archive costs, and speed up processing across many locations.
- Process documents faster so we can gain early payment discounts.

These are pains:

- 20% of documents are lost or take more than five hours to find after one year.
- Many customers call us complaining about how slow we are.
- 15% of receipts we pay are for the wrong amount, and we are, on average, 23 days late in payment.

Create a vision/goal/needs/pain chart for your customer. With your customer, prioritize their goals, needs, and pains. Send the chart to your customer for written confirmation that everyone understands the customer scenario.

You can now use this chart to communicate better about your project. You should not talk with corporate executives about product features or departmental pains directly, but start at their vision language and level, and diving down to the operation goals level to communicate. Communicate to each level at their level, referring either to one level up or down, and occasionally going to further levels. If you do this well, it will help you communicate the value of your KTM project more effectively.

This chart will also help you focus on creating a KTM project that exactly matches what your customer needs.

Some Examples

A government department	
Executive Vision	Be a model state agency, delivering exceptional customer service and promoting effective and efficient business processes, professional employees, innovative technology and strategic partnerships
Operational Goals	Administer the State's licensing and titling laws: • maintain strict controls to deliver secure and valid identification, licenses, property records • accurately account for the receipt and timely distribution of all revenue collected • provide the best customer service to serve our citizens
Departmental Needs	• Reduce the time of the front counter experience for customers • Improve customer service response time • Implement and administer Legislative mandates for Records Retention policies • Provide platform for long-term scalable and sustainable growth
Departmental Pains	Slow, not transparent, lost, wrong, complaints, increasing costs, complex, wasteful, no resources

Land Registry Office	
Executive Vision	To make property transactions secure, integrated, accessible, and easier for all. To become an efficiently operated and successful institution that guarantees geo-referenced real property related rights for facilitating secure property transactions and providing an infrastructure and services for economic, environmental, and social purposes.
Operations Goals	Create a profitable value-added service by selling data for research, analysis and statistics.
Department Needs	Turn existing paper document archives into valuable, structured data.
Department Pains	Not able to use available funding. Not able to deliver.

Customer Walkthrough

Perform a customer walkthrough early in the sales cycle. Walk around the department at your customer's facility, observing exactly what happens with their documents and processes. Interview people about what they are doing and why they are doing it. Take photos if possible. Act like a detective on a crime scene looking for clues and evidence of document and process crimes. This walkthrough will help you understand where the customer's needs are. You will also gain new ideas and experience that will help you with other projects.

This also helps you and your customer focus on the people and their processes rather than on the technology.

Document Analysis

In this step, you will analyze the documents and their processes with your customer.

A customer may provide you with 5-10 samples (perhaps photocopies) and a list of required fields and expect you to build a solution. This is **not** enough to build a project.

Here are some key points for document analysis.

- Your customers knows their own documents. Make sure you interact with document experts and not IT project managers, who do not know the documents intimately.

- It is not your job to become a document expert. Your job is to transfer human knowledge about these documents to your KTM project. Your KTM project needs to mimic the humans, and the best way to do that is to learn lots of examples, not to build a rules engine.

- It is not your mission to build a magic black box that performs the people's jobs better than they do, but to build a system that makes the people far more productive.

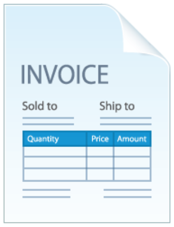
Document Analysis Workshop

Hold a meeting with your customer for three to five hours. Make sure that all the relevant business personnel are there. The customer representatives should bring many photocopied samples of each document class. You will need lots of colored highlighter pens.

Teach your customer what classification, separation, and extraction are by using piles of paper and colored pens. Ask your customer to classify and separate documents and extract data. Ask them to explain how they made their choices. Do this for tens or hundreds of pieces of paper, until you all agree that everyone understands how the whole process will work for all of their documents.

If two people “extract” the same document differently, then your customer still does not know what data needs to be extracted.

It is important that the customer understand exactly what KTM does – nothing magical, but exactly what they have just done with pen and paper. Here is a picture of what KTM does – exactly what people do:



→

Field	Value
CLASS	**Invoice**
Invoice Number	**345098**
Invoice Date	**04.05.2013**
VendorID	**56908**

While the customer is building this Excel sheet, they are also collecting together all their internal domain knowledge, data sources, and representative documents.

Representative Document Collection

Your customer needs to provide you a collection of representative documents for the project.

“Representative documents” are good examples of the documents that the business sees from day to day.

- Exactly the same as the documents in the production system (size, kind, quality) 300 dpi TIFF group4 images, scanned with VRS, no marks or stamps[2].
- You need at least a few days’ worth of documents. If your project is expected to process 20,000 documents per day, then you can expect your customer to provide you with 60,000 representative documents.
- Exactly the types of documents that are processed daily – a representative mix of good and bad/easy and difficult/readable and unreadable/printed/dot-matrix/handwritten/faxes/emails/common and rare and strange.
  - If, for example, there are special invoices with two tax rates or special discounts, they need to be in the representative set.
- The documents need to represent all processes and document classes that will be in the production system.
- These documents will define the entire scope and acceptance requirements of the project.
- Representative documents remove unwanted surprises.

[2] See Appendix 1 for how to use Kofax Express to produce high- quality representative documents.

- Representative documents form the benchmark sets you will use.
- When your customer understands what "representative" means, they will realize that 10-50 examples are simply not enough. Try to get at least 20 documents of each type, preferably 50 or more.
- A customer who says that they cannot provide you with 1000 examples, but expects your solution to produce 1000 per day, is being neither realistic nor cooperative.

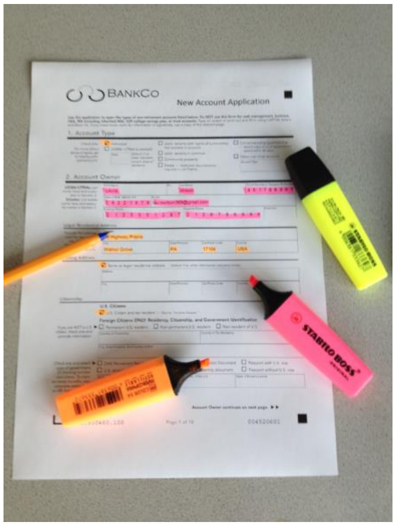
Agree with your customer in writing before project begin that these documents represent the quality, volume, classes, processes, and variety that will be in the production environment and that performance metrics measured on these documents are the acceptance criteria for this project.

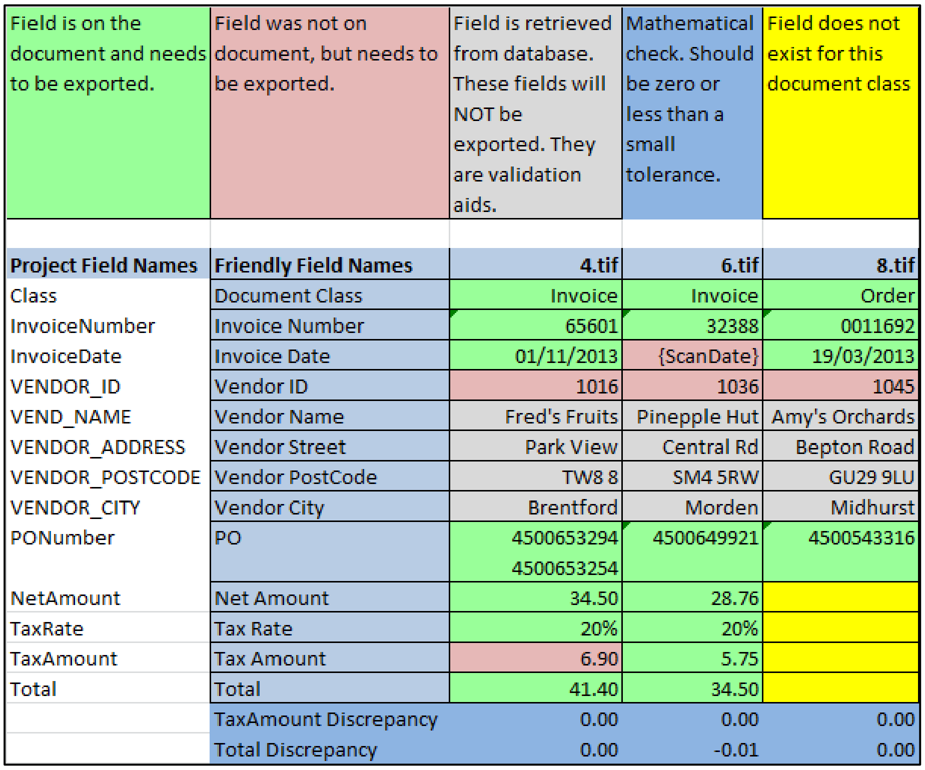
Data Collection

It is now the job of your customer to fill an Excel Sheet with field data from tens of documents. If the customer is unable to fill Excel with well formatted, consistent data from their own documents, they still have not understood the process and are not ready to build a KTM project. When this Excel sheet has been built, you know they have understood, mastered, and solved all of their data entry problems.

Key-Value Pairs entered into Excel.

Image





Field is on the document and needs to be exported.	Field was not on document, but needs to be exported.	Field is retrieved from database. These fields will NOT be exported. They are validation aids.	Mathematical check. Should be zero or less than a small tolerance.	Field does not exist for this document class
Project Field Names	**Friendly Field Names**	**4.tif**	**6.tif**	**8.tif**
Class	Document Class	Invoice	Invoice	Order
InvoiceNumber	Invoice Number	65601	32388	0011692
InvoiceDate	Invoice Date	01/11/2013	{ScanDate}	19/03/2013
VENDOR_ID	Vendor ID	1016	1036	1045
VEND_NAME	Vendor Name	Fred's Fruits	Pineppple Hut	Amy's Orchards
VENDOR_ADDRESS	Vendor Street	Park View	Central Rd	Bepton Road
VENDOR_POSTCODE	Vendor PostCode	TW8 8	SM4 5RW	GU29 9LU
VENDOR_CITY	Vendor City	Brentford	Morden	Midhurst
PONumber	PO	4500653294 4500653254	4500649921	4500543316
NetAmount	Net Amount	34.50	28.76	
TaxRate	Tax Rate	20%	20%	
TaxAmount	Tax Amount	6.90	5.75	
Total	Total	41.40	34.50	
	TaxAmount Discrepancy	0.00	0.00	0.00
	Total Discrepancy	0.00	-0.01	0.00

Note the following

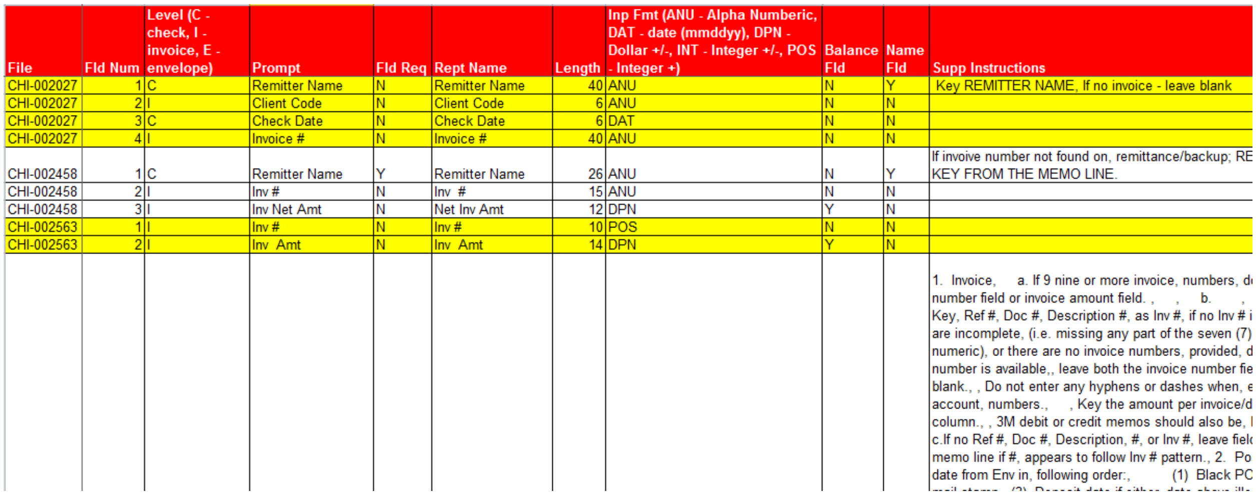
- Numeric and percentage fields are well formatted.
- PO Number is a table field (Use Alt-Enter to enter multiple rows in an Excel cell)
- Dates are formatted with dd/mm/yyyy, and not d/m/yyyy
- Vendor 1036 has no invoice date on the document, so the ScanDate should be used instead.
- 6.tif has a rounding error of 0.01 £ in the total.

Key Value Pairs

Many customers will expect that it is enough to provide you with a list of document classes and required fields. Often a lot of effort has gone into the document – people have made an effort to write down rules about fields – but it generally is lacking. It is much better to obtain lots of real documents and analyze real field data.

There are usually complex descriptions of what field formats and validation should be right. This data is rarely completely reliable.

This data is deterministic data, and is not very useful in your non-deterministic project.



File	Fld Num	Level (C - check, I - invoice, E - envelope)	Prompt	Fld Req	Rept Name	Length	Inp Fmt (ANU - Alpha Numberic, DAT - date (mmddyy), DPN - Dollar +/-, INT - Integer +/-, POS - Integer +)	Balance Fld	Name Fld	Supp Instructions
CHI-002027	1	C	Remitter Name	N	Remitter Name	40	ANU	N	Y	Key REMITTER NAME, If no invoice - leave blank
CHI-002027	2	I	Client Code	N	Client Code	6	ANU	N	N	
CHI-002027	3	C	Check Date	N	Check Date	6	DAT	N	N	
CHI-002027	4	I	Invoice #	N	Invoice #	40	ANU	N	N	
CHI-002458	1	C	Remitter Name	Y	Remitter Name	26	ANU	N	Y	If invoive number not found on, remittance/backup; RE KEY FROM THE MEMO LINE.
CHI-002458	2	I	Inv #	N	Inv #	15	ANU	N	N	
CHI-002458	3	I	Inv Net Amt	N	Net Inv Amt	12	DPN	Y	N	
CHI-002563	1	I	Inv #	N	Inv #	10	POS	N	N	
CHI-002563	2	I	Inv Amt	N	Inv Amt	14	DPN	Y	N	
										1. Invoice, a. If 9 nine or more invoice, numbers, d number field or invoice amount field. , , b. , Key, Ref #, Doc #, Description #, as Inv #, if no Inv # i are incomplete, (i.e. missing any part of the seven (7) numeric), or there are no invoice numbers, provided, d number is available,, leave both the invoice number fie blank., , Do not enter any hyphens or dashes when, e account, numbers., , Key the amount per invoice/d column., , 3M debit or credit memos should also be, c.If no Ref #, Doc #, Description, #, or Inv #, leave fiel memo line if #, appears to follow Inv # pattern., 2. Po date from Env in, following order:, (1) Black PC

You need to take further steps after receiving such a document.

Field Analysis Workshop

The Field Analysis Workshop is an important meeting that defines the entire scope and expectations of the KTM project.

If this meeting goes well, a simple invoice project could even go live after two weeks of effort, with a happy customer.

Goals of the Field Analysis Workshop

- The customer completely understands the solution and its consequences internally
- The representative set of documents covers all customer requirements
- Number of fields that KTM extracts are minimized
- Databases provided to KTM from the business systems are maximized
- The project reduces effort for the maximum number of people, not just scan and validation operators, but process operators as well.
- The class hierarchy becomes clear and simple. You know which classes to define fields at, and they are inherited into their subclasses.

People you should invite to the Field Analysis Workshop

- Business Unit Managers of all processes that include and follow KTM
- Future Validation Operators

- IT Project Manager
- Document Management Manager
- Scanning Team
- Backend System Manager
- Process/workflow Manager

This meeting is often the first time that all of these people have sat down together to discuss this project as a team. Expect the meeting to be loud and emotional. Often people think you are just delivering a piece of software, but in this meeting they realize you are changing how they work every day… and it is important that they reach consensus and own the solution.

Your KTM project will not only reduce effort for the document team, but it should also reduce effort for many other people in the organization. Unfortunately, some KTM solutions are simple data-entry solutions and have failed to realize the potential to reduce effort across the organization.

Which fields should KTM deliver?

Often your customer has told you “We need these 23 fields from these 50 documents”, however the “23 fields” are simply what the Database Administrator has exported from the database definition – they are not really the fields needed to drive all of the business processes.

Your goal should be to deliver the fewest possible fields to drive all following processes.

Ask the following questions for every field.

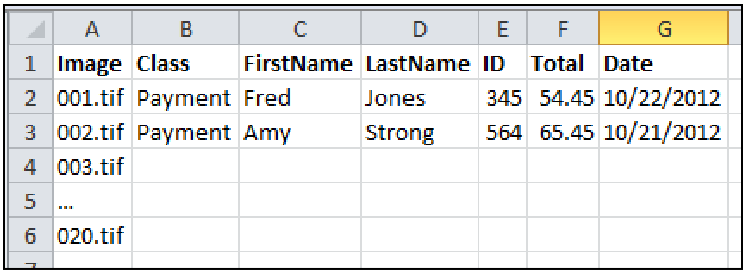
- Why do you need this field? What processes does it drive? Who needs to use it?
- What would happen if you didn’t have it?
- Can the field be found in a database or record elsewhere?

It is always better in KTM to know the field value and search for it on the document, rather than trying to find an unknown.

Ask your customer to explain, for every field, why it is needed.

- Agree on the value and goal of every field in every document class
- Ensure that the output of KTM is sufficient to drive all following processes.
- Ensure that the KTM project is minimizing effort by all people in following processes.

In the example below the Customer wants FirstName, LastName and ID. You should argue that KTM delivers the field ID and not FirstName or LastName. The field FirstName is not usable for driving a process. Is the customer’s name Fred or Frederik or Freddy or Frederika? Only ID=345 is useful. You should be arguing that the customer gives you the customer database so that you can look for the fields. You should agree with your customer that FirstName and LastName will not be delivered by your solution.



	A	B	C	D	E	F	G
1	Image	Class	FirstName	LastName	ID	Total	Date
2	001.tif	Payment	Fred	Jones	345	54.45	10/22/2012
3	002.tif	Payment	Amy	Strong	564	65.45	10/21/2012
4	003.tif						
5	...						
6	020.tif						

Validation Fields

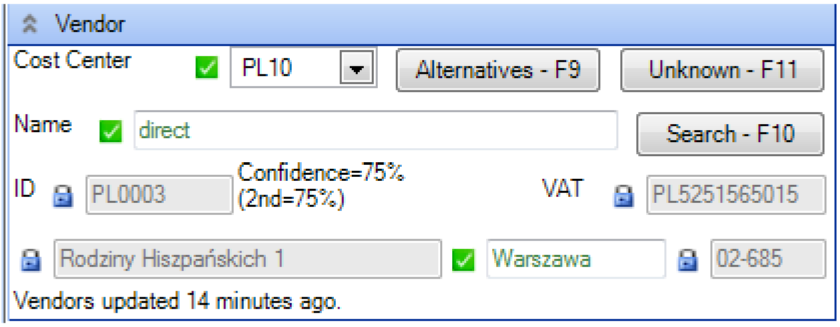
Some fields that you want to have in KTM may not be of interest to the customer.

Many invoice customers only want “Total” and “Tax” found on invoices, while KTM needs to find “Net0”, “Net1”, “Rate1”, “Amount1” and “Total” as well - to be able to check the mathematics and also to train the fields. Without these extra fields, KTM cannot possibly validate the required fields.

The Customer only needs the VendorID from KTM and no other Vendor fields, but they are important to the KTM project for the database locator, and also for the field viewers so that the user can easily validate the vendor.

Validation Fields are useful for

- Locators that need extra fields to locate, validate and learn (Database Locator and Amount Group Locator)
- Providing extra fields, fieldviewers and labels in the Validation Module to help the user make choices fast.



Vendor

Cost Center ☑ PL10

Name ☑ direct

ID PL0003 Confidence=75% (2nd=75%) VAT PL5251565015

Rodziny Hiszpańskich 1 ☑ Warszawa 02-685

Vendors updated 14 minutes ago.

Agreeing on your Data

In this meeting it is important that you have agreed with your customer completely on these items:

- Representative Data Set for all fields, classes, exceptions, and processes that this solution is supposed to help.
- Which fields are exported from KTM.
- Validation fields that are used internally by KTM.
- All Databases are available for building the project.

If this meeting is successful, your customer will have much more confidence in your ability to deliver, and your implementation process will be smooth.

This meeting should be heated and passionate. You want to remove as many fields as possible from the project. Every field needs arguing on its own merit. Someone will insist FirstName is important – you need to convince them that it is not, and that you need the customer database connection. Here is also where you define and agree with the database admins exactly which databases, and columns are available.

Writing your Statement of Work

At this point you can offer:

- We will build a KTM project that will improve the productivity of operators in processing the documents that are in the representative test set by helping them to produce precisely the output that is in the Excel sheet.
- This project will be objectively measured on documents/person/hour.
- Metrics like field accuracy and character accuracy will not be used, because they do not contribute directly to improved productivity and can lead to wasted development effort.
- This project will be built, tested, and measured on the representative Test Data set that has been agreed upon.
- In the production system, you can have the reasonable expectation that every document similar to the Test Data is machine readable and trainable, and should not require human interaction.
- Any documents in production or user acceptance testing that are not like the Test Data, are out of scope and not part of this statement of work.
- During the development process, we will provide, at regular intervals, benchmarks on test sets to provide objective and meaningful data about the performance of the project. These benchmarks will be used to prioritize development and configuration tasks, improve communication and understanding, prevent regression of quality, but not used to set arbitrary goals, which may or may not be attainable.

When the customer has signed this, you are now ready to sit down in front of Project builder and start!

Metrics

A customer naturally wants to test and measure Kofax solutions. Unfortunately, they often apply criteria that are not appropriate and can lead to false security and misleading results. It can even force Kofax to cripple the solution to win a scoring test, rather than demonstrate a solution with the best return on investment.

Good metrics give excellent insight into the human effort required. Unfortunately some metrics do not do that. **Accuracy** Metrics are popular with customers (especially technical people), but they are generally counterproductive. **Performance** Metrics are easier to measure and calculate ROIs with. Performance Metrics focus on the problems the people have, while Accuracy Metrics focus on a perceived technical solution.

Accuracy Metrics

1. Character Level Confidence

Here a customer asks how many OCR characters are above a particular confidence level. This measure is not helpful because various OCR engines score themselves differently. You also receive no information about whether the characters were right or not, or whether confident characters were right. Character level confidence also has a low-level focus on the input data as it appears on the document. This is not always the data you want to export and may or not even be process-relevant.

2. Character Level Accuracy

This metric is usually found in data entry solutions where keystrokes per hour are measured. This is also a poor metric because there are different costs to different types of fields. A date field with an OCR error is usually detected when the date is invalid, or is far in the future or past. An amount field with OCR errors is detected because A+B<>C, and in some of these cases numerical values can be automatically repaired. An error in an address, VAT code, or city name is of no consequence for vendor detection. But an OCR error in an invoice number is very serious indeed.

A character level accuracy of 94% gives us no information about the human effort required to correct the other 6% of errors. KTM can correct or ignore many character-level errors by the use of dictionaries, databases, and formatting rules.

3. Field Level Accuracy

This measure is an improvement over character level accuracy, because invoice number accuracy can be considered more significant than address accuracy. But here we still have the problem of how much effort is required to fix the errors. We have no insight into how many errors are in a field – often it is one character, sometimes two, and perhaps (rarely) three. We have even less insight into the effort required to correct such fields. As we will see later, correct or incorrect doesn’t tell us the full story or what the dangers are – see just below about false positives.

4. Precision/Recall

This is a metric from pattern recognition and information retrieval, http://en.wikipedia.org/wiki/Precision_and_recall . It suffers the same failings as field level accuracy, because it does not tell us enough about the problems and how much effort is required to fix them. It also does not put a high significance on some types of errors – it simply ignores them.

If precision<100 then documents entered the backend system with incorrect data – a catastrophe.

If recall<100%, someone needs to validate more documents by pressing Enter. This is not a catastrophe, just extra work. This metric gives us no insight into how much data entry (true negatives) the user has to do.

The biggest weakness of precision/recall for KTM is that for most projects each and every document is very important for the business, and a precision less than 100% is a business catastrophe. For statistical projects in which only aggregate data, not each document, is important – and perhaps document validation is not even required – this metric can be useful.

5. True/False Positives/Negatives

This is the best accuracy metric for KTM because it gives deep insight into the user experience, is easy to understand and visualize and is relevant for any method of field extraction.

These metrics can be used to make objective decisions to improve the quality and performance of a KTM project:

Field Type	KTM Status	Consequence for User	Possible Causes
True Positive	Correct and valid	Field is correct and the user can ignore it. Every customer wants 100% true positives.	• good KTM Project
False Negative	Correct and invalid	False alarm. The user must press Enter. If this happens too often, the user is frustrated and can cause false positives due to lack of attention.	• low confidence threshold • doc similar to others but needs training • locators producing too many alternatives • incorrect confidence from script locator
True Negative	Incorrect and invalid	User has to correct the field or type data into an empty field. Data entry fields are true negatives.	• Unknown document • OCR Errors • Poor quality vendor database • Data is not on the document
False Positive	Incorrect and valid	Incorrect data leaves KTM Disastrous, user loses trust in KTM, productivity loss, user rejects KTM.	• Badly trained documents • Field confidence thresholds too high • Poor locator strategy • Bad validation rules

Performance Metrics

These are the best metric for testing the performance of KTM validation operators.

6. People per Project

This is the easiest metric to measure a project and the most powerful, because it focuses in the real problem – people's effort and their costs. For example an invoice processing solution might have three people preparing documents, two people scanning, 18 people doing data entry into SAP, and one supervisor. That is 24 people.

If the company has the goal of reducing the FTE (full time employee) count on this project, the problem can be described as 24 FTE and the solution is possibly 12 or even 6.

7. This number is easily convertible to ROI.Documents per Person per Hour

In the previous example, if the 24 people together process 20,000 documents per day, their performance is 833 documents/person/day or 111 documents/person/hour, given 7.5 work hours per day. This metric is useful if the goal is to double or triple the productivity of the users.

The Priorities of a Transformation Project

With an understanding that the most important metrics for a KTM project are **people/project** and **documents/person/hour** and the **true/false positive/negative metric**, we can now list the priorities of any Transformation project.

1. Improve user productivity by improving the user experience.
2. Remove false positives to prevent false data leaving system
3. Reduce false negatives to reduce false alarms for users.
4. Reduce true negatives to reduce keying effort.

Here we see that problems with OCR and accuracy are really fourth priorities. Unfortunately, many KTM projects focus on this low priority, missing the value to be found at the first three priorities.

As you are improving your project, you should start at Step 1, and the go down a step when you have reached diminishing returns at the current step. You will unlikely get each step perfect and will have to compromise somewhere and move to the next level

Benchmarking

Generally there are two kinds of benchmarks – relative and absolute benchmarks

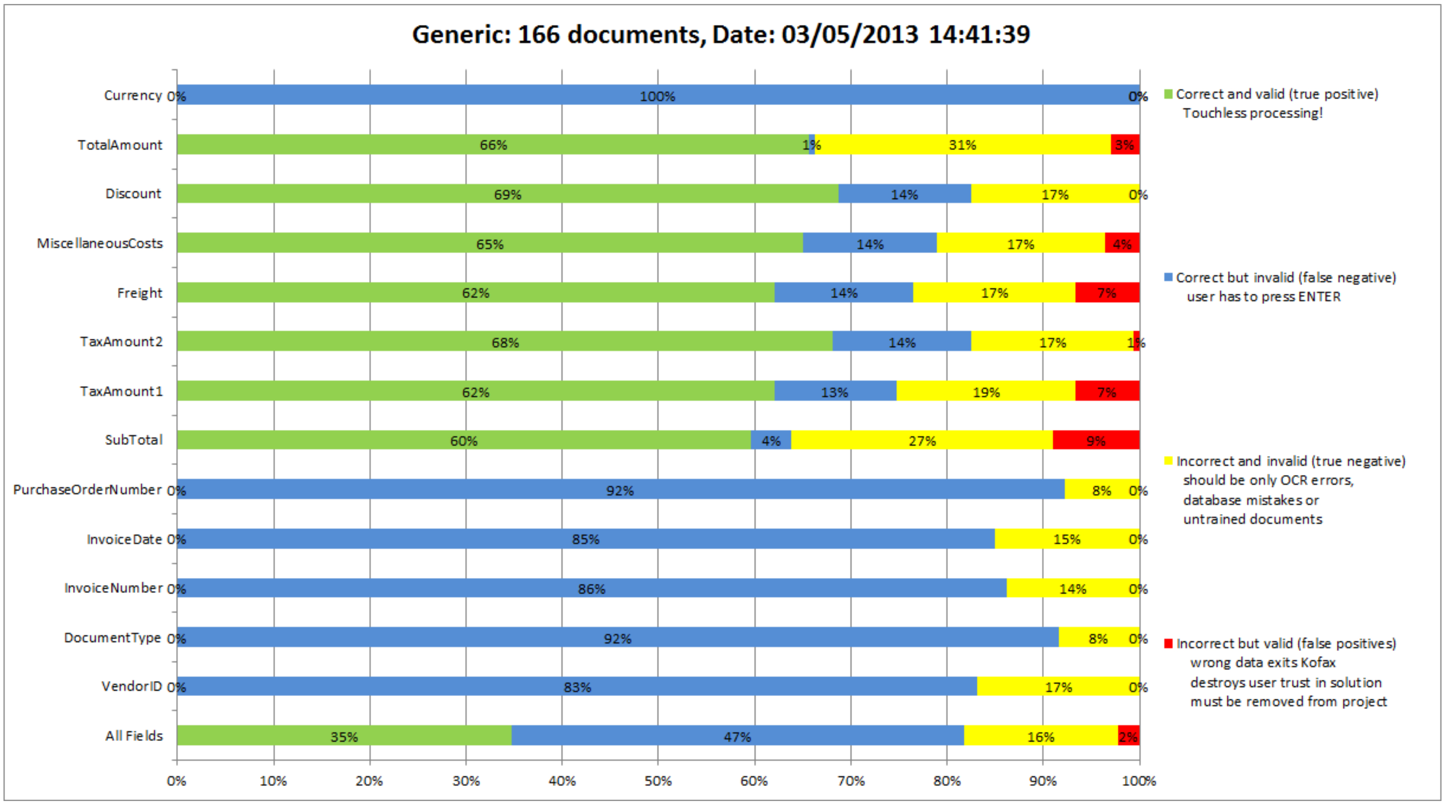
A **relative benchmark** is a score that you give to a system – and as you progress you keep testing yourself to make sure that it never gets worse than your benchmark – in this way you guarantee that your system is always improving and the benchmark is getting better.

Here, in the KTM context, we use an **absolute benchmark**. We know what the truth of the project should be by buildingCreating Golden XDocuments,. and are benchmark is an absolute and score of our system against the perfection of the golden files.

A single benchmark is an objective measure of how good a system is, and we can also reject a new version of a project if the benchmark gets worse.

In KTM we have Extraction Benchmarks, which measure field values, Classification Benchmarks, which measure document classification and also Separation Benchmarks.

Below is an example of a KTM Extraction Benchmark. It shows that the field TotalAmount can be skipped 66% of the time and that the user has to press Enter 1% of the time, they have to correct the TotalAmount 31% of the time, and that 3% of the time they skipped over invalid TotalAmounts.



Value of Benchmarking

- A benchmark helps you focus effort on human productivity, not extraction.
- A benchmark shows you where you or your consultants need to put effort into your project next.
- You focus on all of your data, not on individual documents. This makes your project far more stable and robust.
- A benchmark communicates objectively to everyone the exact status of the project and the value of the work you did yesterday and this morning!
- A benchmark protects you from bugs creeping into your project, and you know the project is always getting better.
- A benchmark helps you find the best field confidence levels.
- You never have to look at “good” documents again. You focus effort always on problems.
- Tuning versus Tweaking

  - Tweaking is changing and testing one document at a time. Many people make a change to a KTM project, test document #1, test doc #2, make a change, test doc #2, test doc #3, make a change, test doc #4 and #3 and #2 and so on. This is a slow process and it means you have to look at your documents over and over again.
  - Tweaking makes a project unstable, creating tension within the settings.
  - Tuning is changing and testing a whole document set at one time. By testing all changes with a larger document set each time, you make decisions that are valid for sets of documents, not individual documents. This makes your projects more robust and probably faster!

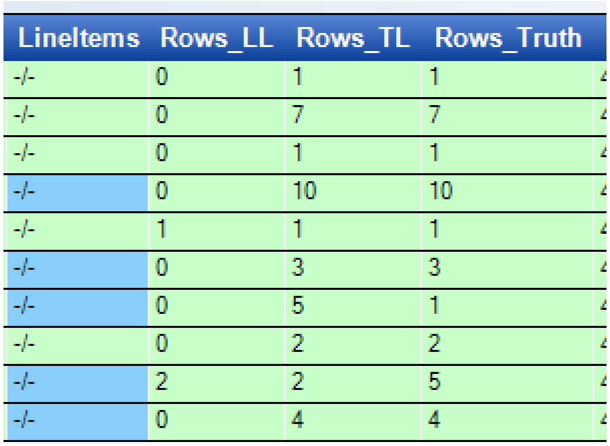
- You become more disciplined and much faster in implementation. Benchmarking is guaranteed to cut weeks off your development time. With KTM 6 you can easily break a larger benchmark set of documents into smaller sets for faster running of extraction benchmarks.
- You can easily test if a new locator, script, checkbox, configuration, or slider is worth changing.
- Your project will have high performance on Day One of Go-Live.
- You have one simple graphical report, with objective numbers, that transparently and simply shows everybody involved the quality of the project.
- You can ensure that a project only improves in quality and never regresses (hence the term Regression Test).
- It helps you reach milestones and acceptance criteria, know when a new version is deliverable, and when your customer will pay you.

Don’t ever do a KTM project without benchmarking.

Benchmarking Table Data

Project Builder doesn’t support Table Date Benchmarking out-of-the box. Below is an example of how you can partially achieve this.

In the picture below you can see the the LineItems cells are empty in the benchmark. The other 3 columns are hidden columns in the project that simply contain the number of table rows in the Line Item Matching Locator and the Table Locator. You can also have a hidden field showing the Table Sum



LineItems	Rows_LL	Rows_TL	Rows_Truth
-/-	0	1	1
-/-	0	7	7
-/-	0	1	1
-/-	0	10	10
-/-	1	1	1
-/-	0	3	3
-/-	0	5	1
-/-	0	2	2
-/-	2	2	5
-/-	0	4	4

```
Private Sub Rows_LL_AfterExtract(ByVal pXDoc As CASCADELib.CscXDocument, ByVal pField As
CASCADELib.CscXDocField)
   pField.Text=CStr(pXDoc.Locators.ItemByName("LL").Alternatives(0).Table.Rows.Count)
End Sub
```

Training Data and Test Data

Training Data is used to build your project and Test Data is used to test your project. You will need at least 100 test samples in a Representative Document Collection to be able to produce meaningful results. Your training data set should be even larger.

KTM 6 Project Builder has features to support training and test sets, including the ability to randomly divide a set of documents into test and training sets.

How many Training Documents should I have?

The correct answer to this question is found at http://en.wikipedia.org/wiki/Margin_of_error#Different_confidence_levels

The simple rule for KTM projects is to use the following “95% confidence” formula.

$$\pm\frac{1}{\sqrt{n}}$$

Example 1.

A customer gives you 2 documents to build a project and tells you that they will test you on 3 unknown documents. You build a perfect KTM project on your two documents. You still have a 71% chance that your project will fail on the unknown documents – you are playing lottery and wasting your time. **Conclusion** – request 50 samples from your customer so your chance of failing drops to 14%

Example 2

You have 8 wrong invoice dates in your benchmark of 50 files (8/50=16%). There is a 95% chance that the invoice date on any other invoice being wrong is anywhere between 32% and 2% (16%±14%). **Conclusion** – your benchmark is too small.

Example 3

$\frac{1}{\sqrt{1000}} = 0.0316 = 3.16\%$. A KTM project with 1,000 benchmark files, that have no false positives, still has a 95% chance of having up to 3.16% false positives in the productive environment. **Conclusion** – perfection is probably not possible.

Test Size	Margin of Error
1	±100%
2	±71%
5	±45%
10	±32%
50	±14%
100	±10%
1,000	±3.2%
10,000	±1.%

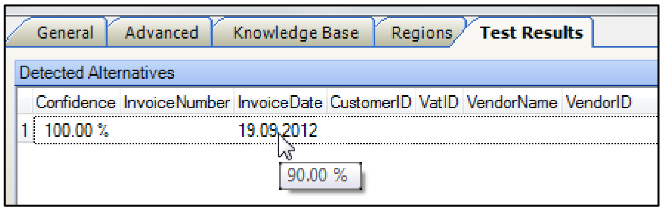
This is why you should always be asking for 10,000 to 20,000 sample documents from your customer. This is completely reasonable when a good KTM project will produce this amount of documents PER DAY.

How to fix mistakes found by a KTM Extraction Benchmark

#1 Remove False Positives

False positives hurt everyone. They need to be corrected first.

- Train documents properly.
  - Hover the mouse over subfields in trainable locators to see the trainable subfield confidence. See Trainer Locator Subfield Confidences for the meanings of these confidences.

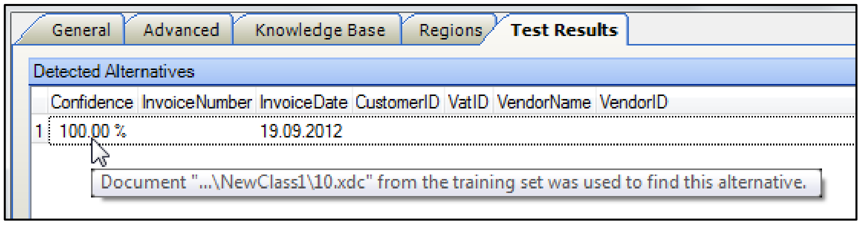


Detected Alternatives

	Confidence	InvoiceNumber	InvoiceDate	CustomerID	VatID	VendorName	VendorID
1	100.00 %		19.09.2012				

90.00 %

  - Hover the mouse over the alternative confidence to find the training documents that caused the error in trainable fields.

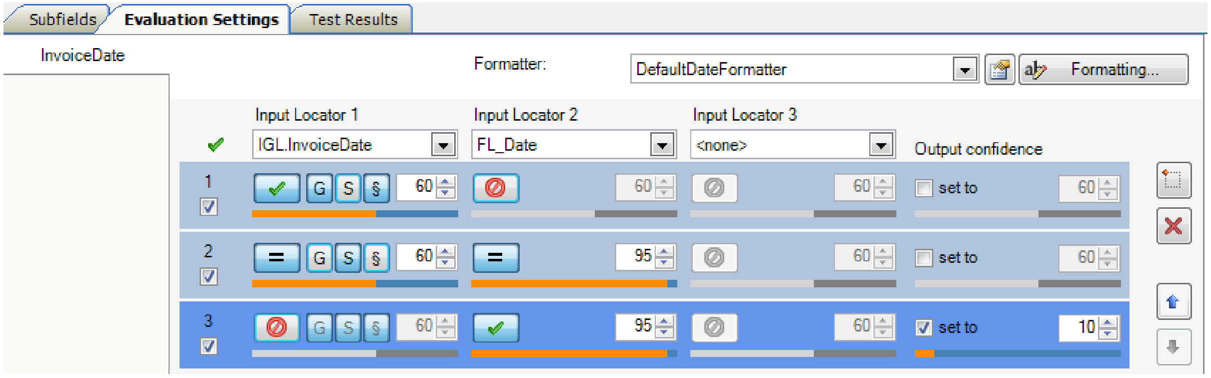


Detected Alternatives

	Confidence	InvoiceNumber	InvoiceDate	CustomerID	VatID	VendorName	VendorID
1	100.00 %		19.09.2012				

Document "...\NewClass1\10.xdc" from the training set was used to find this alternative.

  - Format Locators mostly deliver values with 100% confidence. If these are wrong they will be false positives. Make sure you subjugate format locators to trainable locators in an Invoice Evaluator (requires Invoice Add-On Pack for KTM5.5, otherwise you can also script it. In KTM6 this locator was renamed to Advanced Evaluator and is license-free).)

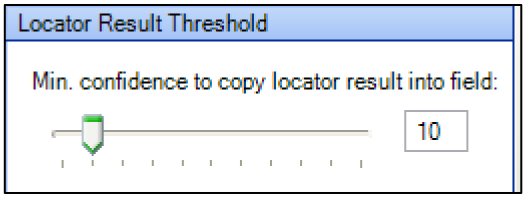


Formatter: DefaultDateFormatter

	Input Locator 1	Input Locator 2	Input Locator 3	Output confidence
✓	IGL.InvoiceDate	FL_Date	<none>	
1 ☑	✓ G S § 60	⊘ 60	⊘ 60	☐ set to 60
2 ☑	= G S § 60	= 95	⊘ 60	☐ set to 60
3 ☑	⊘ G S § 60	✓ 95	⊘ 60	☑ set to 10

- Here we see that the invoice date from specific training always wins. (We trust the user more than the locators!)
- After that we can enforce that generic training must agree with the format locator
- As a third option we accept the result of the format locator but give it a bad confidence (forcing it to be a blue or yellow). You can then experiment with the benchmark and these thresholds to optimize the field (no red and minimum blue). Start strict and then slowly relax the thresholds.

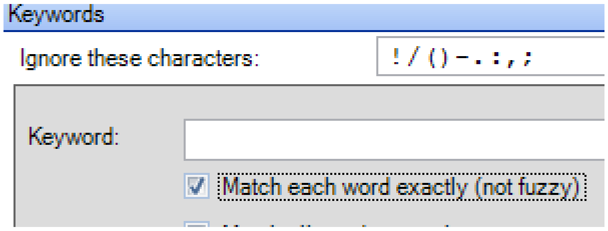
- By default if the confidence is less than 10%, the field will not take the locator value.



Locator Result Threshold

Min. confidence to copy locator result into field: 10

- Format locators can achieve scores less than 100% if you allow fuzzy matching of keywords (and you should).)



Keywords

Ignore these characters: ! / ( ) - . : , ;

Keyword:

☑ Match each word exactly (not fuzzy)

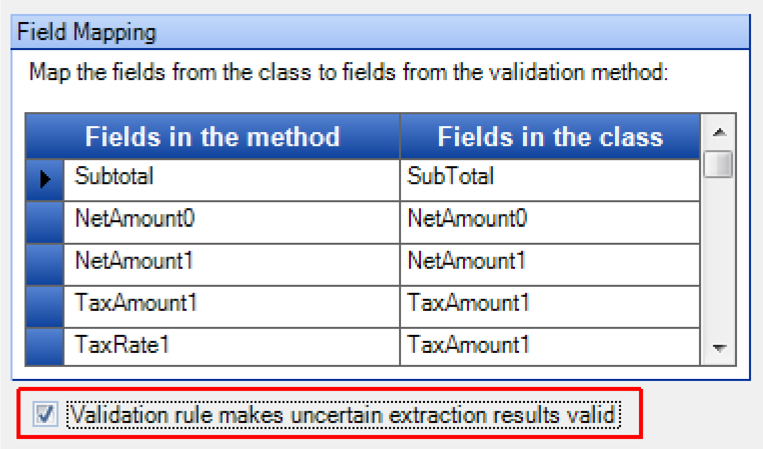
- Make sure that you have strict validation rules on every field.
- If you find a false positive created by a KTM locator or classifier, you should report it to Technical Support. Make a KTM project with one locator, one field, and one image that reproduces the problem. Report it as a KTM false positive to aid us in tracking.

#2 Reduce False Negatives

There will always be compromises between false positives and false negatives when fixing false negatives. Possible ways to improve false negatives:

- Modify locator thresholds and difference thresholds.
- Relax validation rules.

- Use multi-field validation rules so that some fields correct others.



Field Mapping

Map the fields from the class to fields from the validation method:

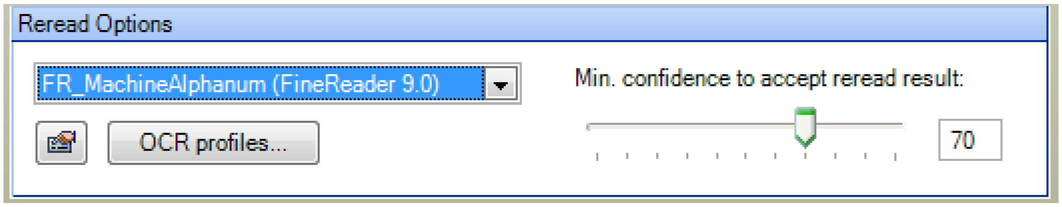
Fields in the method	Fields in the class
Subtotal	SubTotal
NetAmount0	NetAmount0
NetAmount1	NetAmount1
TaxAmount1	TaxAmount1
TaxRate1	TaxAmount1

☑ Validation rule makes uncertain extraction results valid

#3 Minimize True Negatives

Remember that these errors are only priority #3 on your benchmark. You should be dealing with them only after the red false positives and blue false negatives have been resolved.

- Ensure excellent image quality.
  - Scan at 300 dpi. Optimize VRS Settings. Use Enhanced Clarity level 3.
  - Consider using Kofax Web Capture to build a web portal if customers are scanning & emailing invoices.
- Clean up Vendor databases. Use Vendor Locator to rescore Database Locator results.
- Use OCR Reread on the fields with stricter OCR Profiles

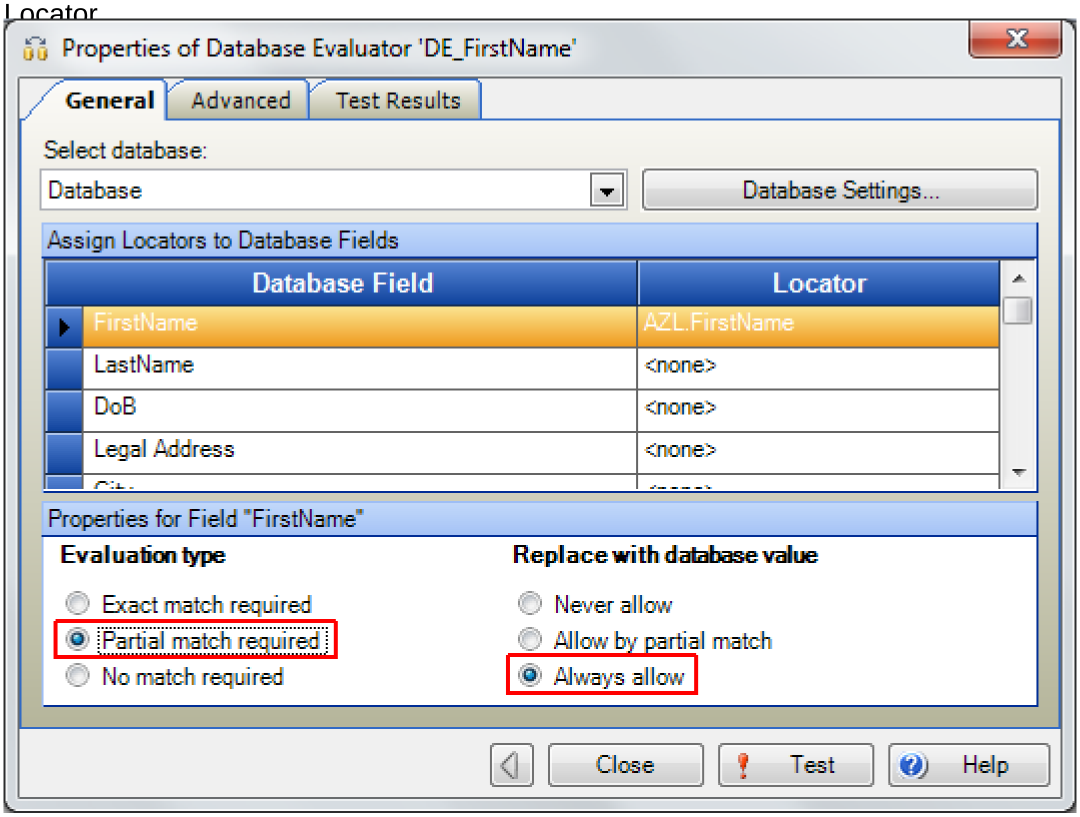


Reread Options

FR_MachineAlphanum (FineReader 9.0)

Min. confidence to accept reread result: 70

- Spell-check fields using a Database Evaluator. This example spell-checks the FirstName field of a Zone Locator



Select database: Database

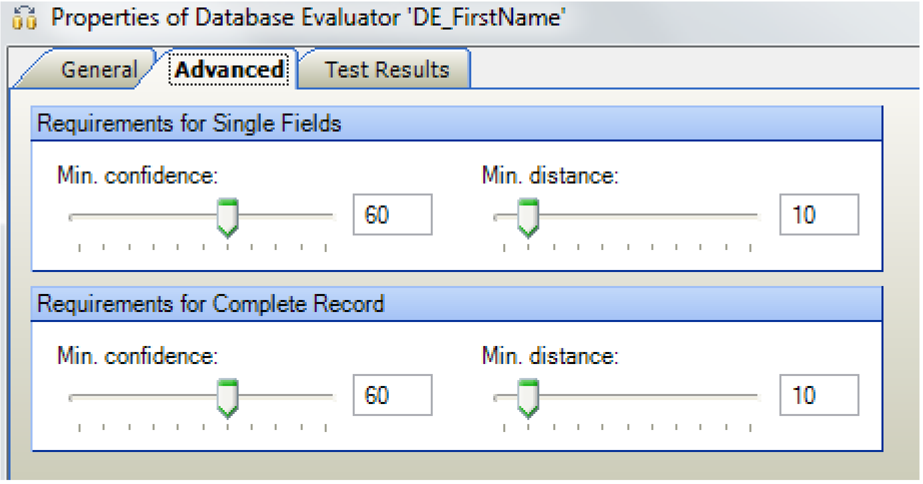
Assign Locators to Database Fields

Database Field	Locator
FirstName	AZL.FirstName
LastName	<none>
DoB	<none>
Legal Address	<none>

Properties for Field "FirstName"

Evaluation type	Replace with database value
○ Exact match required	○ Never allow
● Partial match required	○ Allow by partial match
○ No match required	● Always allow

- On the Advanced Tab you can adjust the sliders for when spellchecking occurs to optimize yellow vs. blue vs. red. Use the Extraction benchmark and lots of examples to find the optimum thresholds.



Requirements for Single Fields

Min. confidence: 60

Min. distance: 10

Requirements for Complete Record

Min. confidence: 60

Min. distance: 10

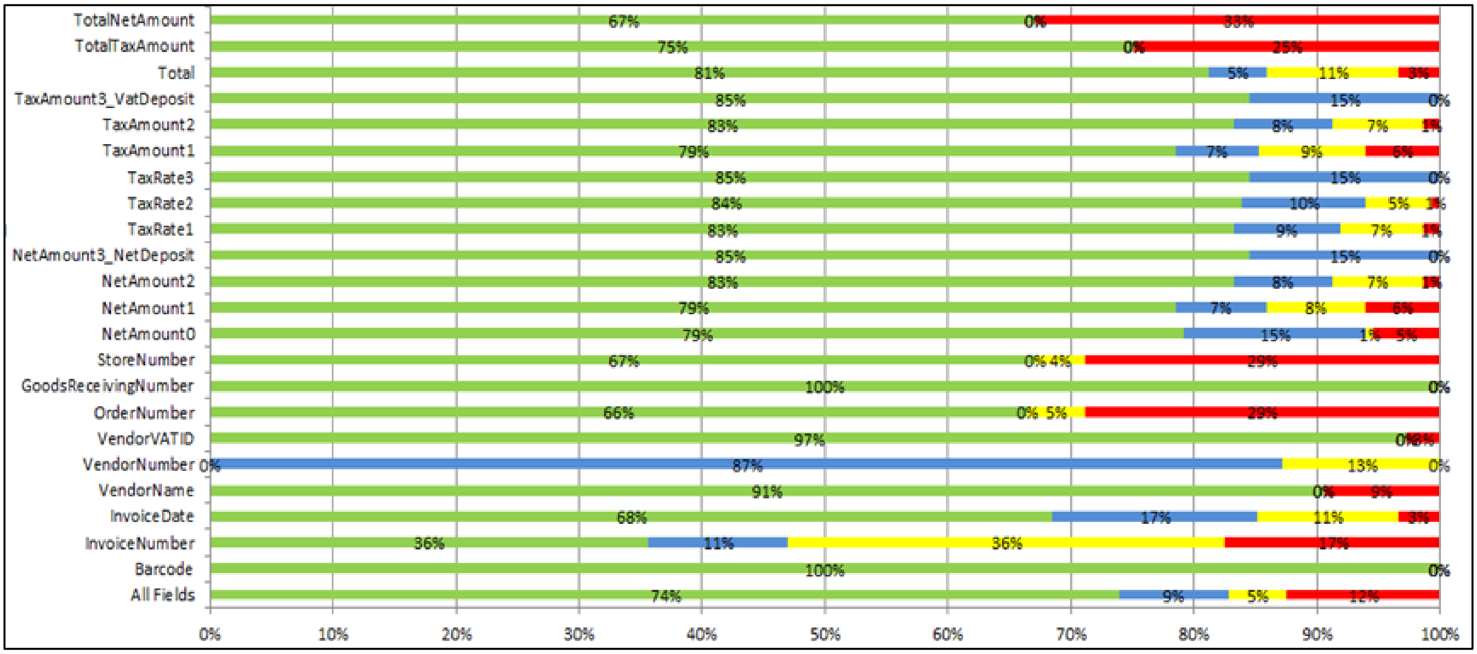
- Write a Database Formatter that does spell checking.
    - Create a script formatter.
    - Look up pField.text in a fuzzy database.
    - If the first alternative has a high confidence and the distance to the second is large, then auto-correct.

- Write a number formatter that does some OCR substitutions and then calls the DefaultAmountFormatter.

```
Private Sub RepairingAmountFormatter_FormatField(ByVal FieldText As String, FormattedText As String,
ErrDescription As String, ValidFormat As Boolean)
   'Call the Default Amount Formatter
   ValidFormat=DefaultAmountFormatter.FormatFieldText(FieldText,FormattedText, _
                ErrDescription)
   If ValidFormat Then Exit Sub
   'If it fails, try some cleanup
   If Len(FieldText) = 0 Then FieldText="0" 'This works if "Require Decimal Point" is deselected
   FieldText=Replace(FieldText,"l","1")
   FieldText=Replace(FieldText,"I","1")
   FieldText=Replace(FieldText,"O","0")
   FieldText=Replace(FieldText,"o","0")
   FieldText=Replace(FieldText,"S","5")
   FieldText=Replace(FieldText,"B","8")
   FieldText=Replace(FieldText,"G","6")
   ValidFormat=DefaultAmountFormatter.FormatFieldText(FieldText,FormattedText, _
                ErrDescription)
End Sub
```

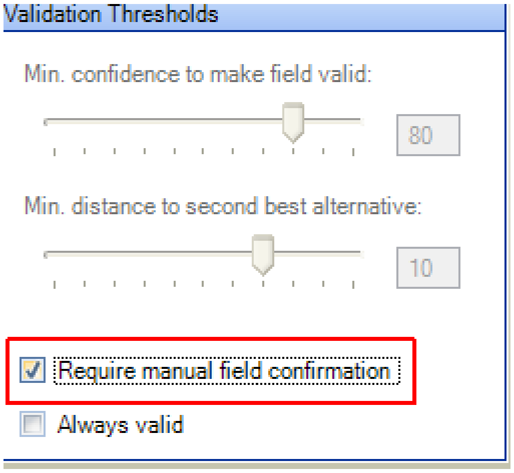
Further Interpretation of a Benchmark

A benchmark can easily be used to analyze deep inside a KTM, just like an X-ray can see inside a person.



In this chart from a real project where the customer was very unhappy, we see that the fields TotalNetAmount and TotalTaxAmount are related to each other and that they are often wrong. But their benchmark is inconsistent with NetAmount0, NetAmount1, TaxAmount1 and TaxAmount2 from which they were *calculated.* This points to a logical error in a script locator – and should be easy to fix.

VendorNumber has far too many false negatives, which frustrated the users. But when we compare it to VendorVATID and VendorName, we see that there must be a configuration problem in the VendorLocator, or something else is causing this field to be always invalid. In this case it was:



Validation Thresholds

Min. confidence to make field valid: 80

Min. distance to second best alternative: 10

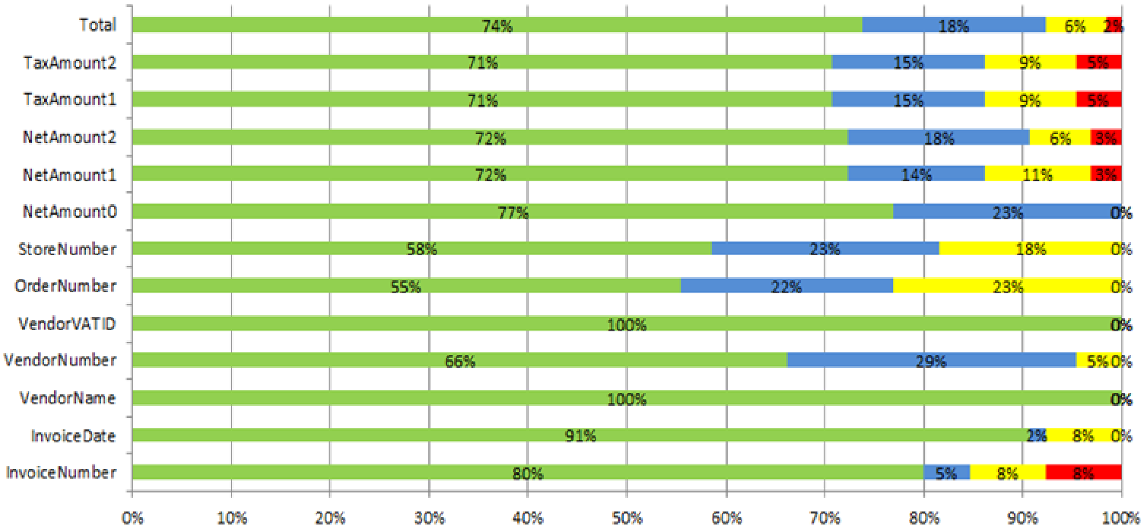
☑ Require manual field confirmation

□ Always valid

Obviously the users had poor trust and demanded that each vendor be manually checked. However their mistrust was wrong, and they should have directed their mistrust toward the amounts fields.

Store Number and Order Number are clearly related and they came from a collection of script locators – there is probably an error in a script.

After a few days of work this was achieved. More work needs to be done to remove red false positives. At this stage we knew every single false positive in the benchmark set and why they all occurred.



Creating Golden XDocuments

You will need “golden files” to create a benchmark in KTM. A golden file is an XDoc that has been perfectly validated. The work your customer has done to provide you with representative data sets can enable you to quickly process golden files.

You can create Golden XDocuments in three ways

1. Build a KTM project without only classes and fields (no locators) and have someone do the data entry into Validation in Project Builder. Save the XDocs when complete

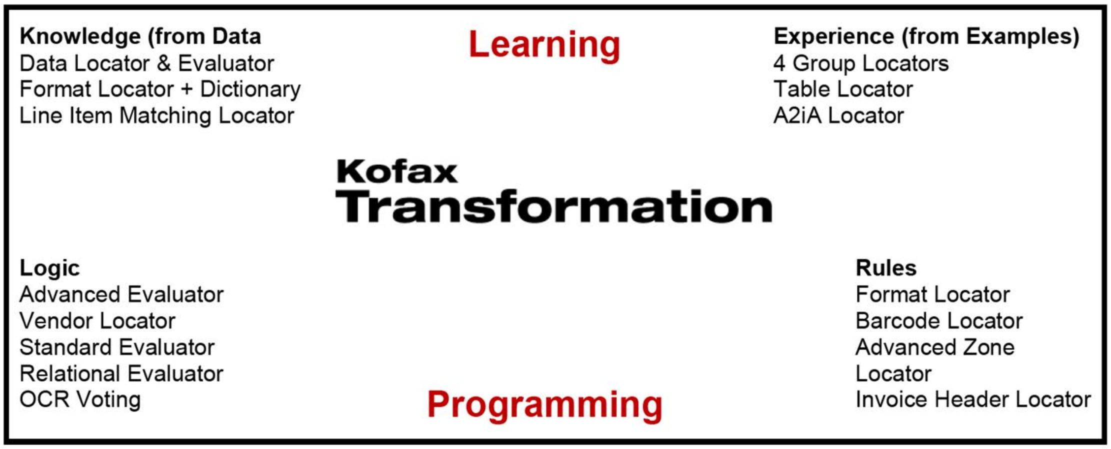
2. Use an existing KTM project in Kofax Capture, but turn off Kofax Export Connector. Copy validated XDocuments and TIFFS out of the KC Image folder.

3. See the Appendix Create Golden Files from CSV Data for a script on how to automatically create golden files from Excel data or extracts from ERP systems.

Implementing a KTM Project

Build a Project that learns

Your KTM should try to mimic a human as much as possible. Humans learn by experience and your project should also learn by experience. Use the following chart to decide which locators to use. Your project should use learning locators first, and use rules locators only as a backup. You then use Logic locators to subjugate rules locators to learning locators.



There are two ways a project can learn – from external data through databases and from training samples.

These locators can learn from external data and require some configuration:

- Database Locator & Database Evaluator
- Line Item Matching Locator
- Format locator + Dictionary. This is a magic combination! The format locator then returns all occurrences of each entry in the dictionary with fuzzy matching. Excellent for find phrases in documents.

These locators learn from training documents and require little configuration for learning:

- Invoice/Amount/Order/Trainable Group Locators
- Text Content Locator in KTM6
- Table Locator
- Line Item Matching Locator
- A2iA Locator learns from prebuilt A2iA check models.

These locators are rules-based and often require heavy configuration:

- Format Locator, Barcode Locator, Advanced Zone Locator
- Invoice Header Locator. (you should consider this locator obsolete)

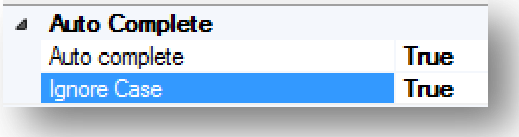
The following locators are logic locators, because they do not locate by themselves. They evaluate the results of other locators.

- Advanced Evaluator. A very important locator that should be inside every KTM project controlling all trainable independent fields.
- Standard Evaluator. Made obsolete by the Advanced Evaluator, but can still be used for its simplicity. Do not use this for trainable fields because it does not distinguish specific from generic learning.
- Vendor Locator. This is actually a Database Locator Rescorer. Do not be misled by the name Vendor. It rescores the results of a database locator.
- Relational Evaluator and OCR Voting are rarely used.

Steps in Building a KTM Project

Based on THE PRIORITIES of a Transformation Project we can now list the steps that you should follow when building a KTM project. The focus first is on user experience, and last of all on removing true negatives.

- Create the project
- Create the class structure
- Create the fields
- Load the documents and perform OCR.
    - Produce the golden files in Project Builder Validation
      As you are doing data entry, go back to the Validation form and make these improvements:
        - Turn on **Autocomplete** wherever you can to avoid using the mouse.



Auto Complete	
Auto complete	True
Ignore Case	True

        - Change **Field** and **Field Viewer** sizes and font sizes to make values easy to read.
        - Build field **Formatters**
        - *(And, yes, build a few quick locators to make data entry go faster – but don't spend time in the locators)*
        - **Database** lookups
        - **Validation Rules**
- Save your Golden Files.
- You have now proven that you have a good user experience, even before you have started on the Locators.
- Run the Ex**traction Benchmark** and fix the **red**, **blue** and **yellow** problems in that order.

- As the last step, we build the locators, . Locators are the last priority in building a KTM project. Locators are really solving the problem of true negatives, which we saw earlier were actually the lowest priority goals in a KTM project.

This is a very different approach from the way most people build their KTM projects (starting with locators). I strongly urge you to build the locators last.

Watch this 20 minute video http://youtu.be/bIDmLVHmJNM to see this process in Action!

Clear Separation of Logic and Data

In much the same way that a webpage is made up of two separate components – content in HTML and style in CSS – your KTM project should also have a clear separation between Logic and Data.

Logic is the way your classification strategy, locators, formatters and validation rules work together.

Data includes the values that your logic uses. Data should be external to a project – KTM provides you with Script Variables, Script Resources, Databases and Dictionaries.

Script Variables are used to store parameters for your scripts.

Script Resources are strings for displaying to users that can be translated for localization.

KTM Fuzzy Databases can be used to store tables of values.

Why you should avoid the Format Locator as much as possible

Format Locators are a tempting starting point for deterministic programmers as they are familiar and they make sense.

Before you use a format locator with regular expressions, consider whether one of these locators might be better:

- Trainable group locator for finding a phrase with an anchor
- FormatLocator+Dictionary for fuzzy matching
- Advanced Zone Locator, if the value appears always at the same location

However they have a number of weaknesses.

- You might be preferring a deterministic approach to learning. Your deterministic approach should be a backup to learning and subjugated to it.
- They require a long time to configure. Many format locators contain many regular expressions and evaluation settings. The effort that went into configuring these is often better spent training documents with a Trainable group locator.
- They can be slow because they perform regexes on every word of the document. Database locators and group locators are faster.
- They are not fuzzy (except when using dictionaries).
- You must expect them to fail. If they are feeding script locators, make sure your script locator handles the case when no result is found.

Regardless, they are still useful locators:

- For finding amounts for the table locator.
- For precisely matching Tax codes and other numbers in the Vendor Locator.
- Combined with dictionaries, they are powerful fuzzy phrase finders.

User Experience

User Experience is the most important part of a KTM project. The story at the beginning shows that effort put hear can be 10 times as effective as building locators.

Your first job in building your project is to create a **great user experience.** You also need your golden files as soon as possible, even before spending much time on locators.

Building your user experience first gives you many advantages

- You know your customer's documents well and all their weird problems.
- You are focusing on the people first and not the technology and this sets the tone of the project form the beginning
- You can prove to yourself that the data is really findable from the documents.
- You hook into the project external databases as fast as possible
- You build a very good **data-entry** project very quickly. I am convinced many KTM projects bring great value to the customer simply by having great data entry, and not by have good locators.
- You get great golden files.
- You get all of your field formatters, validation rules and GUI design right at the beginning. The locators are behind the scene.

Steps to building a great User Experience – Fingers , Eyes & Mind.

The User Interface is the most important part of your KTM project. You should spend much more time building this than in building locators.

Some of the tips below could improve your users' productivity by more than 100%.

Here are some principles to following when designing your user interface.

User Productivity

Every single decision you make should make the user more productive. Always be thinking "How can I make it easier, faster? How can I do it in less keystrokes?

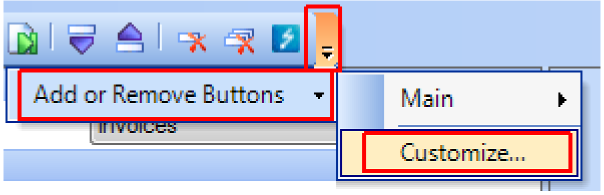
You can help a user to be much faster by helping their **fingers, eyes** and **mind.**

Fingers

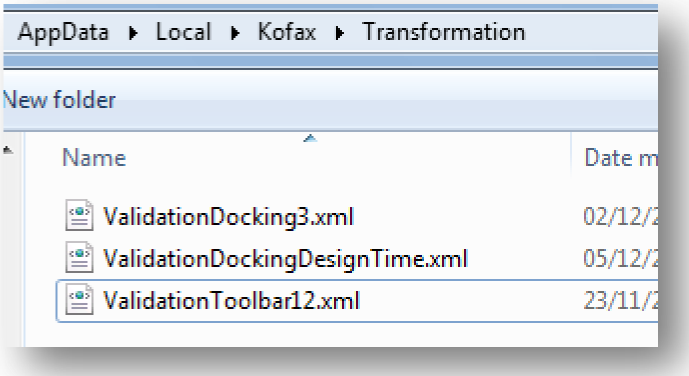
Make sure that the user can control everything with the keyboard and that the finger movements are comfortable.

Use Hotkeys and show them to the User

There are hotkeys for almost every activity that you would do with the mouse!



Custom Keybindings are stored in **%appdata%\Local\Kofax\Transformation**

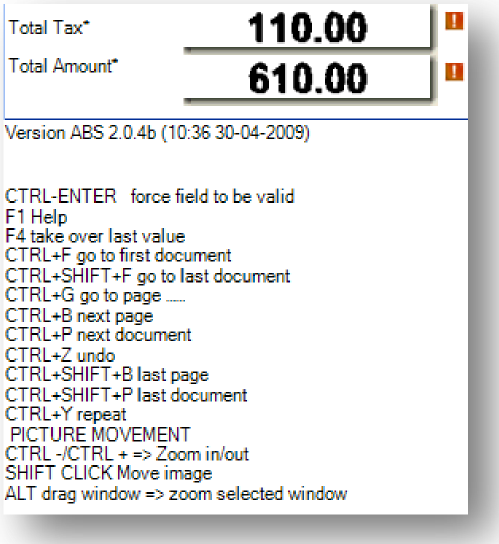


AppData ▸ Local ▸ Kofax ▸ Transformation

New folder

Name	Date m
ValidationDocking3.xml	02/12/2
ValidationDockingDesignTime.xml	05/12/2
ValidationToolbar12.xml	23/11/2

Put all of the hotkeys onto the Validation Form in a label, so that it is in front of the user's eyes and easy for them to learn and use.



Total Tax* 110.00

Total Amount* 610.00

Version ABS 2.0.4b (10:36 30-04-2009)

CTRL-ENTER force field to be valid
F1 Help
F4 take over last value
CTRL+F go to first document
CTRL+SHIFT+F go to last document
CTRL+G go to page .....
CTRL+B next page
CTRL+P next document
CTRL+Z undo
CTRL+SHIFT+B last page
CTRL+SHIFT+P last document
CTRL+Y repeat
PICTURE MOVEMENT
CTRL -/CTRL + => Zoom in/out
SHIFT CLICK Move image
ALT drag window => zoom selected window

You cannot directly make multiple line labels with Project Builder. Use "\n" in the labels for line feeds, and the following script to convert to multiple lines.

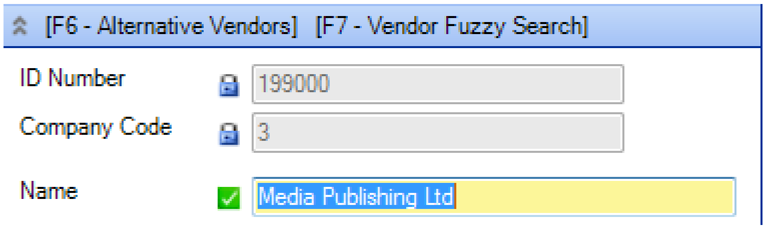
```
Private Sub ValidationForm_DocumentLoaded(ByRef pXDoc As CASCADELib.CscXDocument)
   With ValidationForm.Labels.ItemByName("LabelHelp")
      .Text=Replace(.Text,"\n",vbCrLf)
```

```
    End With
End Sub
```

Use F6-F12 Function Keys for Buttons.

You also have CTRL and SHIFT. Be careful to space out function keys – F6, F8, F10 are better spaced than F6, F7 and F8.

A very good idea for buttons is to put them on an invisible Tab (`ValidationForm.Tabs.ItemByName("Buttons").Visible=False`) and only use labels to show the hotkeys. This forces the user to use the keyboard and also prevents buttons being left with the keyboard focus when dialogs are closed.



[F6 - Alternative Vendors] [F7 - Vendor Fuzzy Search]

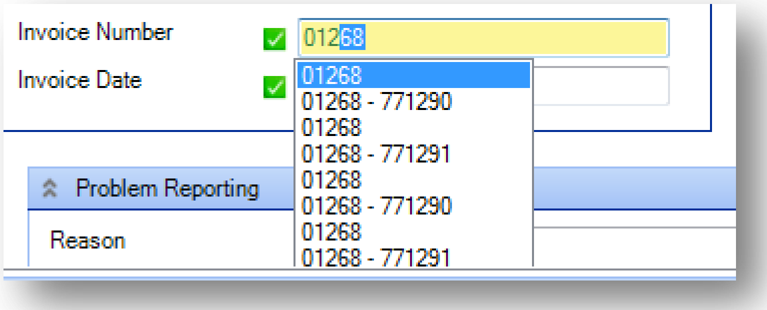
ID Number 199000

Company Code 3

Name ✓ Media Publishing Ltd

*Use the **Autocomplete** Feature*

This is a fantastic productivity feature in KTM, and so familiar to people from Google Search with its suggestion features



Invoice Number ✓ 01268

Invoice Date ✓

01268
01268 - 771290
01268
01268 - 771291
01268
01268 - 771290
01268
01268 - 771291

Problem Reporting

Reason

Autocomplete was added to KTM to get field viewer coordinates for the online learning mechanism without forcing the user to use the mouse.

Below is a list of how to use it to ensure that field viewers have the correct coordinates for the fields – this is important if you want fast users who know how to train documents.

AUTOCOMPLETE

ENTER to validate

ESC accept snippet, but edit text

SHIFT + ESC accept text but not snippet

Press "SPACE" to select next word in autocomplete

Arrow up , shift-tab previous Field

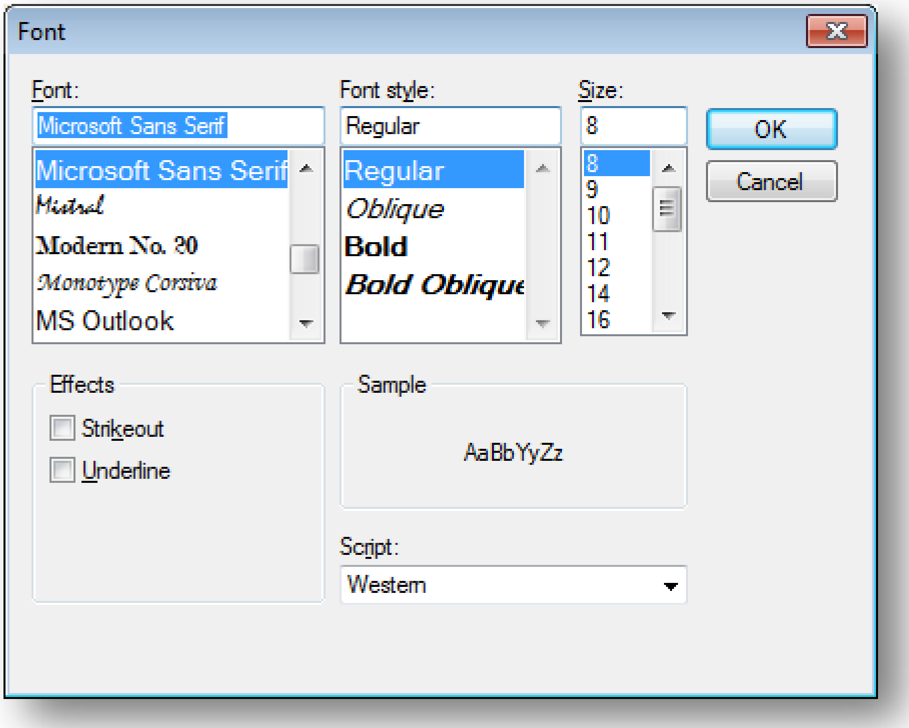
Arrow down shift-down necxt field

Eyes

Guide the viewer's eyes comfortably down through the fields. Don't force them to have to glance back and forth between the document and the fields.

Fonts, Layout and Colors

Make your validation form layout pleasing to the eye. Your users will be staring at it all day every day. Use different fonts to make things easier to read.



Font: Microsoft Sans Serif

Font style: Regular

Size: 8

□ Strikeout

□ Underline

Script: Western

You can even dynamically change the color of a label in script.

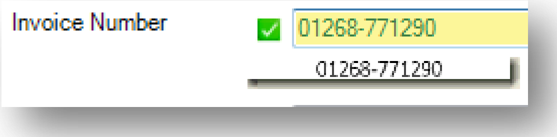
```
ValidationForm.Labels(0).ResetForeColor
ValidationForm.Labels(0).SetForeColor(255,0,0)  'Red
```

Field Viewers

Field Viewers serve two purposes

- Show the coordinates on the image for the online learning mechanism
- Help a user to quickly make a decision about a field

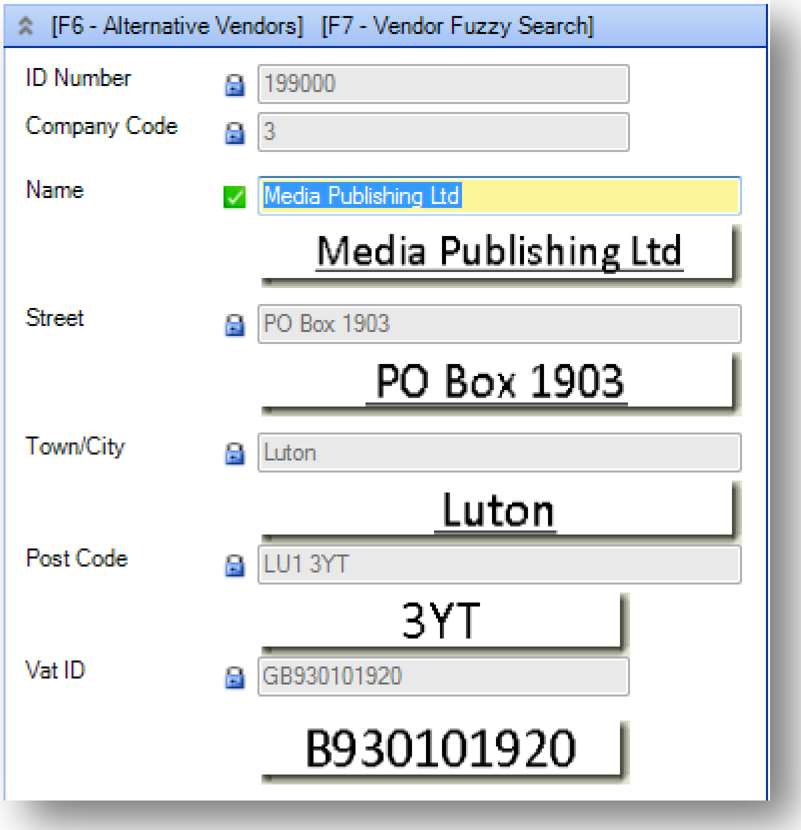
You can align field viewers underneath or above the fields to make it easier on the eye, when you have to check long numbers.



Invoice Number ✓ 01268-771290

01268-771290

In the example below you can see the use of Field Viewers and read-only fields to make it easier for the operator to decide "Do I press ENTER to confirm or DO I press F7 to Search?" when searching for a vendor. They can make that decision without having to glance to the document.



ID Number 199000

Company Code 3

Name ✓ Media Publishing Ltd

Media Publishing Ltd

Street PO Box 1903

PO Box 1903

Town/City Luton

Luton

Post Code LU1 3YT

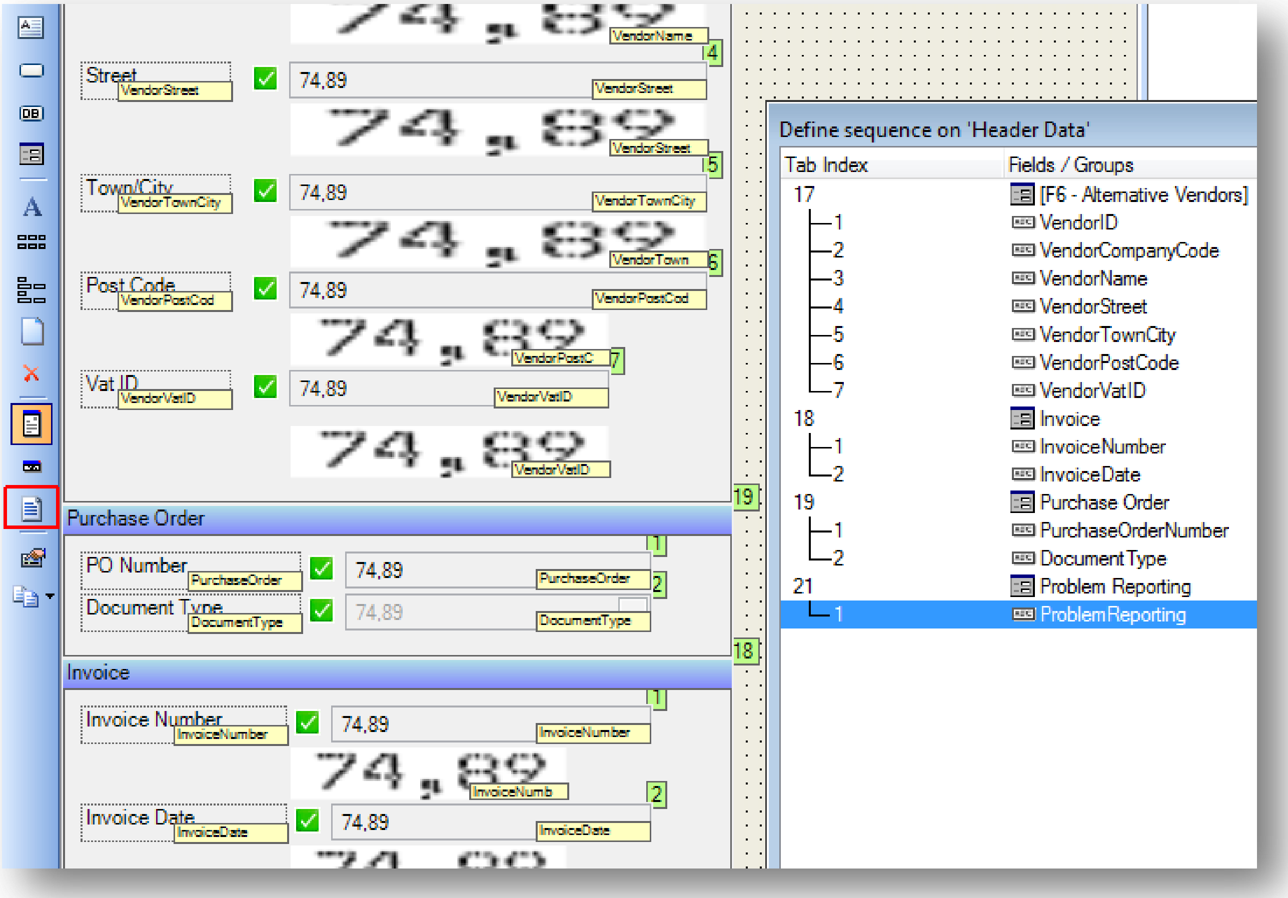
3YT

Vat ID GB930101920

B930101920

Field Sequence

Make sure you have configured the field sequence to step through the fields from top to bottom.



Define sequence on 'Header Data'

Tab Index	Fields / Groups
17	[F6 - Alternative Vendors]
1	VendorID
2	VendorCompanyCode
3	VendorName
4	VendorStreet
5	VendorTownCity
6	VendorPostCode
7	VendorVatID
18	Invoice
1	InvoiceNumber
2	InvoiceDate
19	Purchase Order
1	PurchaseOrderNumber
2	DocumentType
21	Problem Reporting
1	ProblemReporting

You must never allow the cursor to jump up to a previous field. Always place your fields on the document so that dependent fields are lower on the screen.

Mind

The user is constantly confronted with a new decision every time the cursor is blinking in a field. Your job is to make it as easy as possible for the user to work out, “Is that a false alarm (false negative)?” and press ENTER or to decide, “That is wrong, I need to change it”.

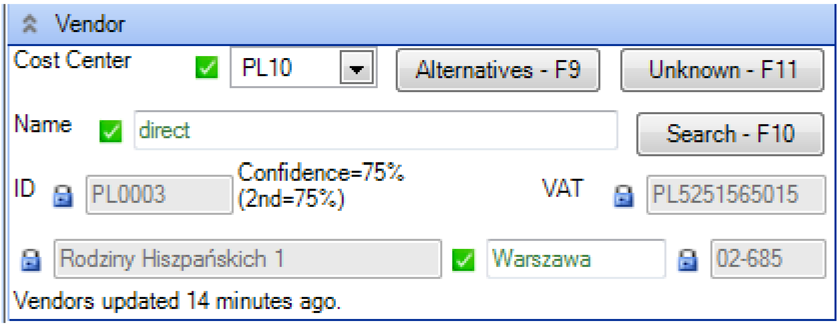
Provide the user with as much useful information as possible to make it easy and fast. But provide the information passively, so that the user can always choose to ignore it or user it.

Passive Information in Labels

Passive information appears in labels that the user can choose to use or ignore. You can show **confidences, alternatives, discrepancies, database lookups**.

The example below shows the confidence of the Vendor Detection, as well as the confidence of the second alternative – this can help the user decide to either press F9, F10 or the ENTER key. You also see how many minutes old the

Vendor Database is.



Cost Center ☑ PL10

Name ☑ direct

ID PL0003 Confidence=75% (2nd=75%)

VAT PL5251565015

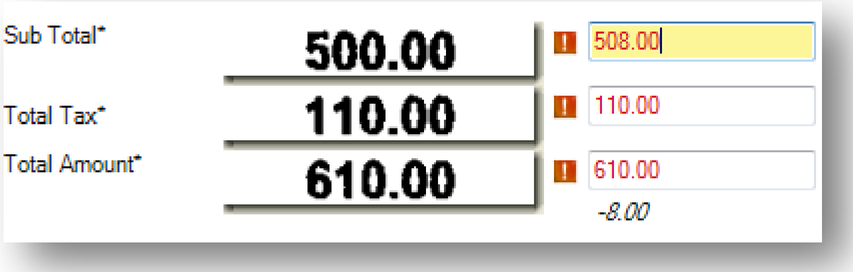
Rodziny Hiszpańskich 1 ☑ Warszawa 02-685

Vendors updated 14 minutes ago.

Here is an example of numeric discrepancy. The label shows a **discrepancy** of -8.00 in the Total Amount.

In the **Thick Client** you can change labels with the **ValidationForm_OnFieldChanged** Event**,** which is fired on every keystroke. In the **Thin Client**, you have to wait until **ValidationForm_OnFieldChanged** when the user presses the ENTER key.

This helps the user find the problem that a “0” has been replaced by an “8” in the SubTotal



Sub Total* 500.00 508.00

Total Tax* 110.00 110.00

Total Amount* 610.00 610.00

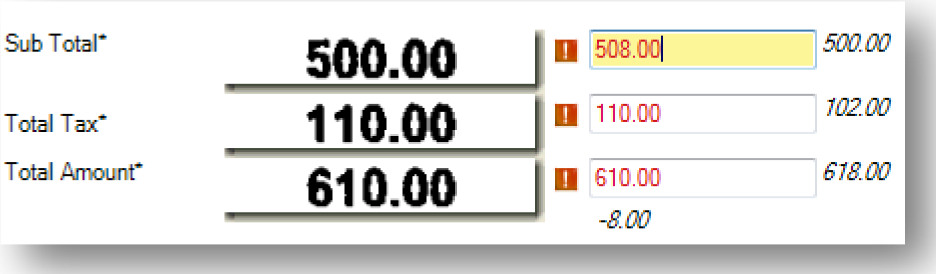
-8.00

Suggestion Labels

We can often do even better than just providing passive information about problems. We can make suggestions about **numbers, alternatives** and even **Spellchecking.**

SubTotal + Total Tax = Total Amount. Here the user can see what all the numbers would be assuming the others were correct. (Make the suggestions go away completely when the fields are correct).

Here you have really helped the user by doing arithmetic for them, and drawing their eyes to where the problems are – and even before they have pressed the ENTER key, they know that the field is valid.



Sub Total* 500.00 508.00 *500.00*

Total Tax* 110.00 110.00 *102.00*

Total Amount* 610.00 610.00 *618.00*

-8.00

The user can now see quickly that “500.00” is needed instead of “508.00”, but still requires **FIVE** keystrokes to fix it **LEFT, LEFT, LEFT, BACKSPACE, 0.**

We can make this even easier for the user by having a hotkey for automatically copying the suggestion. If the user presses “?” then the correct value is copied. You can use the following code.

```
Private Sub ValidationForm_AfterFieldChanged(ByRef pXDoc As CASCADELib.CscXDocument,
ByRef pField As CASCADELib.CscXDocField)
   If InStr(pField.Text,"?") Then
      pField.Text=ValidationForm.Labels.ItemByName("LabelSuggestion" &
pField.Name).Text
   End If
   ...
```

Error Messages should suggest possibilities

Many field error messages contain phrases like **“This value is wrong”** or **“Total<>Subtotal + Tax”** or “**There are more than one alternatives”**, but these errors do not actually help the user find the answer – and often it is easy for you to know what the correct answer should be, or to suggest possibilities to the user.

Change your error messages to be more helpful like **“”Press ? for 500.00”** or **“Press ? for Vendor XYZ. Press @ for Vendor ABC”**, so that the user can fix problems with a single keystroke.

Classification

Do you really need to classify documents?

A customer might think they need to classify documents because they have been doing it manually. During the Customer Walkthrough and Document Analysis phases, you had the opportunity to really understand what was happening with the documents. Here you need to really question the processes that are paper-based and find a good justification to transfer these processes to your Transformation Project.

Documents only need classifying in KTM so that you can apply locators to those documents. If your customer has 20 “classes” of documents but reads the same 5 fields from each of them, do you really need to classify them in KTM?

You need to find out how your customer names the documents, as well as how documents are grouped together.

Ask your customer “Why are documents being classified now?”

Answer	Suggestions and further Questions
So that we can find them later.	Use Kofax Express to produce searchable PDFs without classifying and export to the customer’s Document Management System where you can do a text search to find them quickly, rather than manually hunting through a classification tree. Find out if a really simple solution might be better. Your customer might simply be happy if all 50 pages of a customer’s file become one big PDF file and use the PDF viewer’s search function to look inside it. Ask if anyone will ever look at these documents again. What is the cost of not finding the document again? If you are scanning millions of pages and only 0.1% of

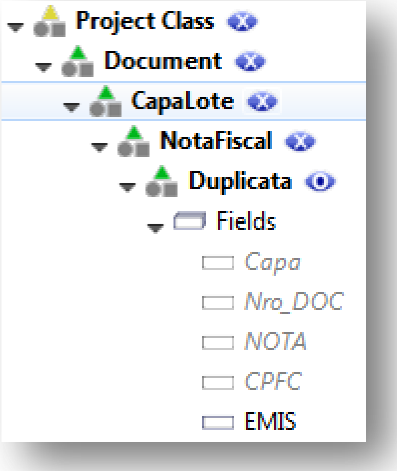
	them will ever be looked at, why invest a huge effort?
Because we have a complex classification system we have been using for years	Maybe the system is out -of -date, inconsistent and more than needed. Find out if a simpler classification strategy might drive all the required process
Because different documents need to go to different departments	If there are only four departments, then classifying into 40 classes might be excessive.
Because we need to extract different fields from different documents.	Maybe you only need to extract a few fields from a folder of many document types. Instead of classifying all the documents, just classify the particular pages where info needs to be extracted and leave all other pages as "default" with no locators and fields.
Because we are doing business intelligence on the documents	Each document is unimportant by itself, only the aggregate results matter. This means you have a higher tolerance for false positives. You may not need document review and validation module at all. You also only need to classify to the level of the statistics you are generating.

Classification Trees and Field Inheritance

You need to define your fields in KTM at the highest level possible in the class tree to benefit from the inheritance mechanisms for formatters, validation rules and locators.

Below is the result of field analysis on some Portuguese Documents.

File Name	Class Name	Field Names				
		Capa	Nro_DOC	NOTA	CPFC	EMIS
1.tif	CapaLote	123987-2012				
2.tif	Duplicata	123987-2012	852147-A	60.000,00	07.248.659/0001-03	15/02/2013
3.tif	Duplicata	123987-2012	1489/1	15.963,57	17.155.342/0003-45	01/12/2011
7.tif	Nota Fiscal	123987-2012	65357	7.981,39	80.089.964/0001-97	
8.tif	Nota Fiscal	123987-2012	194.580	48.741,92	76.777.556/0001-50	

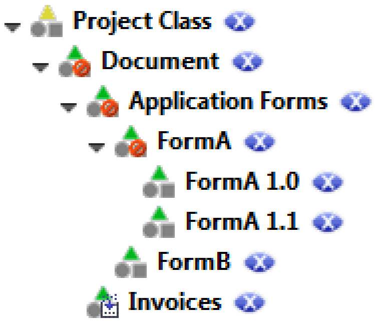


Project Class
Document
CapaLote
NotaFiscal
Duplicata
Fields
Capa
Nro_DOC
NOTA
CPFC
EMIS

This corresponds to the Class Tree in KTM on the left, where the field “Capa” is defined in the class “CapaLote”, and “Nro_Doc” is in the class Duplicata.

“Structural” Classes

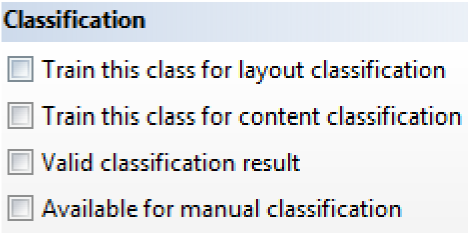
These are classes that exist in projects, but they don’t have any documents associated with them.



Project Class
Document
Application Forms
FormA
FormA 1.0
FormA 1.1
FormB
Invoices

Sometimes you need to insert “structural” classes into a class hierarchy to hold fields and validation rules.

In this example you can see three structural classes “Document”, “Application Forms” and “FormA”. They have the following classification features disabled



Classification

□ Train this class for layout classification
□ Train this class for content classification
□ Valid classification result
□ Available for manual classification

“Document” may not even have any fields and no documents will be classified to this class. The same is true for “Application Form” and “FormA”. “FormA” has a few variants that require different locators but they inherit fields from FormA.

Fields that are in common between FormA and FormB are defined in “Application Forms”

Structural classes are also used in the classification mechanism to resolve ambiguities. If a document had an 85% score for “FormA 1.0” and 83% score for “FormA 1.1” then the document would be classified as “FormA” if you allowed “Valid classification result”.

Your project should always have a top-level structural class called “Document” to keep reminding you of the inheritance mechanism and also to keep yourself future safe – as your project grows you will need to add more classes.

Separation and Classification always go hand in hand - your strategy for one will affect the other

Building Training Sets

Your customers have deep knowledge of their own documents and know how to do them. They should be responsible for classifying documents, and naming them, rather than you or a project manager. Use as much of the customer's knowledge as possible in your project. That means teaching your KTM project about classification, preferably with hundreds and thousands of documents that your customer has already classified.

Classification Tools

Here is a list of classification "tools" listed in the order that you should consider using them.

1. Extracting automatically from a Document Management System.

This is the best method of building a set of classification documents because the work has already been done by your customer. In any classification project always ask about projects that have already been classified, and use them as a classification basis.

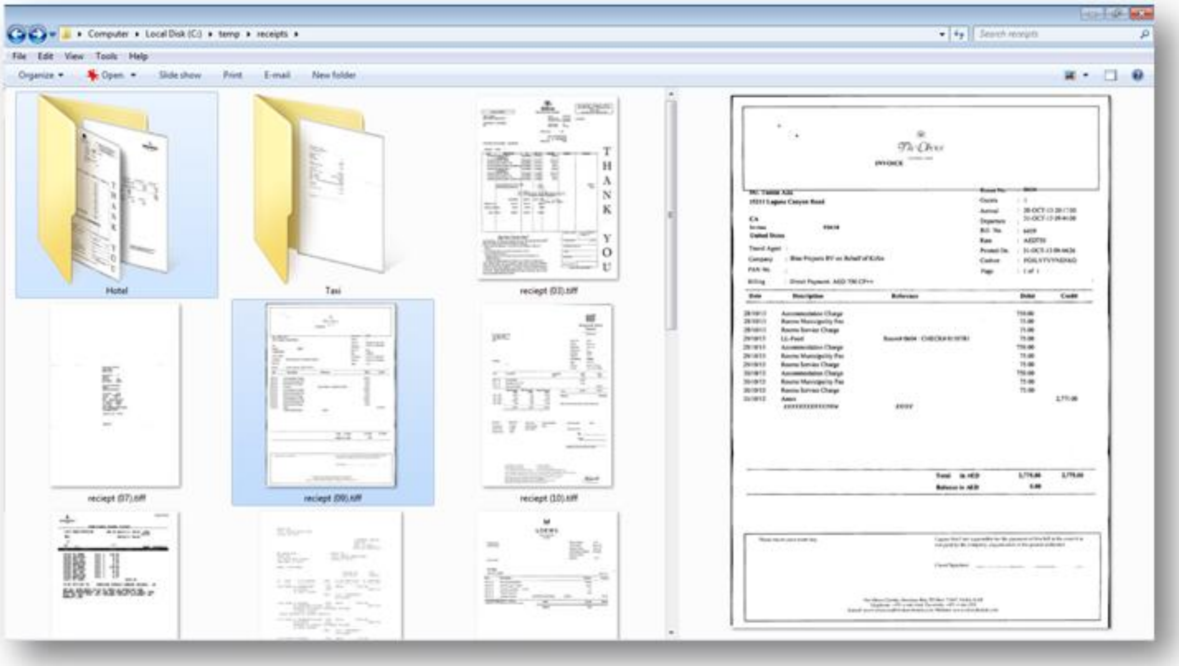
2. Windows Explorer

Windows Explorer has great value as a classification tool. It is installed on every machine and your customer knows how to use it intuitively. It is very visual, and more than one person can classify documents at the same time. You can classify many hundreds of documents per hour and easily check and correct for classification mistakes. If someone has a large monitor then they could even classify 10 or 20 documents at once by dragging them into a folder. One Customer in the Netherlands classified 3500 documents over two days using Windows Explorer.

It is the most useful tool for your customer during their document analysis phase to **understand, organize and name** their own documents.

Settings

- View\Extra Large Icons
- Organize\Layout\Navigation Pane to hide it – you could also use the navigation pane if you have many classes with a tree structure.
- Organize\Layout\Preview Pane
- Keyboard Shortcut to create a new folder CTRL-SHIFT-N



3. Build a KTM project simply for Classification

Windows Explorer is likely to be simpler and faster for the user than trying to build a custom solution. The user cannot add new class names, and KTM validation requires the user to select the Class Name from a drop-down list with the mouse and then press ENTER – it is not built for speed.

The best solution would be to have a single field containing the classification name and apply a script format locator which uses a fuzzy database locator to choose the correct class name. The documents can then be reclassified by using a special script later.

4. Document Clustering

This was a standalone tool in KTM5.5, and has now been integrated into Project Builder 6.0.

This is not a good tool for helping a customer to understand their documents, because it does not help with naming and organizing – the user is confronted with a document and must name it. There is no option to defer a document or come back to it later.

Document Clustering is good if the customer has a very clear understanding of the documents and knows exactly how to name them.

Another disadvantage of this tool is that it requires the user to understand Project Builder in KTM 6.0.

5. Trainable Document Separation (TDS)

Trainable Document Separation requires an immense amount of work and skill.

It uses http://en.wikipedia.org/wiki/Hidden_Markov_model to build training models to classify pages and separation documents. It requires thousands of training samples to be able to produce accurate results (read about http://en.wikipedia.org/wiki/Sparsity in Hidden Markov models for the reasons why)

You should only use Project Planner in KTM5.5 or Trainable Document Separation in KTM6 if the following criteria are fulfilled

- You genuinely need to classify and separate every single document accurately.
- There are FAR too many documents being processed to apply barcode stickers or separator sheets, or to use Document Review for Manual Separation.
- Your customer's document experts can pick up any random page and easily tell you "This is a first/middle/last" page. If they cannot tell this, then TDS will possibly also be confused.

6. Project Builder

Project Builder itself can be used for classifying by dragging documents into classes, retraining the project, classifying the remaining documents and sorting them by classification confidence. This way you can rather quickly classify (this process is quite similar to how the clustering tool would work, but you can stop and start as you like and choose which documents to work with)

Classification Methods

Kofax Transformation has seven methods for classifying documents at runtime.

1. Layout Classification

This method is fast and can classify hundreds of pages per second without requiring OCR. Layout classification is mainly used for fixed forms, specific training for invoice vendors. It is also used in Kofax VRS Auto-profiles and Kofax Express Online Form Learning.

2. Text Classification

This method requires the OCR text of the document. It does not use any geometry. If matches letter groups from three characters up to about 25 characters per phrase. It is very good at finding unique letter patterns that identify a page. It is good at classifying unstructured documents, email bodies, and even fixed forms.

It is probably not good at classifying invoices because they share a lot of common vocabulary, and table line item descriptions are mostly unique on each document.

In KTM 5.5 you can choose whether a training document uses layout or text classification. In KTM 6 this choice is made automatically.

3. Instructional Classification

This method is simple to configure. You need only to give it phrases and a score from -100% to 100%, but it is a deterministic methodology and contains a number of risks. It is easy for it to make false positives and may require a lot of work to be trustworthy. It doesn't consider the location of the phrases on the page. See SCRIPT CLASSIFICATION for searching for identifying phrases inside or outside particular regions of a page.

Avoid instructional classification unless no have no other choice, or unless there are very few document classes.

4. Script Classification

Use script classification for the following cases:

- Classification by barcode value, database lookup, scan operator name, phrase at a particular location on the page, and so on.

See Appendix VISUAL BASIC 6 tips

Use `With … end With` to make your code readable.

Use `For…Next` instead of copy/pasting code.

Use the following to loop through "Total", "SubTotal", etc…

```
For each fieldname in split("Total SubTotal TaxRate1 TaxAmount1")
```

Do error checking at beginning of functions.

```
If condition then exit sub.
```

Use the setting `'#Language "WWB-COM"` to get keywords `return, andalso, orelse, isnot`.

All four keywords will reduce nesting and increase readability.

Have tight logic loops and functionalize what is in them for clarity and easy debugging.

The following example reads every word on a line, fuzzy matches it to a database and then builds a score. It is quite complex, but the complexity has been pushed off into another reusable function, and this loop is now very simple.

```
For w = 0 To textline.Words.Count-1
      word=LCase(Trim(textline.Words(w).Text))
      match=DataBase_SearchString(databaseName,"headerword",word,conf)
      score=score+conf*Len(word)
Next
```

1. Fuzzy Database Queries from Script

This is a useful and flexible script for retrieving one or many, fuzzy or precise results from a local or remote fuzzy database.

Combining an SQL Database with Kofax Search & Match Server and this script you can perform webqueries much faster and even perform fuzzy "webqueries."".

```
Public Function Database_Search(dbname As String, column As String, searchString As
String, numberHits As Integer, minimimConfidence As Double, Optional allColumns As
Boolean=False) As CscXDocField
   'Searches inside a fuzzy database for the searchstring and returns the results in
the alternatives of a new CSCField Object.
   'if column="" then all columns are returned as subfields, otherwise returns only the
chosen column in the alternatives.
   'Set minimimConfidence=1.0 for exact match search.
   Dim DB As CscDatabase, Fields() As String,FieldIDs() As Long
   Dim col As Integer,c As Integer,i As Integer
   Dim hits As CscDatabaseResItems, alt As CscXDocFieldAlternative
   Dim results As New CscXDocField  'You are allowed to create a standalone field
   Dim value As String, substitute As String
   Set DB=Project.Databases.ItemByName(dbname)
   ' Replace all delimiters by blank
   For i = 1 To Len(DB.AdditionalDelimiterChars)
      searchString = Replace(searchString, Mid(DB.AdditionalDelimiterChars, i, 1), " ")
   Next
   ' Replace all ignore characters by blank
   For i = 1 To Len(DB.RemoveChars)
      searchString = Replace(searchString, Mid(DB.RemoveChars, i , 1), " ")
   Next
   ' Substitution pairs define which texts to be replaced by what.
   For i = 0 To DB.SubstitutionPairCount - 1
      DB.GetSubstitutionPair(i, value, substitute)
      searchString = Replace(searchString, value, substitute)
   Next
   Fields = Split(searchString, " ")
   ReDim FieldIDs(UBound(Fields))
   'Find the column we are looking for
   col=-1
   For i =0 To DB.FieldCount-1
      If DB.FieldName(i)=column Then col=i
   Next
   If col=-1 And column<>"" Then Err.Raise 34589,,"Column '" & column & "' does not
exist in database '" & dbname & "'."
   If col<>-1 Then 'Force query in this column
      For c=0 To UBound(FieldIDs)
         FieldIDs(c)=col
      Next
   End If
   Set hits = DB.Search(Fields, FieldIDs, CscEvalMatchQuery, numberHits)

   For i = 0 To hits.Count-1
      If hits(i).Score>= minimimConfidence Then
         Set alt= results.Alternatives.Create()
         alt.Confidence=hits(i).Score
         If allColumns Then  'the column is "", so we return all fields
            For c = 0 To DB.FieldCount-1
               alt.SubFields.Create(DB.FieldName(c))
               alt.SubFields(c).Index=c
               alt.SubFields(c).Text=DB.GetRecordData(hits(i).RecID)(c)
               alt.SubFields(c).Confidence=hits(i).Score
            Next
            alt.Text=""
         Else
            alt.Text=DB.GetRecordData(hits(i).RecID)(col)
         End If
      End If
   Next
   Return results
End Function
```

How to Classify by Barcode in Script for an example.

and How to Classify by Phrase in a Region on a Document for examples.

5. Classification Locator

You can use the Classification Locator to simplify complex classification, by using other KTM projects to classify certain groups of documents, and then use script classification to apply the classification results in the main project

6. Manual Classification (Document Review & Validation)

If documents require a lot of human insight to classify, then just use Document Review to allow the users to classify the documents.

Manual Classification in Validation is not good for user productivity and should only be used as a last resort.

7. Trainable Document Separation

Trainable Document Separation requires a great amount of work and skill. You should use only **Project Planner** in KTM5.5 or **Trainable Document Separation** in KTM6 if you genuinely need to classify and separate every document accurately. See Trainable Document Separation (TDS)

Classification Tips

How many documents should I train for Classification?

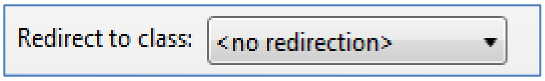
You should train as few documents as possible for each class to keep your training sets small, fast and controllable.

Use the following technique to find the best training documents for a class. This technique guarantees to find the fewest number of documents that account for the greatest variation amongst your samples

1. Pick a document which is clean, has excellent OCR and looks like lots of others in the class. Add it to the training set.
2. Train the project.
3. Classify all the documents from that class and sort the documents by classification score.
4. Pick the document with the **worst** score and add it to the training set.
5. Repeat steps 2-4 until all of the documents have “good” (80% or more) classification confidence.

Customer Classification is not always KTM Classification

Your customer might have a way of classifying documents that are logical to them, based on what the documents mean. In Kofax Transformation, however, you need to classify documents based on how they look and what phrases are used. These might be very different. Use class redirection to move a classified document to a completely different place in the classification tree.


Redirect to class: <no redirection>

Divide and Conquer

Some pages might appear in multiple documents, perhaps as a last page of one document and a middle page of another document. Perhaps some pages are just attachments to a previous document. Classify each as **separate** document, and after classification has been performed, merge the document parts back together again in the Batch_Close event in KTM Server.

Find and Filter

You might find that some of your documents misclassify and that any effort to classify them correctly leads to an instable classification system. Let the documents be misclassified, and then in the Document_AfterClassify use the CSCDocument.Reclassify(,**)** method to reclassify the documents.

Document Separation

Kofax Transformation classifies individual pages and then separates them into documents.

There are seven different ways of separating documents – each method is valid in different scenarios.

1. Use Barcode Stickers

This is simply the best method – fastest, cheapest, and safest in most scanning scenarios,

Every document has its own unique ID from the barcode value. Invoices and most other documents have some white space somewhere on the page where you can stick a barcode. For the very rare cases where that is not the case, stick the barcode on the back of the document and scan the document upside down, or stick the barcode on a separate piece of white paper as a cover sheet.

The paper document is then easy to find in the archive-box. Easy because the barcodes are unique and increasing.

During document preparation, each document needs unfolding, unstapling, removal of advertising, and perhaps page sorting. This paper handling stage requires a minimum of two to five seconds and the effort of sticking on a barcode takes less than one second. The user now has the guarantee of perfect separation.

If a customer designs barcodes according to Kofax specifications (three pixels per thin line and adequate quiet zones around the barcode), misreads should be in the order of one in tens of millions of documents.

Handling Attachments

Many customers use two barcode stickers, and the second is to tell Kofax Transformation to ignore the page because it is just an attachment, and there is no need to pay for the page-count in Transformation.

Most Kofax BPO customers and many invoice processing customers use barcode printers like those found at www.zebra.com.

I have convinced every customer of mine to use barcodes, even those who were initially resistant to using them.

If you stick a barcode on the invoice and it is torn or folded, just stick another one over it or elsewhere.

2. Scan documents individually

This is the best method for untrained users who only occasionally scan documents, and only minimal effort is needed to manually separate two or three documents.

This method is recommended for Kofax Web Capture and Kofax Mobile Capture solutions.

3. Use Separator Sheets

Separator sheets are best in very large scanning solutions where there are ten to fifteen document classes and the customer wants to manually classify them.

Separator sheets also have a number of disadvantages because they double scanning time. About 50% of what you scan is not needed. Scanners also wear out twice as fast and need more maintenance.

Reusing separator sheets also requires a lot of work to separate them again, and the documents in the physical archive are not in the same state that they were in when they were scanned.

If you need to find the original paper again, you will search longer than if it had been barcoded.

4. Combine all three methods

Physically separate all single-page documents and scan them with a “single page” separation profile.

Scan all the two-page documents separately with a two- page separation profile. In Total Agility 7 you also have single-sheet and double-sheet separation profiles.

Scan the remaining invoices with separator sheets, manually or with barcodes.

5. Rubber Stamp with Datamatrix barcodes.

Make sure that the stamp is designed by an expert. A good datamatrix barcode has less than 75% redundancy. Datamatrix is the most robust 2D barcode type, superior to QR code in density and readability.

Stamp this barcode anywhere on the document. If the stamp doesn’t look good, just stamp again.

The only known weakness of this method is that some customers use these stamps too long before replacing them, which can lead to failed barcode reads.

6. Trainable Document Separation (TDS)

See TRAINABLE DOCUMENT SEPARATION (TDS) for more details. TDS is valuable for massive scanning projects in banks and insurance companies where other methods of separation are too slow, there are many document types, and the customer has some tolerance for mis-separations.

7. Automatic Document Separation for Invoices

There is no good and robust strategy for automatically separating invoices. Recommend to your customer to use barcode stickers.

You cannot use TDS for invoices because invoices don't have first, middle, and last pages that look different from each other. Invoices share a lot of the same vocabulary except for line item descriptions that vary.

An automatic separation strategy would have to deal with a vendor sending ten invoices together and the case where a delivery note is attached to the invoice and they look the same.

Any strategy for separation or combination of strategies (such as change of vendor, date, amount, PO, layout) has scenarios where this does not mean separation.

The risk to a customer of automatic invoice separation is very high because an invoice will not be paid! The effort to prevent this problem is more effort than the one second required to barcode the invoice.

This request typically arises where workers are scanning a small group of invoices at the end of the month with simple scanners that produce PDF files which are then emailed. Here a Kofax Web Capture solution would solve the document separation problem, the image quality solution, by putting VRS into the user's browser and integrating the invoice-senders directly into the process.

Some customers solve this by charging the vendor a processing fee for doing manual separation in Document Review Module.

Locators

Locators are at the heart of Kofax Transformation.

Locators use the document or other locators to find values and return coordinates and confidence of each alternative found.

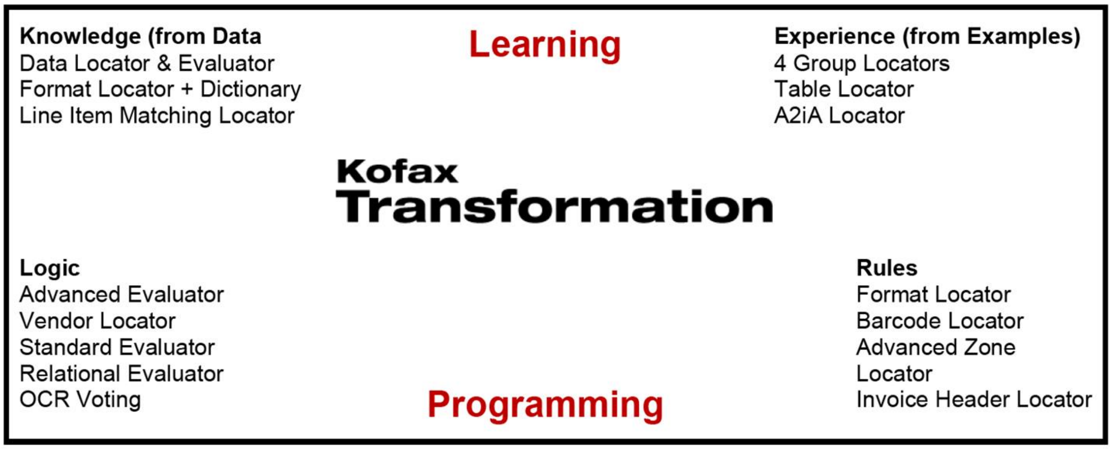
Most locators can be restricted to look at or avoid regions on first, middle, or last pages of a document.

A single field locator returns alternatives with single values.

A multifield locator returns alternatives with multiple subfields.

A table locator returns 1 Alternative with a single table.

Locators can grouped into two broad categories, learning locators and programmable locators. You should prefer teaching locators to programmable locators because they require less effort to configure and can improve with time.



There are two kinds of Learning Locators:

- knowledge locators use information from the outside world via databases and dictionaries to locate information on documents.
  (*Here is where Kapow can be of immense value to KTM, because it can bring the internet into a project)*
- experience locators use examples of previous documents from the customer to interpret new documents.

There are two kinds of Programmable Locators:

- rules locators do not use outside knowledge - they are programmed or configured.
- logic locators combine the results of other locators together to produce alternatives

Build your project with knowledge and experience locators mainly, using rules locators as fallbacks, and then combine results together with logic locators.

Teachable Locators are easier and faster to configure than **programmable locators.**

Knowledge locators			Use Cases
Database Locator **(multifield)**	DL	Matches entire database with a document fuzzily Finds only one occurrence of each DB entry	Finding vendors, customers.
Database Evaluator **(multifield)**	DE	Matches an entire database with output from a locator fuzzily or strict Finds only one result.	Used to spell check handwritten fields from AZL. Look up a customerID fuzzily/strict and return from the database the entire customer record. Can function as a “fuzzy webservice call” script free.
Format Locator + Fuzzy Dictionary **(single field)**	FL	Fuzzily find of a list of phrases on a document. Finds all occurrences of each phrase	Find keyphrases to identify a document at a particular location on the page. Find specific labels for fields
Line Item Matching Locator **(multifield)**	LL	Fuzzily matches purchase orders from a given Vendor in an SQL database with an invoice	Matching each purchased item with the invoice.

Experience locators			Use Cases
Invoice Group Locator **(multifield)**	IGL	Find a number and nearby date on a document. Return document ID if trained.	Finding invoice number, invoice date & retrieving VendorID from user training. Finding CustomerID and ApplicationDate on insurance documents.

Order Group Locator **(multifield)**	OGL	Find a number and nearby date on a document	Finding order number and order date on an invoice. Finding delivery date and delivery number on a waybill.
Amount Group Locator **(multifield)**	AGL	Find subtotals, taxes, total & currency on a document	Finding amount footer information on an invoice.
Trainable Group Locator	TGL	Finds a set of subfields that appear together on a document. If you have unrelated fields, use more than one TG Works well on fields with a clear anchor phrase	Finding customer Ids, special dates.
Text Content Locator **(multifield)**	TCL	Find tokens in punctuated (?!,.:;) text on a document. Simple, trainable,fast Ignores word wrapping No rules New in KTM6.	Find all occurrences of names, dates, addresses, ids, and so on, in a very large contract.
Table Locator	TL	Find tabular data on a document. Has three modes that all require training (manual, automatic and training)	Invoice line items. Tables with rich numeric data Only finds one table on a document.
A2iA Locator **(multifield)**	A2iA	OEM of http://www.a2ia.com Field Reader and Check Reader. Uses dictionaries to read handwritten cursive text	Read checks, cursive handwriting, handwritten numbers.

Rules locators			Use Cases
Barcode Locator	BL	Find all 1D and 2D barcodes on a Document	
Advanced Zone Locator **(multifield)**	AZL	Read zones on a fixed-form document, with high control over OCR profiles and image cleanup. Advanced Registration Cleanup Profiles OCR Profiles High precision Slow to configure Slow to run, Group Locators can be much faster.	Reading handwritten forms.

Format Locator	FL	Find all occurrences of regular expressions on documents. Anchor management is rules-based	Find dates and amounts. Warning: Not fuzzy – OCR errors will lead to missed data. This locator runs very slowly if you have many regular expressions.
Invoice Header Locator **(multifield)**	IHL	Consider deprecated. Use IGL & AGL instead. Non-trainable locator for finding invoice fields	Find all invoice fields

Logic locators			Use Cases
Advanced Evaluator (formally Invoice Evaluator)	AE	Combine alternatives together from other locators and rescore them.	Choose best invoice date from 4 locators that attempted to find it.
Vendor Locator **(multifield)**	VL	Recalculates the confidences of the alternatives of a database locator	Giving higher confidence to a vendor where the faxnumber is perfectly found on the document.
Standard Evaluator **(single field)**	SE	Combines alternatives from two or more locators either as best of or first of.	Superseded by Advanced Evaluator, except that it can take more than 3 inputs..
Relational Evaluator **(single field)**	RE	Find an alternative of one locator that is left/right/above/below the alternative of another locator	Very rarely used.
OCR Voting **(multifield)**	OV	Pick the advanced zone locator subfield with the best confidence	

Training

If you understand well how the training mechanism in Kofax Transformation works, and you know how to train documents and configure the Advanced Evaluator (formerly the Invoice Evaluator) then you will be easily able to build projects that are fast to build and give the user a great experience in learning from their validation.

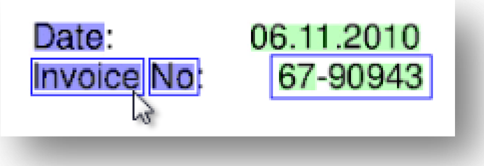
How to Train Documents in Project Builder

Watch this video https://www.youtube.com/watch?v=bIDmLVHmJNM#t=1035 to see how to train documents in Project Builder.

You can do all of the document training from within Project Builder. You do not (and should not) use KTM Validation to train your documents – you will be very slow, unable to improve the validation interface as you are working, debug problems, and your documents will provide poor field confidences at runtime.

Selecting Anchors

When a document is trained, the location on the page is stored along with any anchor words that are typically to the left or above the field



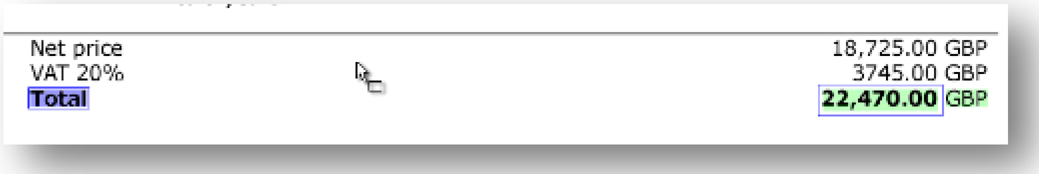
Date: 06.11.2010
Invoice No: 67-90943

In the example above we see that the invoice number consists of 3 words "67", "-" and "90943". The blue box surrounds the region on the page that KT will look for the invoice number. The two words to the left "Invoice" and "No" are marked as anchors. If you do not like an anchor, you **should change it**, by pressing **CTRL-RIGHT-CLICK** on the anchor.

You should be spending a very long time checking and correcting anchors – it is a big part of the success of your project.

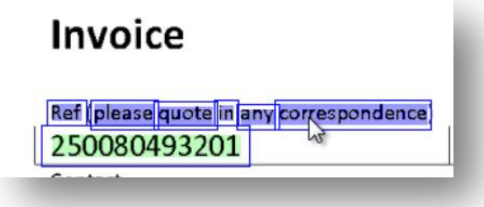
How to Select Anchors

- You should pick anchors that do not have OCR errors if you can.
- Pick words that clearly identify the field for this particular document. The anchors can even be far away as "Total" is below.

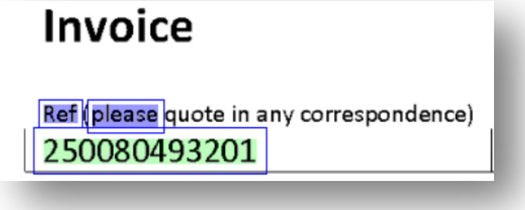


Net price 18,725.00 GBP
VAT 20% 3745.00 GBP
Total 22,470.00 GBP

- Pick words that you know will help also on other documents of this class, as these words will go into the generic knowledge base to extract fields from unknown documents
- Do not pick anchors that are only coincidently there and can lead to confusion.
- In the example below KT picked too many anchors. Deselect what doesn't make sense.

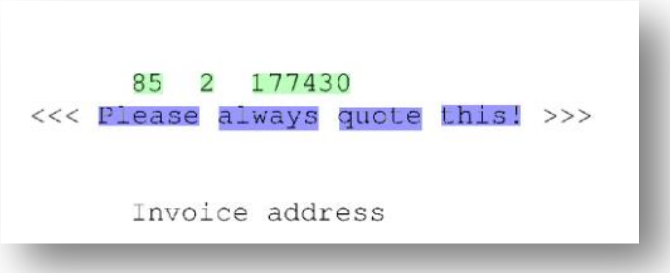


Invoice
Ref (please quote in any correspondence)
250080493201



Invoice
Ref (please quote in any correspondence)
250080493201

- In the example below there was no “correct” anchor near to the invoice number. I chose to use “Please always quote this!” because it **will** help for this vendor and **shouldn’t** cause confusion on other documents.

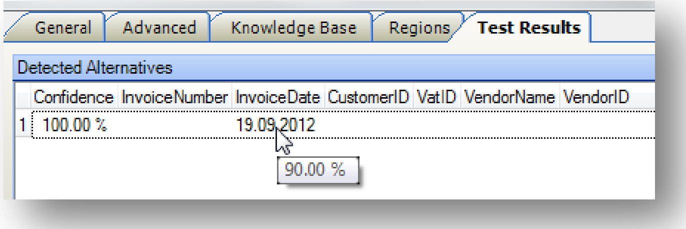


85 2 177430
<<< Please always quote this! >>>

Invoice address

Trainable Locator Subfield Confidences

Kofax Transformation **trusts** you as a user of Project Builder more than it trusts a Validation Operator when it comes to training documents. If you train a document in Project Builder, you only need **ONE** training sample to achieve a specific-training confidence of 90%. Pick a document with clear anchors and with long phrases in the fields.



Detected Alternatives

	Confidence	InvoiceNumber	InvoiceDate	CustomerID	VatID	VendorName	VendorID
1	100.00 %		19.09.2012				

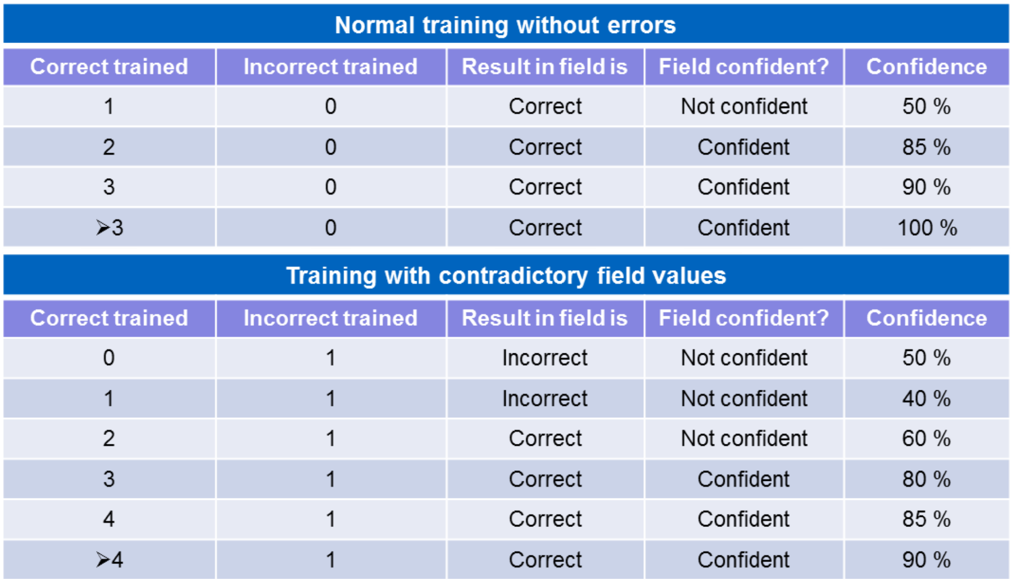
90.00 %

If a **second** document is trained in Project Builder then the confidence is 95%. Documents that are trained in KTM Validation start out only with a 50% score.

Online Training Scoring and automatic conflict cleaning

If a document is trained in KTM Validation and then processed by KTM Learning Server, then the subfields in the next document will have confidence of 50%. After 2 documents the confidence will be 85%, 3 documents 90% and 40 documents 100%

If the **second** document conflicts with the first document because the field coordinates are different, then the confidence for the 3rd document is 40%, the 4th is 60%, 5th is 80%, 6th is 85% and 7th,8th, … stay at 90%. This is the conflict mechanism learning to ignore the conflicting documents.

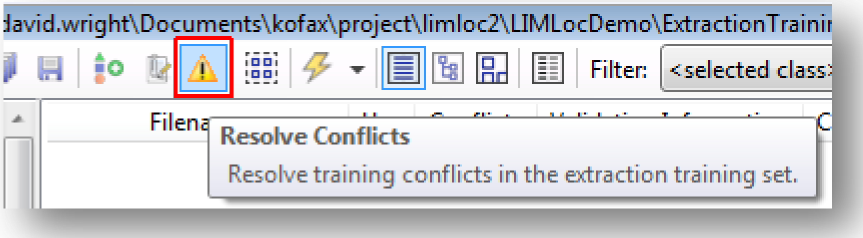


Normal training without errors				
Correct trained	Incorrect trained	Result in field is	Field confident?	Confidence
1	0	Correct	Not confident	50 %
2	0	Correct	Confident	85 %
3	0	Correct	Confident	90 %
➤3	0	Correct	Confident	100 %

Training with contradictory field values				
Correct trained	Incorrect trained	Result in field is	Field confident?	Confidence
0	1	Incorrect	Not confident	50 %
1	1	Incorrect	Not confident	40 %
2	1	Correct	Not confident	60 %
3	1	Correct	Confident	80 %
4	1	Correct	Confident	85 %
➤4	1	Correct	Confident	90 %

Resolving Conflicts

When you train your project with extraction samples, you can view the conflicts in the **Resolve Conflicts Screen**.



david.wright\Documents\kofax\project\limloc2\LIMLocDemo\ExtractionTrainin

Filter: <selected class>

Filena

Resolve Conflicts

Resolve training conflicts in the extraction training set.

Here you have the choice to fix the conflict or to delete one or both of the documents.

Conflicts occur when two documents with the same classification layout have the same field at different places on the screen.

Invoice Evaluator/Advanced Evaluator

This is one of the most important locators in KTM, and is key to success in online learning.

It was renamed to **Advanced Evaluator** in KTM 6.0 and is license-free. You should use it in probably any project.

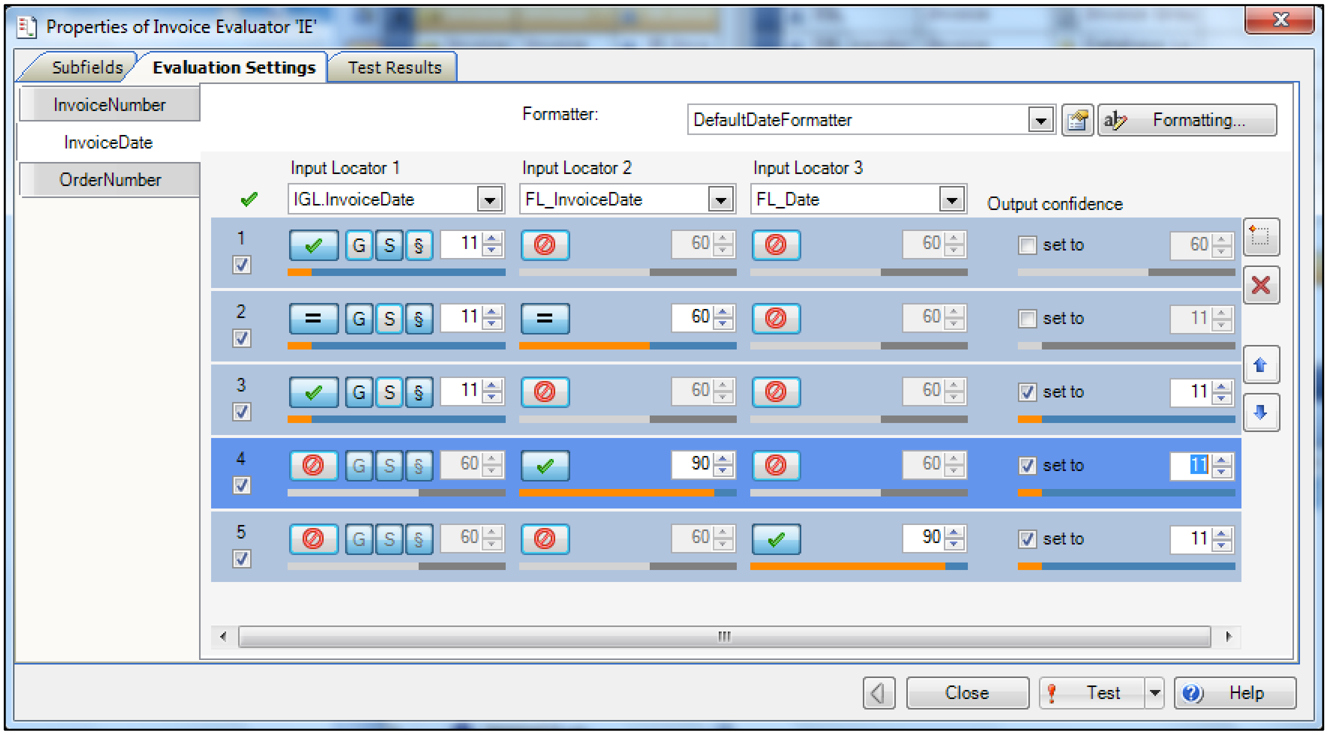
The Invoice Evaluator requires an invoice add-on license in KTM5.5

You should only use this locator for **independent trainable fields,** e.g. invoice number, invoice date, order number, order date.

DO NOT put any amount fields into the IE, as they are dependent on each other and the Advanced Evaluator can mix unrelated alternatives

Create a strong Learning Feedback Mechanism for the User

The most important principle of configuring IE/AE is to create a strong feedback mechanism for the user:



Formatter: DefaultDateFormatter

	Input Locator 1	Input Locator 2	Input Locator 3	Output confidence
✓	IGL.InvoiceDate	FL_InvoiceDate	FL_Date	
1 ☑	✓ G S § 11	⊘ 60	⊘ 60	□ set to 60
2 ☑	= G S § 11	= 60	⊘ 60	□ set to 11
3 ☑	✓ G S § 11	⊘ 60	⊘ 60	☑ set to 11
4 ☑	⊘ G S § 60	✓ 90	⊘ 60	☑ set to 11
5 ☑	⊘ G S § 60	⊘ 60	✓ 90	☑ set to 11

1. Make sure that what the user has trained always wins, no matter how bad the score.
    - This is strong feedback and makes the user realize, “KTM really learns from me. When I train well it does well, when I make a mistake it shows me my mistake again.”
    - That is why the first row is Specific with threshold of 11% (11% is just over the lowest threshold of 10% for a locator to be copied to a field).
    - Specific should always beat generic. Specific means “I have seen this document before”. Generic means “I haven’t seen this before but I think….”
    - Let the conflict resolution mechanism raise the scores of training files – you can set field thresholds less than 85% so that two samples give straight-through processing, greater than 85% for three samples, and greater than 90% for four samples.
2. Generic result agrees with a format locator that has evaluation words. – when non-determinism agrees with determinism.
3. Generic result is shown, but confidence set to 11% to require user validation.
4. Show the result from the format locator with evaluation words but give bad score.
5. Show the first result from the weaker format locator.

This is just a starting point for your Advanced Evaluator. We have configured it very aggressively above to avoid false positives. You may find that you can relax some of the tight thresholds by running and rerunning benchmarks with different configuration settings. You should never adjust these settings based on individual documents, but rather on larger groups of documents.

Databases

KTM has an immensely powerful Fuzzy Database technology that should form the heart of many things that your project does.

Many KTM developers have a deterministic background and very familiar with SQL databases, but SQL databases are less than ideal in most KTM contexts because they are slow to query, require search-by-column and require perfect input, which you rarely have from OCR documents.

KTM fuzzy databases have the following advantages

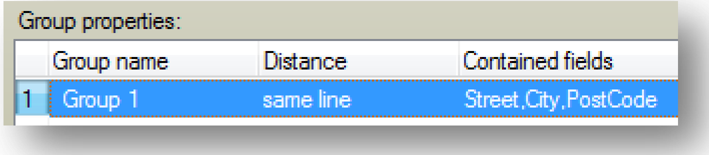
- Queries are fuzzy, returning many alternatives
- Very fast. Even databases of 10’s of millions of records can be queried subsecond.
- It is easy to query the **entire text of a document** with a database. This is impossible with SQL.
- Users do not need to be aware of database columns
- They function like Google Search – any words can be used to search, and spelling mistakes are allowed. And usually what you are looking for is the first or second result.
- They are very interactive and easy to understand for the user
- They easily bring in data from other business systems making KTM a single cockpit for extracting data from documents.

Database Locator

You should always consider using a Vendor Locator to rescore and filter the results of the Database Locator. Often it is easier to configure a vendor locator to clean up database locator results, than it is to configure a database locator to get the correct result every time.

Vendor Names are often not the same on invoices as they are on documents.

Make sure you put city, street and post code in a group and restrict them to the same line.



Group properties:

	Group name	Distance	Contained fields
1	Group 1	same line	Street,City,PostCode

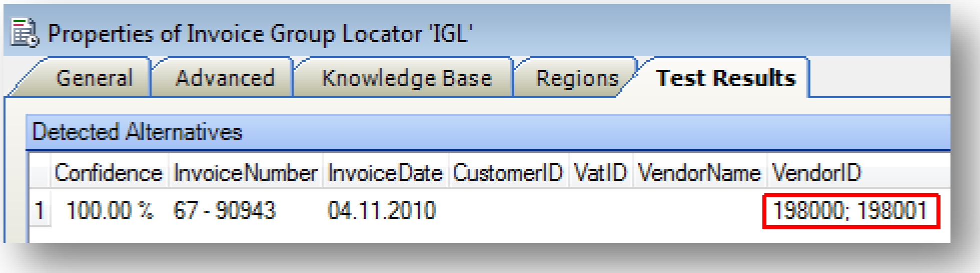
If the first alternative of the Exclusion Database has a match of 80% or more, then a dynamic exclusion zone is produced on the document. Use this to force the database locator to ignore certain results.

Vendor Locator

This locator is important to be able to train VendorIDs, rescore the alternatives of the database locator and remove unwanted alternatives.

It also supports invoices with more than one Vendor ID. Perhaps one Vendor sends invoice to 3 departments and has 3 different VendorIDs in the database. The Vendor locator can resolve the correct Vendor. Below you see the Invoice

Group Locator returning 2 trained VendorIDs for this invoice.

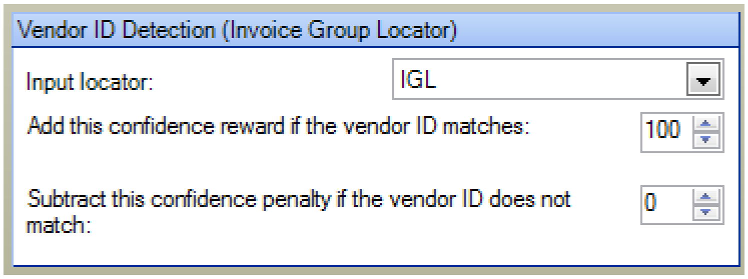


Detected Alternatives

	Confidence	InvoiceNumber	InvoiceDate	CustomerID	VatID	VendorName	VendorID
1	100.00 %	67 - 90943	04.11.2010				198000; 198001

Steps to configure the Vendor Locator

1. Make sure that the Database Locator is returning MANY results, not just 20.
2. Make sure that the Database Locator is giving scores of 40%-70% for most results.
3. Make sure that the Database Locator has the correct alternative in the top 20-50. It is not important for the database locator to get it right.
4. Use a Format Locator to find VAT ID candidates or Business Numbers or Fax Numbers, and configure the Vendor Locator to reward alternatives with 100% which match perfectly.
5. Reward the alternative that matches online learning with 100%.



Vendor ID Detection (Invoice Group Locator)

Input locator: IGL

Add this confidence reward if the vendor ID matches: 100

Subtract this confidence penalty if the vendor ID does not match: 0

6. Do not subtract confidences in the Vendor Locator. You do not want to punish a result because of an OCR error.
7. Always use the Extraction Benchmark to tune all of these options to find what works best with your documents and databases.

Database Evaluator

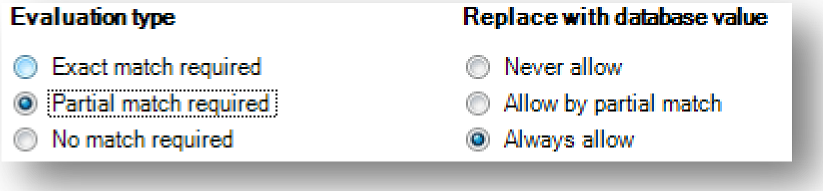
The Database Evaluator is a seldom used Evaluator, but it has some wonderful use cases.

- Spell Checking
- Record Retrieval
- Fuzzy Webservice

Spell Checking with Database Evaluator

You can use a Database Evaluator to spell check values from an Advanced Zone Locator.

If a zone has 100 or even 1000 possible values, put them into a fuzzy database with 1 column and use the Database Evaluator to automatically correct the spelling by selecting **Partial match required** and **Always allow.**



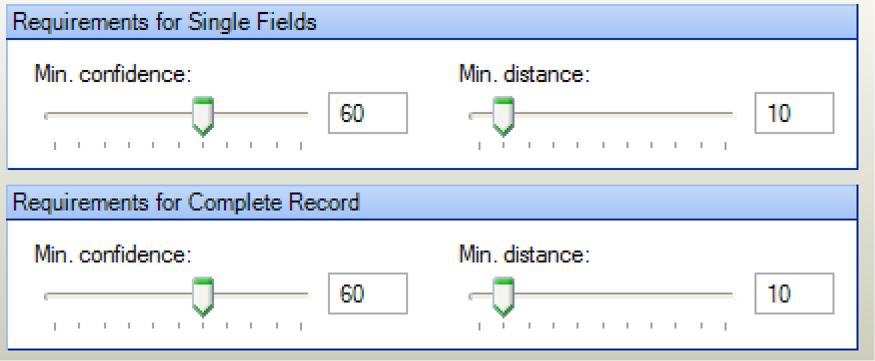
Evaluation type

○ Exact match required
● Partial match required
○ No match required

Replace with database value

○ Never allow
○ Allow by partial match
● Always allow

You can more finely control what happens by adjusting the sliders.



Requirements for Single Fields

Min. confidence: 60

Min. distance: 10

Requirements for Complete Record

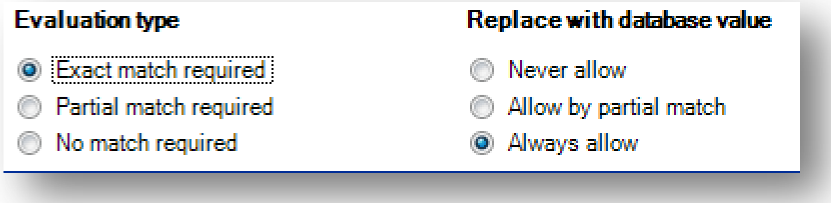
Min. confidence: 60

Min. distance: 10

“Webservice” or “SQL” query with Database Evaluator

You can use the **Search & Matching Server** and a **Database Evaluator** with **Exact match required** to have a web-service like call, complete script-free, instead of writing a webservice to access a database and then KTM scripting to call the webservice,

Choose “partial match required” to have a “fuzzy” webservice call.



Evaluation type

● Exact match required
○ Partial match required
○ No match required

Replace with database value

○ Never allow
○ Allow by partial match
● Always allow

Validation Form Search

You might have a field for “US State” on a document. You could create the following database from http://en.wikipedia.org/wiki/List_of_U.S._state_abbreviations

State	USPS	Other	ANSI
Alabama	AL	ALA	01
Arizona	AZ	ARI	02
Alaska	AK	Alas	02
…	…	…	

You could use the above US State database in a field formatter to spellcheck words. If the user types “AZ” and ENTER, the text will be replaced with “”Arizona”. They could also type Arizo or Abalama or 01 as well. See CALLING A FUZZY DATABASE IN A FIELD FORMATTER for Spell Checking

Now you have a very flexible, fuzzy and fast way of entering US States, and each user can use whatever system they prefer.

Search And Matching Server

Kofax Search & Matching Server KSMS has the following value

- Security
  - Customer databases need to be secure and encrypted. It should not be possible for anyone to steal or leach data from it.
  - The Customer’s data stays in the data center, not in the application center.
  - The KTM developer should have zero access and no read rights to customer databases.
- The project has >>100 MB of fuzzy databases
  - These should not be loaded into every Validation Client into RAM because it is slow to open module, uses RAM, and is a security risk.
  - These should not be loaded into every KTM Server CPU instance, because 16 CPU times lots of MB = lots of GB of RAM wasted.
- Integration Effort
  - The customer doesn’t need to write a tool to push the data regularly to KTM, because KSMS pulls the data.
- KSMS bridges the deterministic world of SQL and web programming with the Quantum, fuzzy world of KTM, and makes a lot of deterministic and anachronistic webservice and dll integrations to KTM unnecessary.
- KSMS should be sold to the DB Admin as a free and simple-to-install-and-configure fuzzy indexer for any SQL database. This fuzzy database/view is something that they control and can completely lock down.

Comparison between different Database Types

You should try to get ALL data as fuzzy. Avoid SQL and webservices if you can.

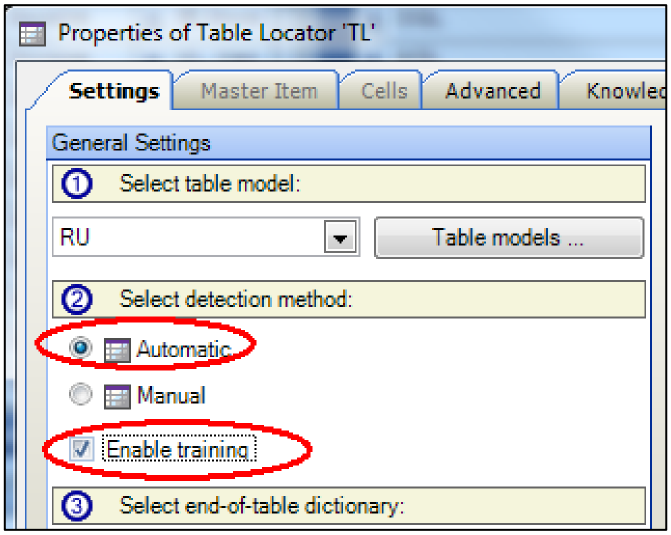
Determine a data strategy considering advantages of SQL, webservices, FUZZY Databases, Search&Matching server, Flat Files or XML.

Database Type	Advantages	Disadvantages
Fuzzy Local	Fast Zero Latency	Read only Entire database & index transferred

	Immune to OCR errors KTM has no access to Enterprise Database Infrastructure Requires no scripting Also supports non-fuzzy searches	to clients as plain text Database Admins need to generate csv files periodically.
Fuzzy Remote **(Search & Matching Server)**	All above Secure and scalable. KTM has NO access to Enterprise Database Infrastructure Supports 10s of millions of records Converts any SQL database into a fully indexed fuzzy database No need for Validation clients to connect directly to databases. Easy for DB Admin to use. License Free.	Higher latency than local fuzzy
SQL	KTM scripting supports "SELECT". .	Fail on any OCR errors. Latency problems Security risk. ODBC config and or passwords in plain text on clients. Many users have access to data. Requires complex scripting Need to use ADO.NET or ODBC to do INSERT.
Webservices	Well known	Deterministic Fail on any OCR errors Can have latency problems DLLs need installing on all clients
Dictionaries	Easy to create	Require project republishing

Tables

Line Item matching is the most time-consuming task for account processing clerks, and it can easily provide the largest return on investment in a KTM solution.



Properties of Table Locator 'TL'

1 Select table model:

RU

2 Select detection method:

● Automatic

○ Manual

☑ Enable training

3 Select end-of-table dictionary:

KTM's Table Locators use at least seven different methods to find the line items of an invoice and can be difficult to configure optimally.

We recommend combining Manual and Automatic Methods. This is why trained tables use the Manual Method and unknown tables use the automatic method.

Automatic Table Locators

The automatic table locator is used to locate the table on an unknown invoice. It attempts to find:

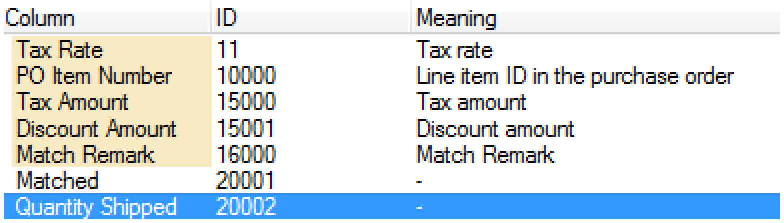
1. The table header
2. The rows and the columns
3. The identity of the columns
4. The end of the table

KTM 5.5 added the ability to the Table Locator to take the Line Item Matching Locator's table as input.

To detect the header of a table, you will need to train 50-100 invoices in Table header packs per language for this to be successful.

Table Model

Make your table model as simple as possible. Your table model should exactly the columns required for data entry into the ERP system. But use the built-in KTM columns where possible, because they are used by the detection algorithms. Custom columns will require header detection to be found.



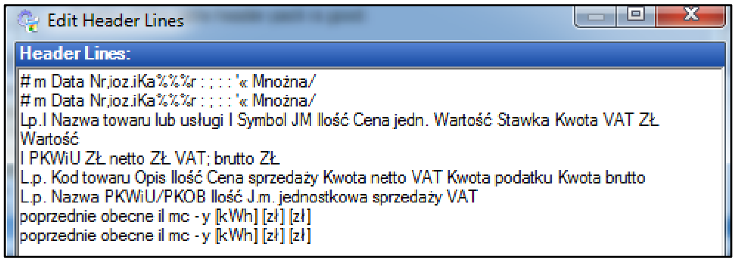
Column	ID	Meaning
Tax Rate	11	Tax rate
PO Item Number	10000	Line item ID in the purchase order
Tax Amount	15000	Tax amount
Discount Amount	15001	Discount amount
Match Remark	16000	Match Remark
Matched	20001	-
Quantity Shipped	20002	-

Note: the “Unit Measure” column looks for scaling units: 1, 100, or 1000. It not kg,m^2, and so on.

Table Header Pack

A header pack consists simply of three text files. Try to make these files as complete as possible. Correct OCR errors manually. Header detection works best on column names that have no word-wrapping.

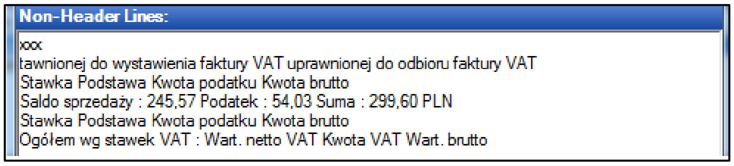
1. Header row examples:



Header Lines:

```
# m Data Nr,ioz.iKa%%%r : ; : : '« Mnożna/
# m Data Nr,ioz.iKa%%%r : ; : : '« Mnożna/
Lp.I Nazwa towaru lub usługi I Symbol JM Ilość Cena jedn. Wartość Stawka Kwota VAT ZŁ
Wartość
I PKWiU ZŁ netto ZŁ VAT; brutto ZŁ
L.p. Kod towaru Opis Ilość Cena sprzedaży Kwota netto VAT Kwota podatku Kwota brutto
L.p. Nazwa PKWiU/PKOB Ilość J.m. jednostkowa sprzedaży VAT
poprzednie obecne il mc -y [kWh] [zł] [zł]
poprzednie obecne il mc -y [kWh] [zł] [zł]
```

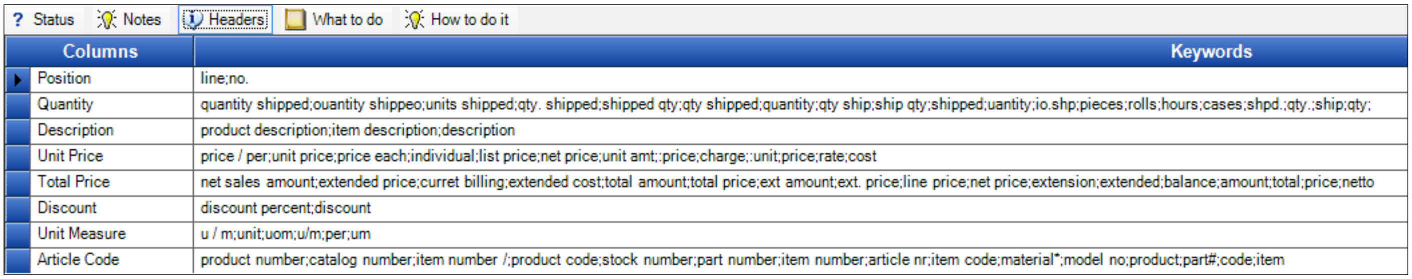
2. Non-Header row examples:



Non-Header Lines:

```
xxx
tawnionej do wystawienia faktury VAT uprawnionej do odbioru faktury VAT
Stawka Podstawa Kwota podatku Kwota brutto
Saldo sprzedaży : 245,57 Podatek : 54,03 Suma : 299,60 PLN
Stawka Podstawa Kwota podatku Kwota brutto
Ogółem wg stawek VAT : Wart. netto VAT Kwota VAT Wart. brutto
```

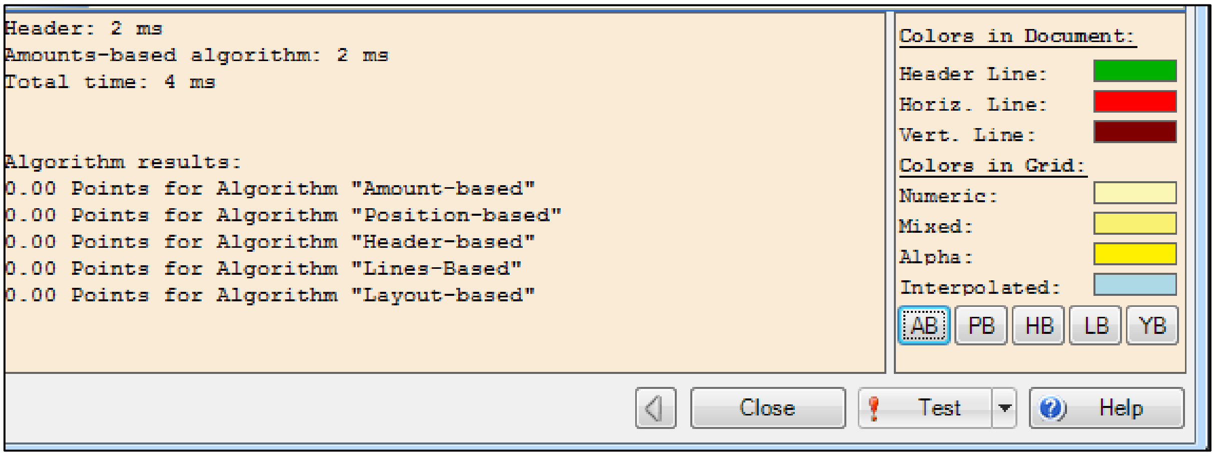
3. Header Keywords



Columns	Keywords
Position	line;no.
Quantity	quantity shipped;ouantity shippeo;units shipped;qty. shipped;shipped qty;qty shipped;quantity;qty ship;ship qty;shipped;uantity;io.shp;pieces;rolls;hours;cases;shpd.;qty.;ship;qty;
Description	product description;item description;description
Unit Price	price / per;unit price;price each;individual;list price;net price;unit amt;:price;charge;:unit;price;rate;cost
Total Price	net sales amount;extended price;curret billing;extended cost;total amount;total price;ext amount;ext. price;line price;net price;extension;extended;balance;amount;total;price;netto
Discount	discount percent;discount
Unit Measure	u / m;unit;uom;u/m;per;um
Article Code	product number;catalog number;item number /;product code;stock number;part number;item number;article nr;item code;material*;model no;product;part#;code;item

Row and Column Detection

The next step applies five different algorithms that attempt to read the lines under the header and interpret the columns. To switch the Table Locator configuration panel into Debug Mode where you can test individual algorithms, press Ctrl-F12. The algorithm with the best score wins – the other four are ignored.



```
Header: 2 ms
Amounts-based algorithm: 2 ms
Total time: 4 ms


Algorithm results:
0.00 Points for Algorithm "Amount-based"
0.00 Points for Algorithm "Position-based"
0.00 Points for Algorithm "Header-based"
0.00 Points for Algorithm "Lines-Based"
0.00 Points for Algorithm "Layout-based"
```

Colors in Document:
Header Line: 🟩
Horiz. Line: 🟥
Vert. Line: 🟥
Colors in Grid:
Numeric: 🟨
Mixed: 🟨
Alpha: 🟨
Interpolated: 🟦

Amount-based Algorithm

Attempts to find mathematical relationships in rows (e.g. A*B=C).

To improve it, make sure that your format locator that feeds the table locator is finding the amounts in the table.

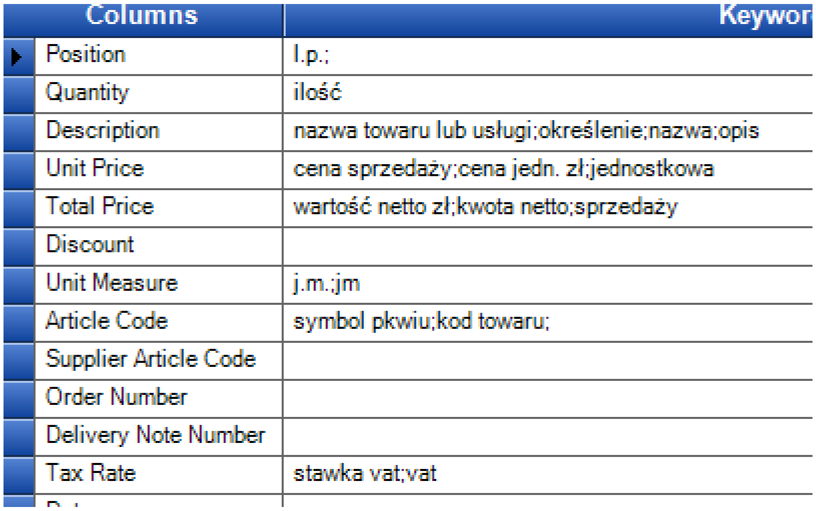
Position-based Algorithm

Attempts to find an increasing number, probably on the left of the document, which represents the position number in the invoice. Ideally it is 1, 2, 3, 4, 5, 6, …..

Header-based Algorithm

Attempts to use the header words to understand where the columns are.

To improve it, make sure that your Table Header Pack is complete with all possible keywords for the columns. This example would fail to find the discount and supplier article code columns. There are only four description column names, which are also probably too few. Correct the spelling of the keywords to improve fuzzy scoring across all of your invoices.



Columns	Keywor
Position	l.p.;
Quantity	ilość
Description	nazwa towaru lub usługi;określenie;nazwa;opis
Unit Price	cena sprzedaży;cena jedn. zł;jednostkowa
Total Price	wartość netto zł;kwota netto;sprzedaży
Discount	
Unit Measure	j.m.;jm
Article Code	symbol pkwiu;kod towaru;
Supplier Article Code	
Order Number	
Delivery Note Number	
Tax Rate	stawka vat;vat

Line-based Algorithm

Attempts to find the table cells based on horizontal and vertical lines that are on the pages. You cannot improve how this algorithm works.

Layout-based Algorithm

Attempts to use white space between columns to understand where the columns are. You cannot improve how this algorithm works.

Manual Table Locator

This second mode of the Table Locator uses sample documents to identify a previously-seen table.

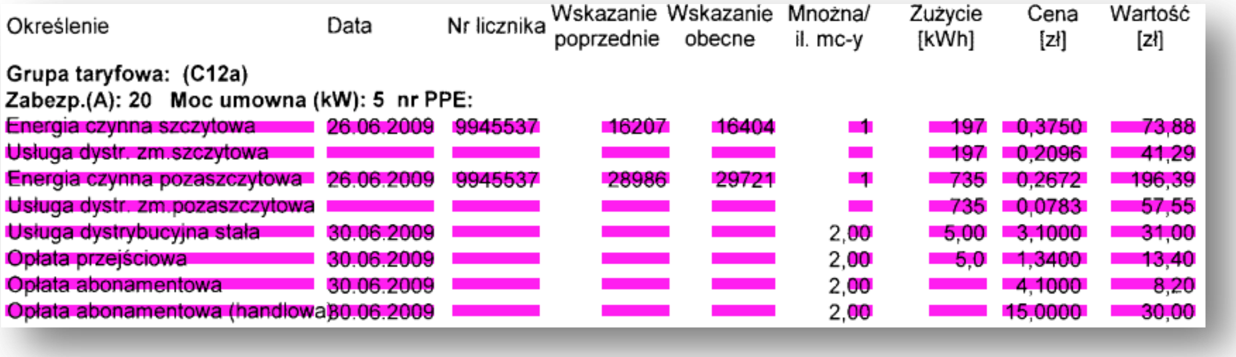
You can either make subclasses for important vendors with their own Manual Table Locator, or use the Online Learning Mechanism's specific knowledge bases to store these sample tables.

The easiest way to understand the table locator is to imagine a stencil (http://en.wikipedia.org/wiki/Stencil) being moved down the page looking for matches. It does not look for the table header.

Tips

- The "master item" should be a table row containing optional row and long descriptions.
- The "master item" should not have missing cells.

- Mark the optional rows in the master item.
- Expand the left and right edges of the cells.
- Make sure that you mark optional cells.
- Cell Types are internal algorithms that attempt to work it if the cells are numeric or alphabetic.
- After online learning, check and correct specific training samples in the Edit Document Dialog (press F10 on the Xdoc).
- Anchors are words or phrases that appear on each table row, but are not needed to be read – they help with matching the stencil.
- In the example below we see that columns 2-6 are optional, and that column 6 s too narrow for the “2,00”. However the 2,00 will be correctly detected. But if the OCR engine sees “2 00” then only 00 will be found.
- The last row will have “(handlowa)80.06.2009” in column 1 because the characters run together.

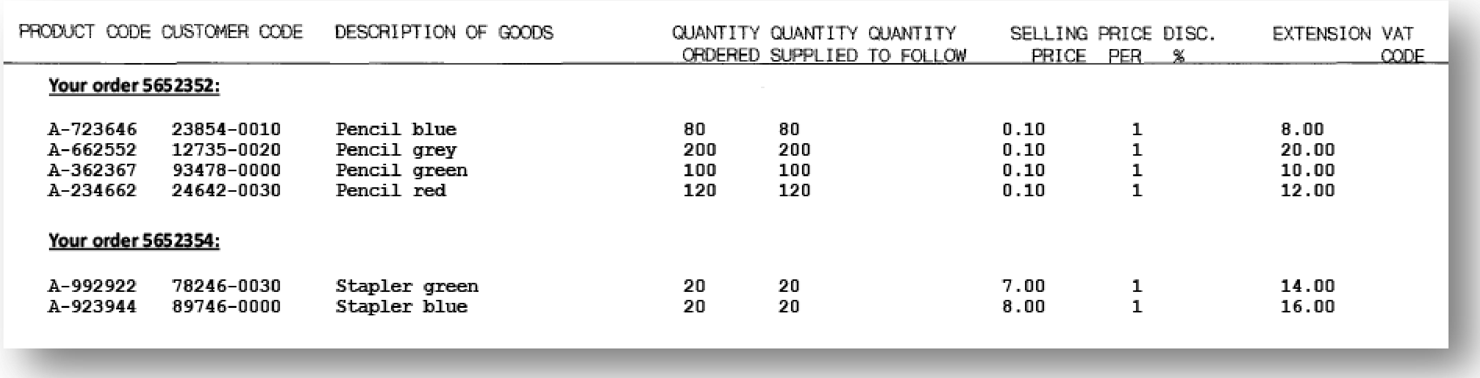


Określenie	Data	Nr licznika	Wskazanie poprzednie	Wskazanie obecne	Mnożna/ il. mc-y	Zużycie [kWh]	Cena [zł]	Wartość [zł]
Grupa taryfowa: (C12a)								
Zabezp.(A): 20 Moc umowna (kW): 5 nr PPE:								
Energia czynna szczytowa	26.06.2009	9945537	16207	16404	1	197	0,3750	73,88
Usługa dystr. zm.szczytowa						197	0,2096	41,29
Energia czynna pozaszczytowa	26.06.2009	9945537	28986	29721	1	735	0,2672	196,39
Usługa dystr. zm.pozaszczytowa						735	0,0783	57,55
Usługa dystrybucyjna stała	30.06.2009				2,00	5,00	3,1000	31,00
Opłata przejściowa	30.06.2009				2,00	5,0	1,3400	13,40
Opłata abonamentowa	30.06.2009				2,00		4,1000	8,20
Opłata abonamentowa (handlowa)	30.06.2009				2,00		15,0000	30,00

Both manual and automatic table detection can search for interleaved and embedded columns.

Interleaved Columns

An interleaved column is a value that applies to all the rows below it, like order numbers in the example below that appear before the first and fifth line items.



PRODUCT CODE	CUSTOMER CODE	DESCRIPTION OF GOODS	QUANTITY ORDERED	QUANTITY SUPPLIED	QUANTITY TO FOLLOW	SELLING PRICE	PRICE PER	DISC. %	EXTENSION	VAT CODE
Your order 5652352:										
A-723646	23854-0010	Pencil blue	80	80		0.10	1		8.00	
A-662552	12735-0020	Pencil grey	200	200		0.10	1		20.00	
A-362367	93478-0000	Pencil green	100	100		0.10	1		10.00	
A-234662	24642-0030	Pencil red	120	120		0.10	1		12.00	
Your order 5652354:										
A-992922	78246-0030	Stapler green	20	20		7.00	1		14.00	
A-923944	89746-0000	Stapler blue	20	20		8.00	1		16.00	

Embedded Columns

An embedded column is typically an article number or date appended to a description.

Line Item Matching Locator

LIMLoc matches the words on the invoices with the open purchase orders from the ERP system. It requires an SQL connection to a database containing open purchase orders.

If LIMLoc does not have a vendor ID, it cannot work.

If no PO numbers are provided, LIMLoc matches against the first 20 open orders in the database.

LIMLoc has a self-contained learning mechanism to improve its extraction.

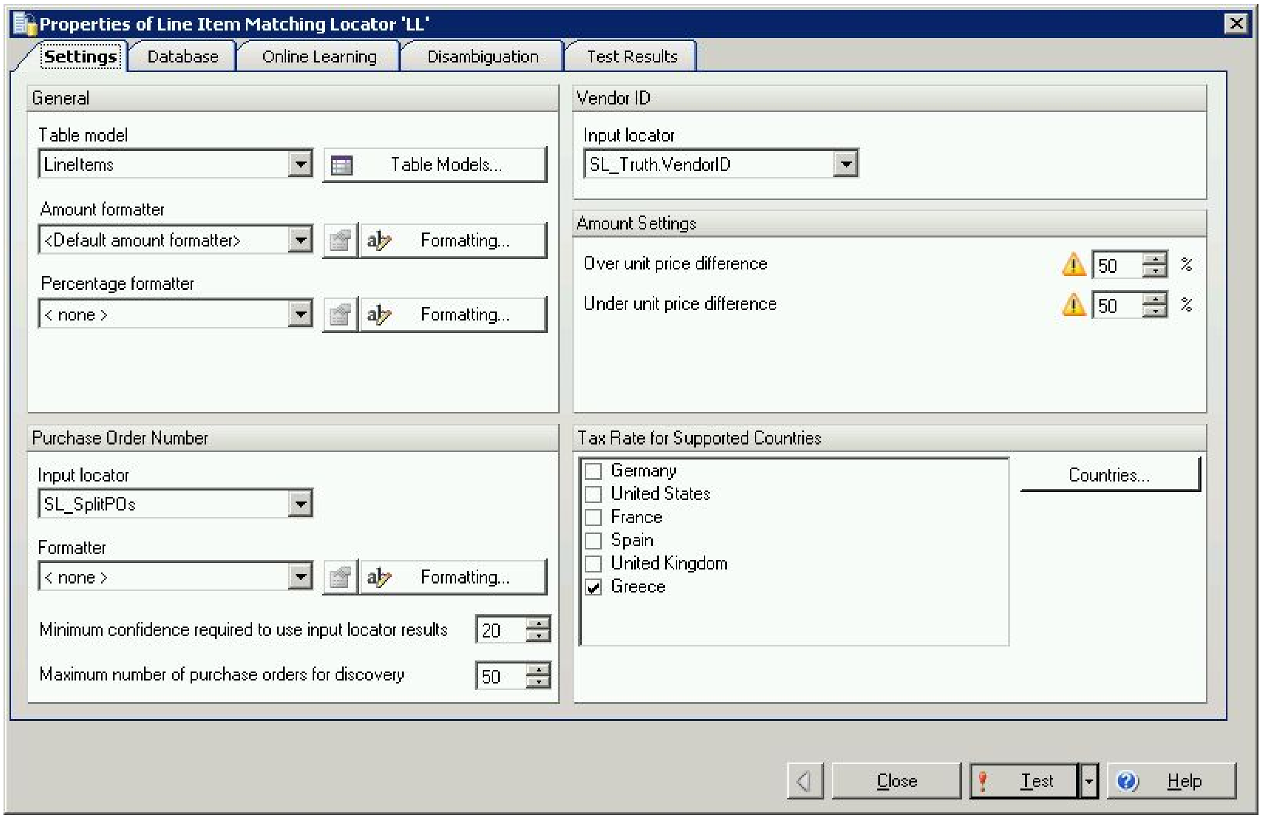
LIMLoc returns tolerance messages for each line item.

RemarkID	Valid	Message	Name
1	True	OK	IDS_MatchRemark_Match
2	True	Under Or over delivery	IDS_MatchRemark_UnderOverDelivery
3	True	Change In units of measurement	IDS_MatchRemark_UomChanges
4	True	Under Or over price	IDS_MatchRemark_UnderOverPrice
5	False	Missing unit price	IDS_MatchRemark_MissingUnitPrice
6	True	Unit price scaled by power of ten	IDS_MatchRemark_ScaledUnitPrice
7	True	Total amount scaled by power of ten	IDS_MatchRemark_ScaledTotalAmount
8	False	OCR errors	IDS_MatchRemark_OcrErrors
9	False	Only total amount Matched	IDS_MatchRemark_OnlyTotalAmount
10	False	Several matches possible	IDS_MatchRemark_Ambiguous
11	False	Only quantity, unit price and total amount Matched	IDS_MatchRemark_UnmatchedConsistent
12	False	Could Not Match	IDS_MatchRemark_Unmatched
13	True	Validated by user	IDS_MatchRemark_UserValidated

Notes to Line Item Matching Locator

- remarkID 6 and 7 only look for scaling of 10, 100 and 1000.
- Multiple PO numbers can be passed in as either
    - a semicolon separated value
    - a list of alternatives
    - a list of subfields.
- Limloc also checks at PO numbers that are not passed in as parameters, meaning that matches can still be found if a PO number is not found from multiple POs.

- Over & Under Delivery has a tolerance of +-3%. This can be extended much further with KTM 6sp1.



Properties of Line Item Matching Locator 'LL'

General

Table model: LineItems

Amount formatter: <Default amount formatter>

Percentage formatter: < none >

Vendor ID

Input locator: SL_Truth.VendorID

Amount Settings

Over unit price difference 50 %

Under unit price difference 50 %

Purchase Order Number

Input locator: SL_SplitPOs

Formatter: < none >

Minimum confidence required to use input locator results 20

Maximum number of purchase orders for discovery 50

Tax Rate for Supported Countries

□ Germany
□ United States
□ France
□ Spain
□ United Kingdom
☑ Greece

- If there are discounts in the line item the Unit Price is replaced with the discounted amount.
- Limloc only supports tax discounts that are the same on all line items.

Combining Locators

You will obtain the best results with table detection by combining together these ten locators.

Locator Name	Locator Type	Function
IGL	Invoice Group	Finds the VendorID from Online Learning
OGL	Order Group	Finds the Order Number from Online Learning
FL_PO	Format	Finds PO Number candidates
IE	Invoice Evaluator	Combines OGL.PO and FL_PO
DB_Vendor	Database	Finds vendor candidates
FL_VATID	Format	Finds VAT ID candidates
VL_Vendor	Vendor	Uses IGL.VendorID, DB_Vendor and FL_VATID to find the Vendor
LL	Line Item Matching	Uses IE.PO, VL_Vendor.VendorID and the SQL access to the Open PO database to find the line Items
FL_Amounts	Format	Finds any amounts on the document

TL	Table Locator	Uses LL and FL_Amounts to find the table.

The diagram below shows how to connect all the locators together for the Line Item Matching Locator.

Green marks learnable fields, **Blue** are not learnable.

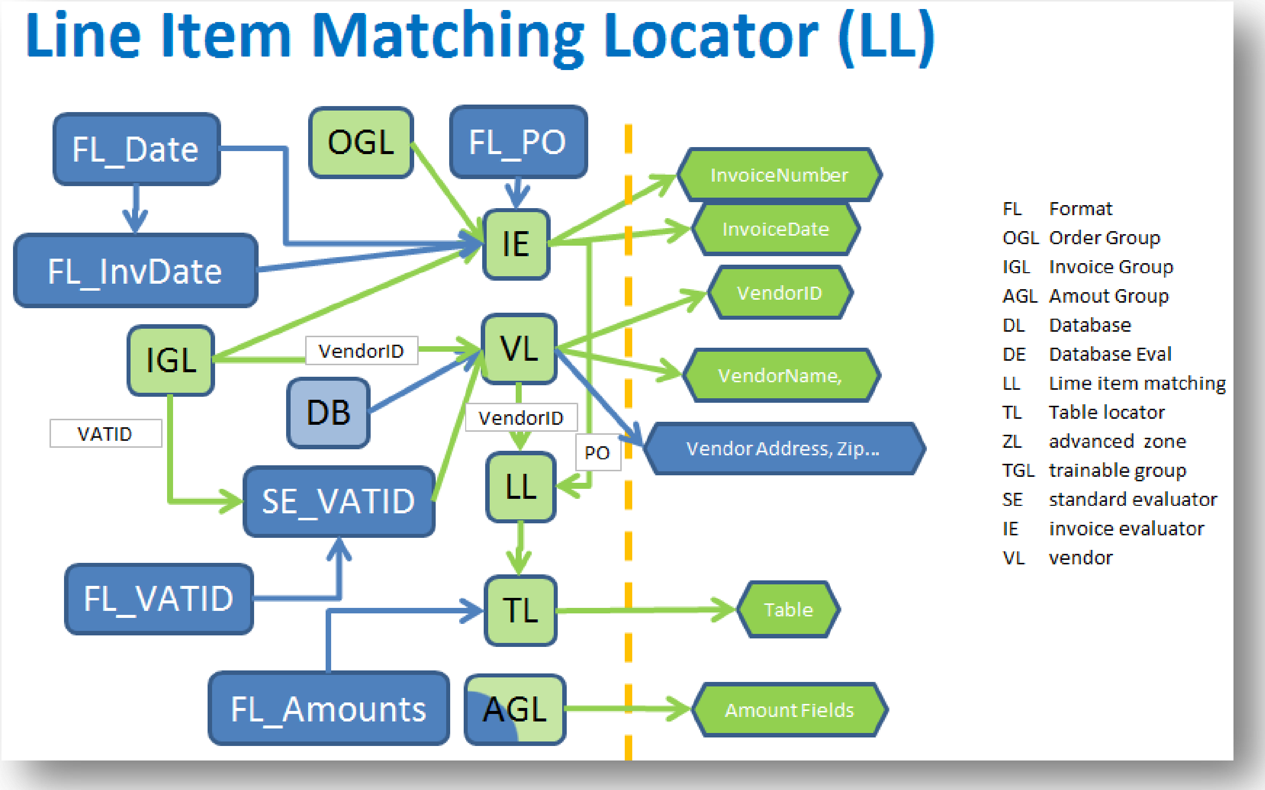


Table Interpolation in Validation

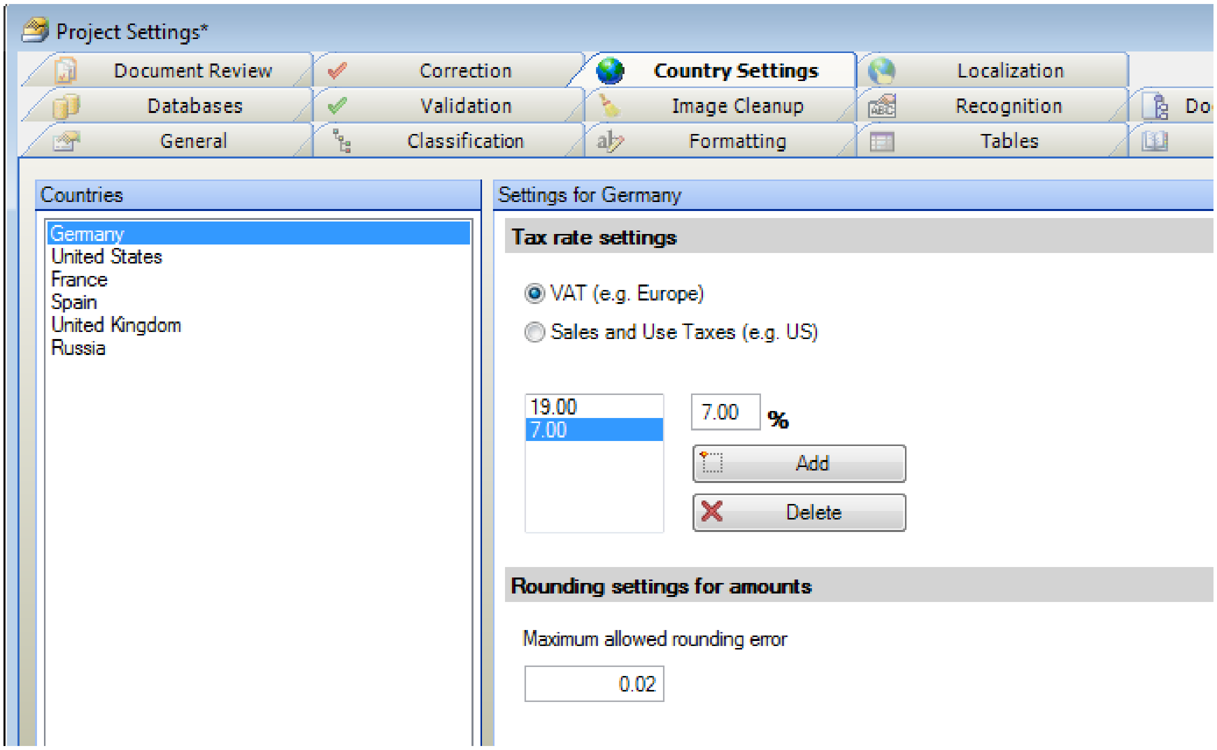
You can use the table interpolation feature in KTM Validation to quickly extract tables and also to train tables. You will need to examine these specific training samples in Project Builder by pressing F10 on the Xdocs.

The Interpolation Button can be pressed more than once. Interpolate a row, select another row and then interpolate that. This will successively find more of the table.

Localization

There are different kinds of localization in KTM

- Product - 10 Kofax Languages
- Project - ProjectSettings/Localization. Hierarchical Field/ErrorMsg localization mechanism using XML.
- Locator - Country Settings, dictionaries, validation rules......
- Localize Locators in KTM



Countries

- Germany
- United States
- France
- Spain
- United Kingdom
- Russia

Settings for Germany

Tax rate settings

● VAT (e.g. Europe)

○ Sales and Use Taxes (e.g. US)

19.00
7.00

7.00 %

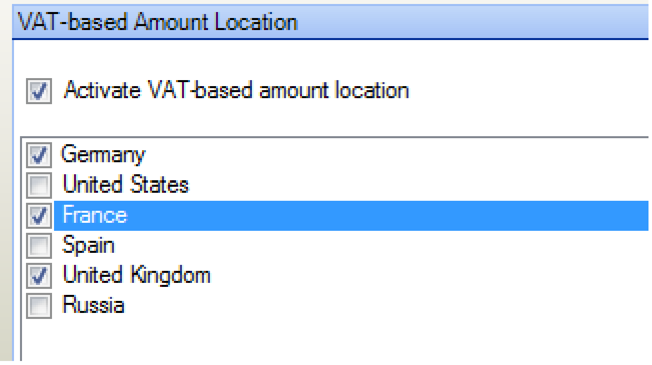
Rounding settings for amounts

Maximum allowed rounding error

0.02

Activate VAT countries in Amount Group Locator for Value Added Tax or GST (Goods and Services Tax)

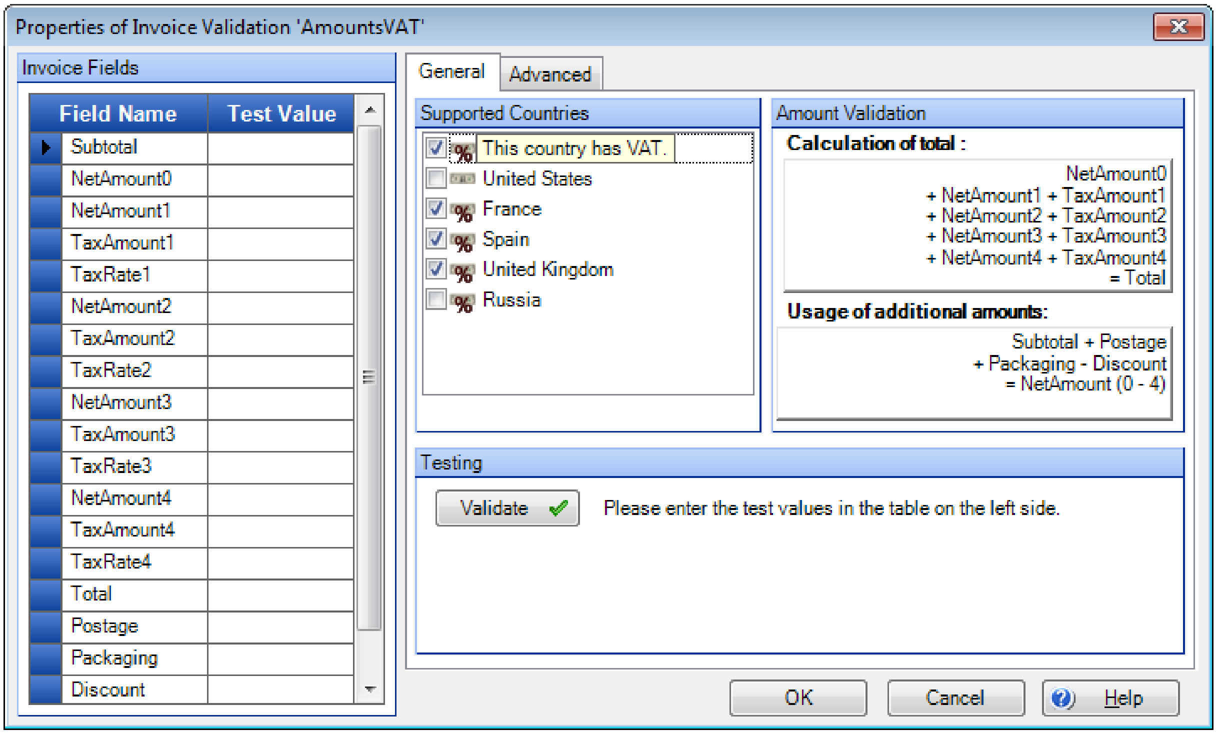
You cannot mix SalesTax and VAT/GST into one locator.


VAT-based Amount Location

☑ Activate VAT-based amount location

☑ Germany
☐ United States
☑ France
☐ Spain
☑ United Kingdom
☐ Russia

Select valid VAT rates in the Invoice Validation Rule.



Properties of Invoice Validation 'AmountsVAT'

Invoice Fields

Field Name	Test Value
Subtotal	
NetAmount0	
NetAmount1	
TaxAmount1	
TaxRate1	
NetAmount2	
TaxAmount2	
TaxRate2	
NetAmount3	
TaxAmount3	
TaxRate3	
NetAmount4	
TaxAmount4	
TaxRate4	
Total	
Postage	
Packaging	
Discount	

Supported Countries

☑ This country has VAT.
☐ United States
☑ France
☑ Spain
☑ United Kingdom
☐ Russia

Amount Validation

Calculation of total :

NetAmount0
+ NetAmount1 + TaxAmount1
+ NetAmount2 + TaxAmount2
+ NetAmount3 + TaxAmount3
+ NetAmount4 + TaxAmount4
= Total

Usage of additional amounts:

Subtotal + Postage
+ Packaging - Discount
= NetAmount (0 - 4)

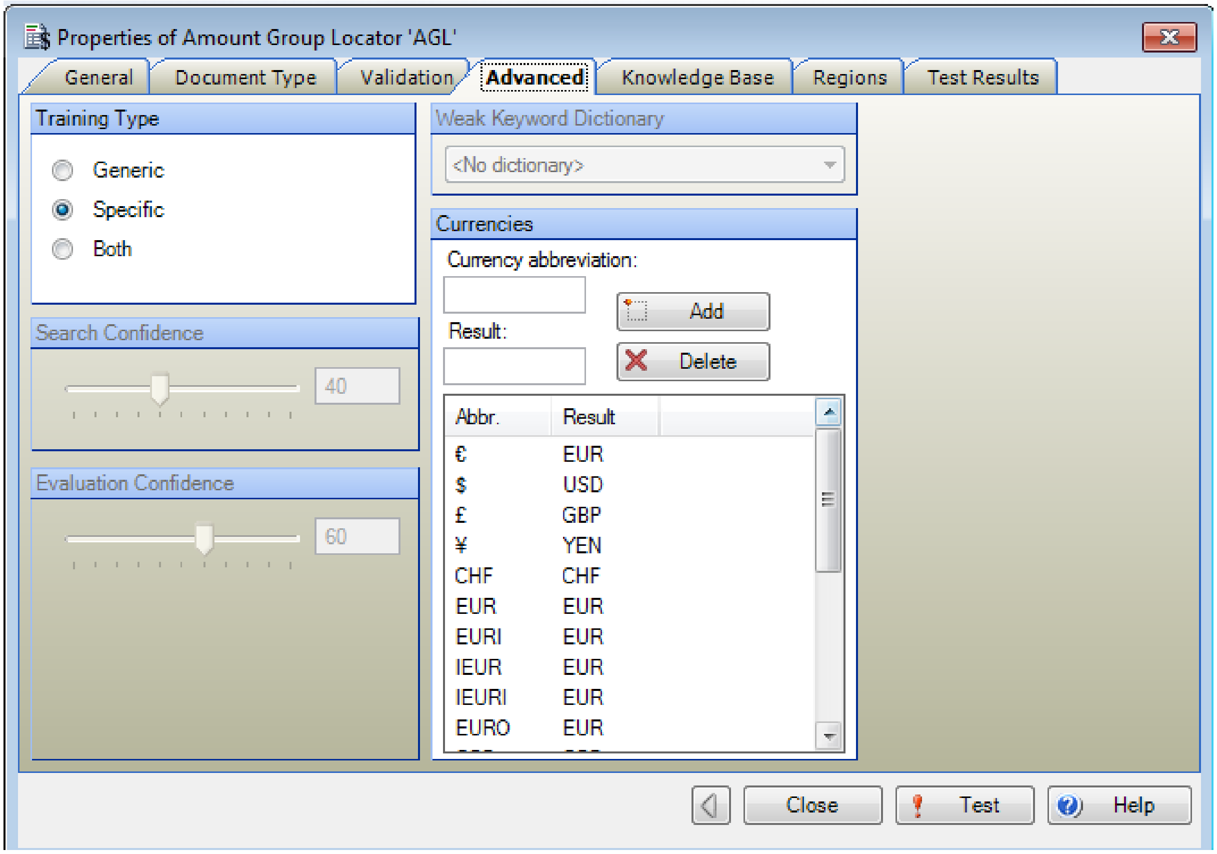
Testing

Please enter the test values in the table on the left side.

Invoice Group Locator/AmountGroupLocator/OrderGroupLocator

Load your knowledge bases (InvoiceAddOnPack comes with en_us, en_uk, De,ES,Fr)

Amount Group Locator has a hardcoded list of currency expressions



Properties of Amount Group Locator 'AGL'

Training Type

○ Generic
● Specific
○ Both

Weak Keyword Dictionary

<No dictionary>

Search Confidence: 40

Evaluation Confidence: 60

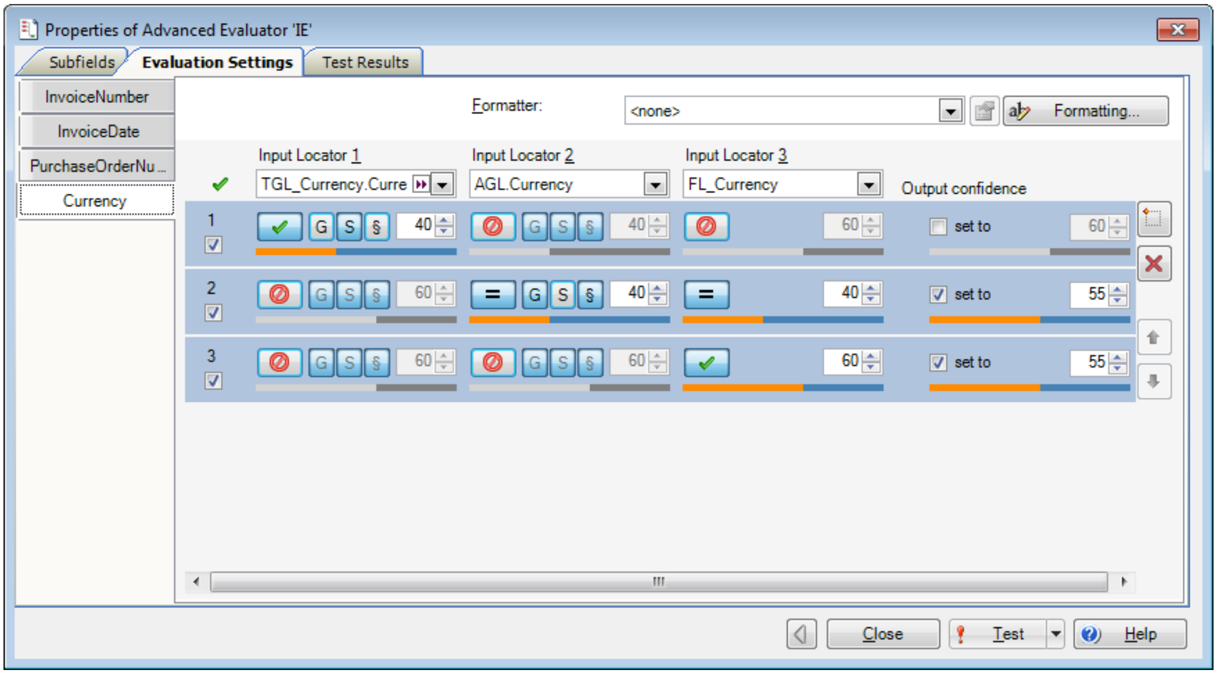
Currencies

Currency abbreviation:

Result:

Abbr.	Result
€	EUR
$	USD
£	GBP
¥	YEN
CHF	CHF
EUR	EUR
EURI	EUR
IEUR	EUR
IEURI	EUR
EURO	EUR

The InvoiceEvaluator.Currency is favouring the Trainable group locator over AGL for currency detection (which is a good idea)



Properties of Advanced Evaluator 'IE'

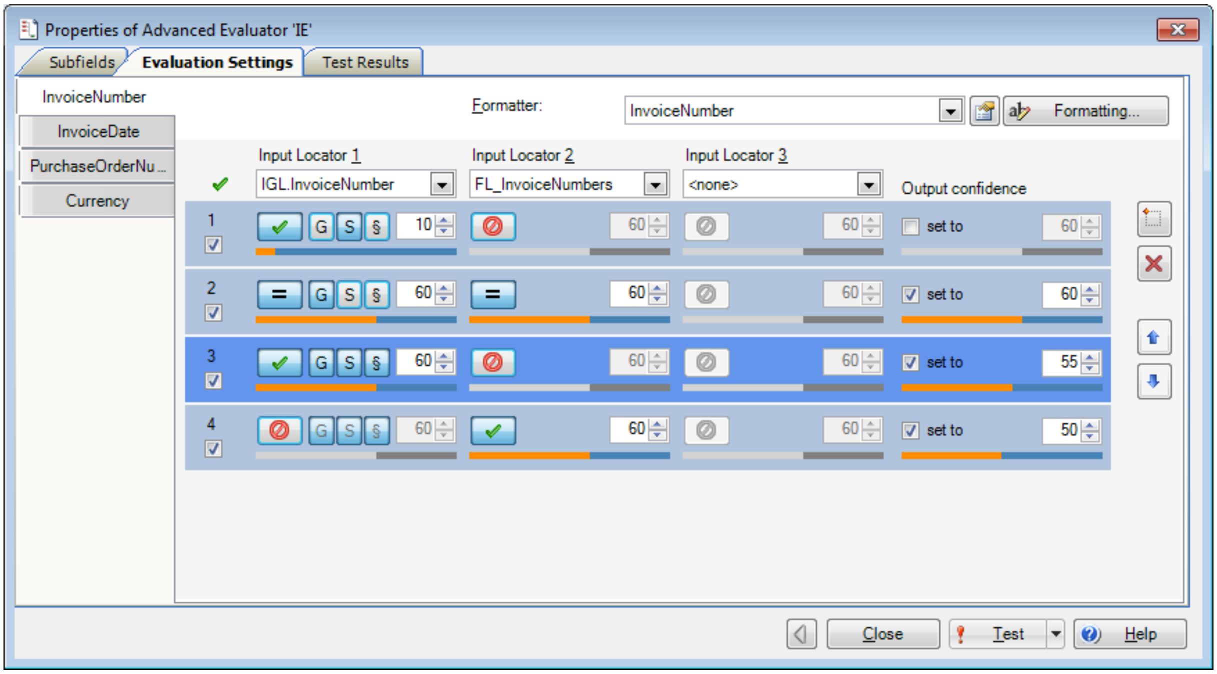
Formatter: <none>

	Input Locator 1	Input Locator 2	Input Locator 3	Output confidence
✓	TGL_Currency.Curre	AGL.Currency	FL_Currency	
1 ☑	✓ G S § 40	⊘ G S § 40	⊘ 60	☐ set to 60
2 ☑	⊘ G S § 60	= G S § 40	= 40	☑ set to 55
3 ☑	⊘ G S § 60	⊘ G S § 60	✓ 60	☑ set to 55

InvoiceEvaluator.InvoiceNumber

It is CRITICALLY important that the IGL ALWAYS beats the FL in invoice number and invoice date detection, because the learning system MUST ALWAYS beat hardcode dictionary lists. Dictionary lists are only backup mechanisms – they can never override human corrections.

In an untuned project we always start with high mistrust of FL' dictionaries. This can be relaxed based on large benchmarks.



Formatter: InvoiceNumber

	Input Locator 1	Input Locator 2	Input Locator 3	Output confidence
	IGL.InvoiceNumber	FL_InvoiceNumbers	<none>	
1 ☑	✓ G S § 10	⊘ 60	⊘ 60	☐ set to 60
2 ☑	= G S § 60	= 60	⊘ 60	☑ set to 60
3 ☑	✓ G S § 60	⊘ 60	⊘ 60	☑ set to 55
4 ☑	⊘ G S § 60	✓ 60	⊘ 60	☑ set to 50

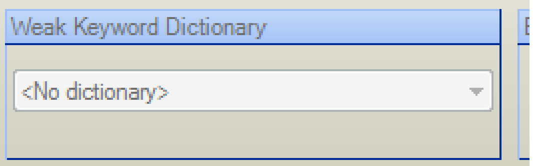
Dictionaries

There are dictionary files in the invoice add on pack. You can add more words. Focus on putting a few good strong phrases into your dictionaries

STRONG PHRASES – not ambiguous. These words ALWAYS mean your field "invoice number", "invoice num"

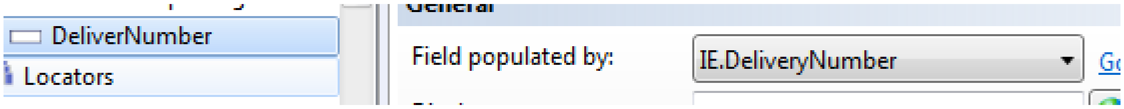
WEAK PHRASES – ambiguous, "Number"**,** "invoice" **,**"Reference"

The Invoice Group Locator (IGL) and Order Group Locator (OGL) have weak keyword dictionaries, which tell the locators what words are weak (i.e. ambiguous). These allow the OGL & OGL to **reduce** the confidence of ambiguous results.

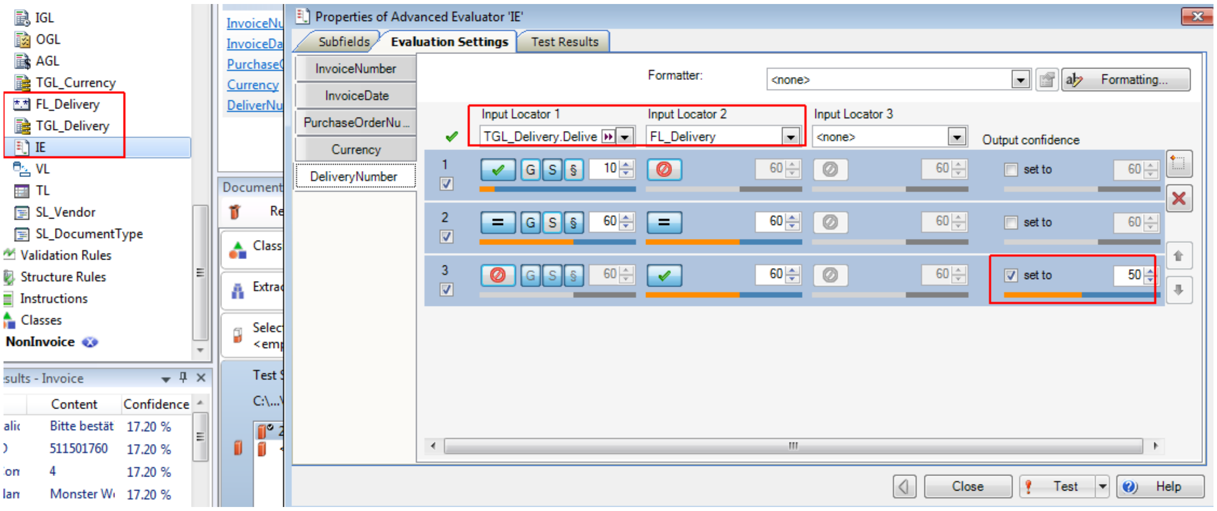

Weak Keyword Dictionary

<No dictionary>

Delivery Number strategy



Field populated by: IE.DeliveryNumber



IGL
OGL
AGL
TGL_Currency
FL_Delivery
TGL_Delivery
IE
VL
TL
SL_Vendor
SL_DocumentType
Validation Rules
Structure Rules
Instructions
Classes
NonInvoice

sults - Invoice

	Content	Confidence
alic	Bitte bestät	17.20 %
)	511501760	17.20 %
on	4	17.20 %
lan	Monster W	17.20 %

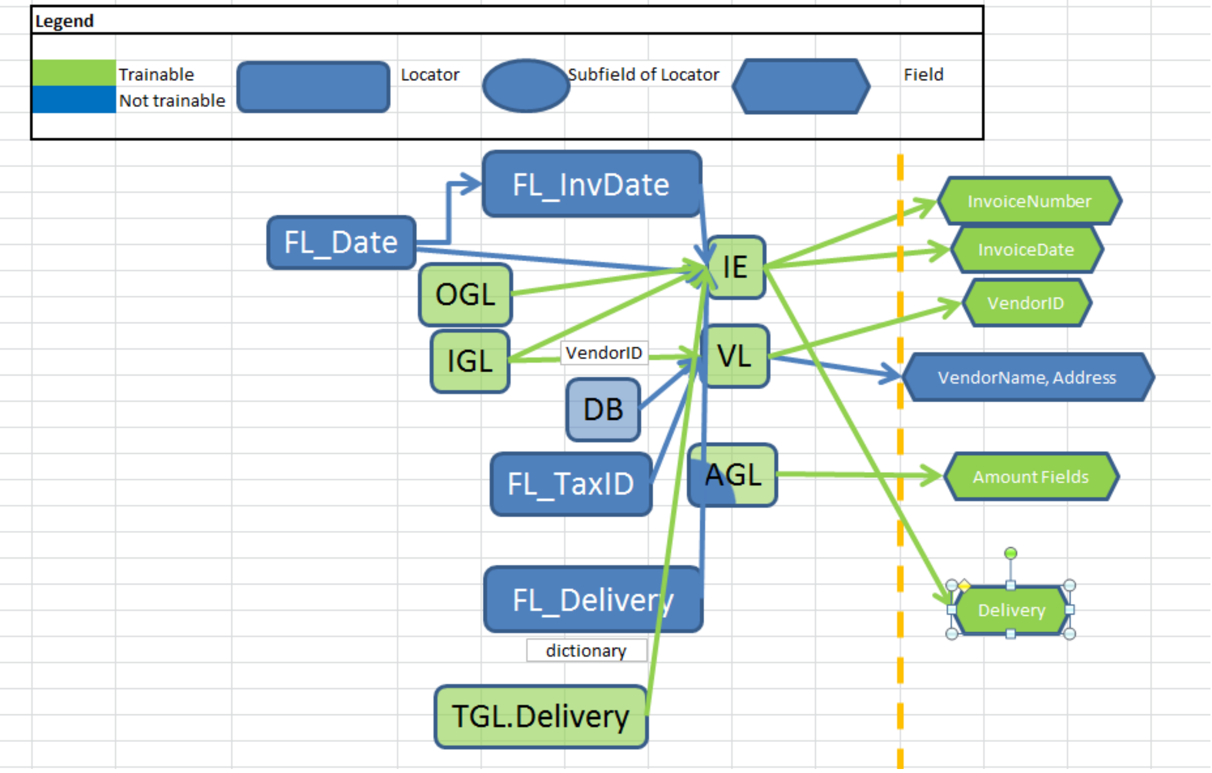
Properties of Advanced Evaluator 'IE'

Subfields | **Evaluation Settings** | Test Results

InvoiceNumber
InvoiceDate
PurchaseOrderNu...
Currency
DeliveryNumber

Formatter: <none>

	Input Locator 1	Input Locator 2	Input Locator 3	Output confidence
✓	TGL_Delivery.Delive	FL_Delivery	<none>	
1 ☑	✓ G S § 10	⊘ 60	⊘ 60	☐ set to 60
2 ☑	= G S § 60	= 60	⊘ 60	☐ set to 60
3 ☑	⊘ G S § 60	✓ 60	⊘ 60	☑ set to 50

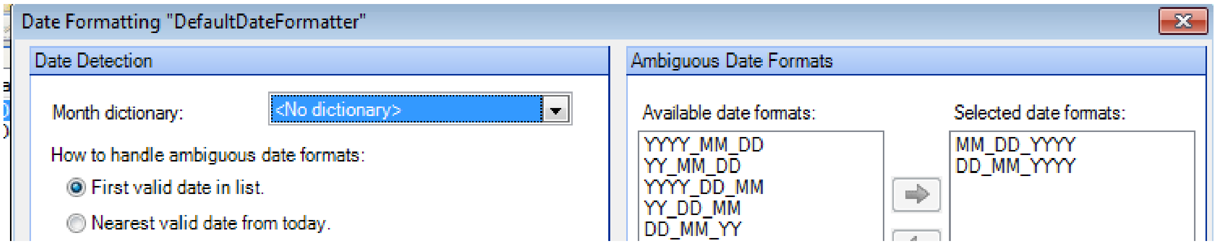


In KTM 6 the “Invoice Evaluator” was renamed to “Advanced Evaluator”

Dates

You cannot mix US and European invoices.

If you configure a Field Formatter to support both DD_MM_YYYY and MM_DD_YYYY you will end up with flipping numbers.



Date Formatting "DefaultDateFormatter"

Date Detection

Month dictionary: <No dictionary>

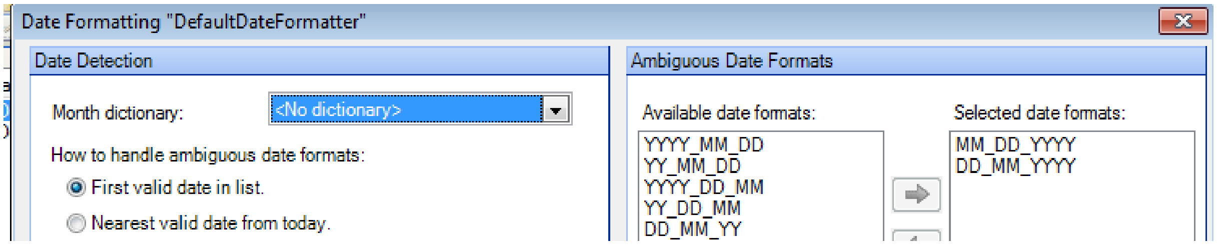
How to handle ambiguous date formats:

● First valid date in list.

○ Nearest valid date from today.

Ambiguous Date Formats

Available date formats:	Selected date formats:
YYYY_MM_DD	MM_DD_YYYY
YY_MM_DD	DD_MM_YYYY
YYYY_DD_MM	
YY_DD_MM	
DD_MM_YY	



Date Formatting "DefaultDateFormatter"

Date Detection

Month dictionary: <No dictionary>

How to handle ambiguous date formats:

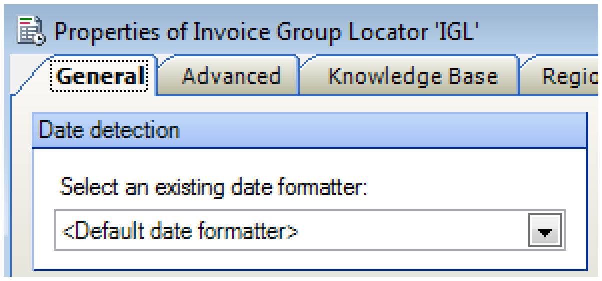
● First valid date in list.

○ Nearest valid date from today.

Ambiguous Date Formats

Available date formats:	Selected date formats:
YYYY_MM_DD	MM_DD_YYYY
YY_MM_DD	DD_MM_YYYY
YYYY_DD_MM	
YY_DD_MM	
DD_MM_YY	

IGL uses the field formatter.

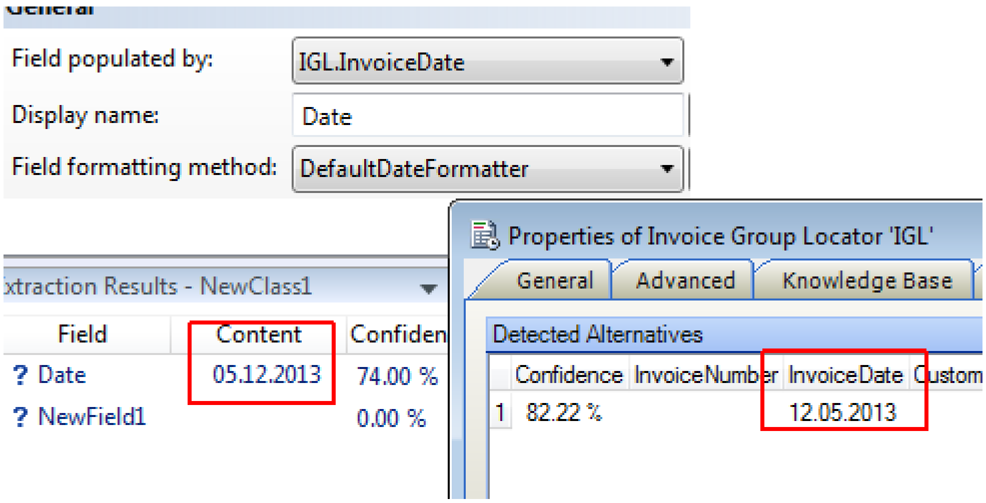


Properties of Invoice Group Locator 'IGL'

Date detection

Select an existing date formatter: <Default date formatter>

Field uses the field formatter.



General

Field populated by: IGL.InvoiceDate

Display name: Date

Field formatting method: DefaultDateFormatter

xtraction Results - NewClass1

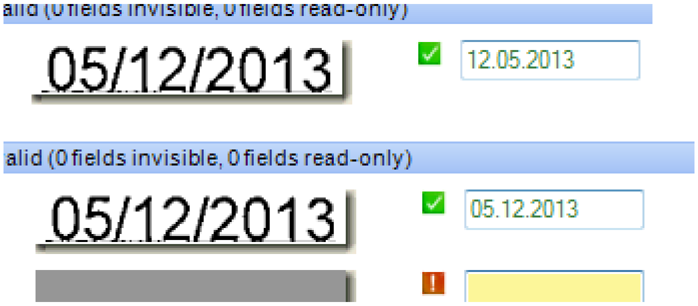
Field	Content	Confiden
? Date	05.12.2013	74.00 %
? NewField1		0.00 %

Properties of Invoice Group Locator 'IGL'

Detected Alternatives

	Confidence	InvoiceNumber	InvoiceDate	Custom
1	82.22 %		12.05.2013	

Validation GUI uses the field formatter when you press ENTER



alid (0 fields invisible, 0 fields read-only)

05/12/2013 ☑ 12.05.2013

alid (0 fields invisible, 0 fields read-only)

05/12/2013 ☑ 05.12.2013

Batch Restructuring

In the events **Batch_Open** and **Batch_Close** you have access to the global object **Batch**, which contains many straightforward methods for moving, deleting and copying documents and pages and also for creating child batches.

Workflow Agents not needed

Workflow Agents are used in Kofax Capture to split batches, route documents, report statistics, change user permissions and other things.

Most of these tasks are far easier to implement in KTM than to write a DLL for Kofax Capture.

In the **Batch_Close** event you can split, merge, move and delete documents, create child batches, reject documents and pages and skip modules.

You cannot however change batch permissions

```
Private Sub Batch_Close(ByVal pXRootFolder As CASCADELib.CscXFolder, ByVal CloseMode As
CASCADELib.CscBatchCloseMode)
   Batch.DeleteDocument(pXRootFolder,3)
   If pXRootFolder.Valid And
Project.ScriptExecutionMode=CscScriptExecutionMode.CscScriptModeServer Then
      pXRootFolder.XValues.Set("KTM_DOCUMENTROUTING_QUEUE_THISBATCH", "KC.PDF")
   End If
   Batch.MoveDocumentTo(pXFolder,0,NewFolder,1)
   ….
```

The following read/write XValues can be used to reject documents and pages

```
XDocInfo.XValues.ItemByName("AC_REJECTED_DOCUMENT")
XDocInfo.XValues.ItemByName("AC_REJECTED_DOCUMENT_NOTE").
XDocInfo.XValues.ItemByName("AC_REJECTED_PAGE2")    'reject the 3rd page
XDocInfo.XValues.ItemByName("AC_REJECTED_PAGE_NOTE3")
```

Splitting Batches

```
'Split a document to another batch
pXRootFolder.DocInfos(x).XValues.Set("KTM_DOCUMENTROUTING", ChildBatchName)
'Route a child batch to another KC module
pXRootFolder.XValues.Set("KTM_DOCUMENTROUTING_QUEUE_" & ChildBatchName, "KC.PDF")
'Rename a child batch
'If this step is skipped, then the batch will be automatically named
pXRootFolder.XValues.Set("KTM_DOCUMENTROUTING_BATCHNAME_" & ChildBatchName,
pXRootFolder.XValues.Item("AC_BATCH_NAME") & " " & ChildBatchName)
```

Auditing a KTM Project in production

1. Benchmark Data
2. Observe Users using KTM
3. Observe processes before and after KTM
4. Project Examination
    - a. Examine Project Class Tree
        - i. Good hierarchy
        - ii. Field and locator inheritance
    - b. Field Names (consistent, do they all come from locators?)
    - c. Locators
        - i. (order, naming FL_, SL_, AGL_, DL, etc)
    - d. Field Formatters
        - i. Well named, simple. Are they used?
    - e. Validation Rules
        - i. Every editable field must have at least one validation rule.
        - ii. Use multifield validation rules even for single fields, so you can access pXDoc
    - f. Validation Forms
        - i. Does it have good usability? “Mouse-lessness”, cursor, keyboard shortcuts, eye movement?
    - g. Run the benchmarks
        - i. Start fixing false positives
        - ii. Reduce false negatives
        - iii. Reduce true negatives.

Scripting Guidelines

Many KTM projects have thousands of lines of complicated scripting. If you follow these principles below, you will have that scripts that are easy to test, debug and understand, short, reusable in other projects. If your scripts are longer than 1000 lines then they are probably too complicated.

Productivity, before Accuracy

Spend more time writing scripts for user productivity, than in writing scripts to improve OCR results or reduce true negatives. Don't be distracted by clever ideas that may not bring much value to the user

Divide & Conquer

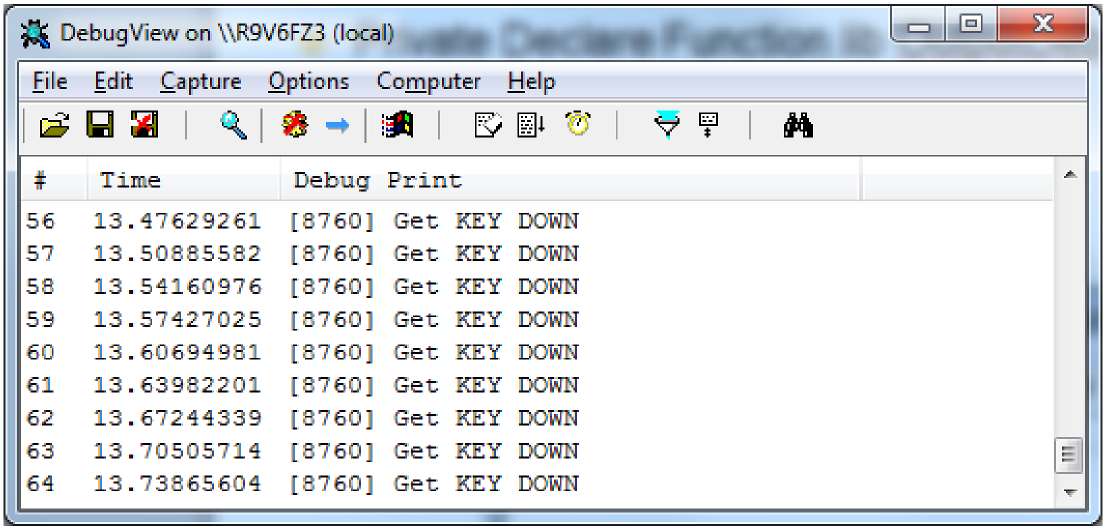
"Find & Filter" -It's often much easier to find alternatives and then filter the bad ones rather than build a complex logic to find only the good ones. Let a table locator find too many rows, and then write a script locator to delete the unwanted rows.

"Find & Fill" – one locator may not find all values, use a script locator to find the rest, such as missing table rows or cells

Debugging

Debugging in Project builder

- Use SysInternals' Debugview to view, filter and log to file safely in a multithreaded 64 bit environment.
- You may also know Sysinternals' other useful products TCPView and Process Explorer http://technet.microsoft.com/en-us/sysinternals/bb896647.aspx



```
#   Time         Debug Print
56  13.47629261  [8760] Get KEY DOWN
57  13.50885582  [8760] Get KEY DOWN
58  13.54160976  [8760] Get KEY DOWN
59  13.57427025  [8760] Get KEY DOWN
60  13.60694981  [8760] Get KEY DOWN
61  13.63982201  [8760] Get KEY DOWN
62  13.67244339  [8760] Get KEY DOWN
63  13.70505714  [8760] Get KEY DOWN
64  13.73865604  [8760] Get KEY DOWN
```

Error handling

Do not ever use "On Error Resume." – you will miss unusual errors and there will be no messages.

Do not use "on error goto" unless:

- There is no other way

- You have only one line of code to test

Use Err.Raise to throw errors HARD. This will reject the batch and force it to Quality Control with an easy-to-read message both in QC and Batch Manager. In Project Builder the debugger will open with a breakpoint on the error.

```
Then Err.Raise 34588,,"Column '" & columnName & "' does not exist in database '" &
dbname & "'."
```

It is better that an error goes to Quality Control and is visible and fixed, than landing in an unread log file, which may take days to find and understand

Run a Benchmark with 100’s or 1000’s of files to fix your bugs before you go into production.

Separate Data from Logic.

Use Built-in script variables and script resources or external xml, txt, databases for parameters instead of constants and global parameters. You will not be able to fix them without republishing – and your customer will not be able to manage their data without your involvement.

Your code will be smaller, more readable, portable, and your customers can fix data problems themselves.

Always assume data is bad, wrong or missing

Validate everything. Check boundary conditions – never assume something exists. Check that arrays or Alternatives are not empty.

Put scripts in the right events

Scripts generally do one of the following - Classify, locate, , format, validate.

Script Task	Where to put it	Comment
Add/Remove/Delete pages or documents	**Batch_Open** & **Batch_Close**	Do everything with the global object Batch, so your results are synchronized to Kofax Capture
Classify Documents	**Document_AfterClassifyXDoc**	Use pXDocument.Reclassify(name, confidence)
Find Data on a Document or use other locators	**Script Locator**	
Change the Format of a field value	**Field Formatter**	These run after extraction in Server, and after the ENTER key is pressed in Validation
Check if a field value makes sense	**Validation Method**	These run after fields are formatted in the Server and Validation Modules.
Button Click in Validation	**ValidationForm_ButtonClicked**	Do not try to format or validate data here. Simply carry out the action of the Button which should only be inserting data into the field.

Do not use **Document_AfterExtract** to fill fields, use Script Locators

Use **Document_AfterExtract** only for these unusual cases

- Except for nested classes where you would need to duplicate script locator code.
- for formatting Zonal Reread values.

Use Formatters and Validation rules, not GUI Events in Validation Form.

Use well defined function names

Name all of your functions and subroutines Object_Method. This helps you organize your scripts better and make them more readable.

Refactor continuously.

Don‘t duplicate with copy/paste. Write functions and reuse them. Isolate your functions by only passing them the parameters they need – only very rarely do you need global variables in KTM – and they may be destroyed if a user clicks to a previous document, or if KTM server is processing documents in parallel.

Sample functions for Naming and Isolation. (These functions are very reusable in other projects)

```
Private Function String_CountDigits(a As String) As Long
Public Function String_RemoveAllSpaces(a As String) As String
Private Function Table_SumColumn(table As CscXDocTable, colID As Long,amountFormatter
As ICscFieldFormatter,ByRef sum As Double) As Boolean
Public Function XDocument_FindLeftTextMargin(pXDoc As CscXDocument,p As Long) As Long
Public Function XDocument_GetNextPhrase(ByVal pXDoc As CscXDocument,subfield As
CscXDocSubField, pixels As Long) As CscXDocWords
Private Sub Batch_SplitIntoSmallerBatches(ByVal Folder As CscXFolder, batchSize As
Integer)
```

Use KTM‘s Object Model. This will simplify your code and make it easier to read. Avoid using Strings.

The following example of a script locator uses many local variables, and none of them strings.

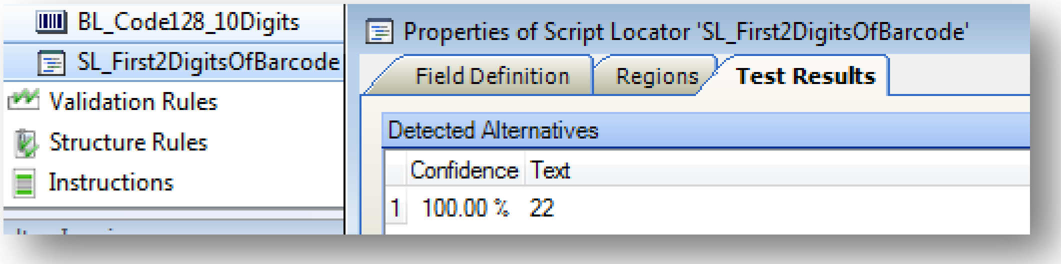
```
Private Sub SL_FillTable_LocateAlternatives(ByVal pXDoc As CASCADELib.CscXDocument, ByVal
pLocator As CASCADELib.CscXDocField)
   Dim l As Long, tablestart As Long, cols As CscXDocFieldAlternatives, a As Long, c As
Long, words() As CscXDocWords, w As Long, row As CscXDocTableRow, table As CscXDocTable
   Dim textline As CscXDocTextLine, newrow As Boolean, prevRow As CscXDocTableRow

Set textline=pXDoc.TextLines(l)
Set
words(c)=pXDoc.GetWordsInRect(textline.PageIndex,cols(a).Left,textline.Top,cols(a).Width,tex
tline.Height)
         For w = 0 To words(c).Count-1
            If words(w).LineIndex=l Then row.Cells(c).AddWordData(words(w))
         Next
```

Use CSCXDocWord(s), CSCXDocField, CSCDatabase, CSCXDocFieldAlternative(s), CSCXDocSubfield, CSCXDocTable

Instead of Strings. Your code will shorter and easier to read. Your will also discover more powerful things that you can do

How to write a Script Locator with a single Subfield

The following example takes the first two digits from a barcode.



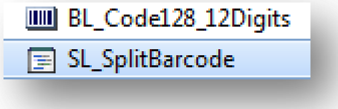
	Confidence	Text
1	100.00 %	22

```
Private Sub SL_First2CharactersOfBarcode_LocateAlternatives(ByVal pXDoc As
CASCADELib.CscXDocument, ByVal pLocator As CASCADELib.CscXDocField)
   Dim Barcodes As CscXDocFieldAlternatives
   Set Barcodes=pXDoc.Locators.ItemByName("BL").Alternatives
   If Barcodes.Count=0 Then Exit Sub ' No barcode was found, so we cannot classify
   If Len(Barcodes(0).Text)<2 Then Exit Sub 'This is not a valid barcode for
classification
   'Create an output alternative for this script locator
   With pLocator.Alternatives.Create
      .Text=Left(Barcodes(0).Text,2)
      .Confidence=Barcodes(0).Confidence 'Copy the confidence from the barcode locator
(it will always be 100%)
   End With
End Sub
```

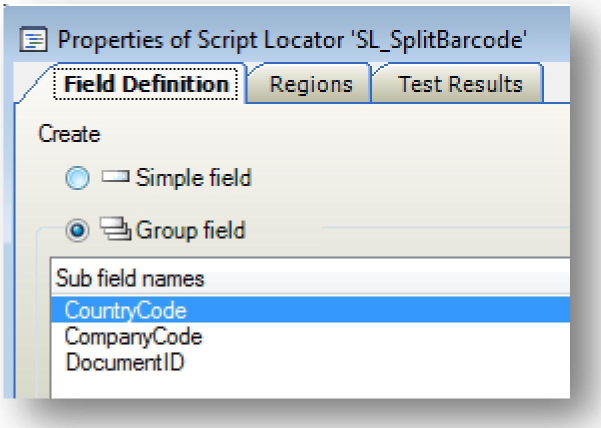
How to write a Script Locator with multiple Subfields

Let’s say a barcode needs splitting into a 2 digit Country Code, 3 digit Company Code and 9 digit DocumentID.

We have a Script Locator following the Barcode Locator



Give the Script Locator 3 Subfields.



Properties of Script Locator 'SL_SplitBarcode'

Create

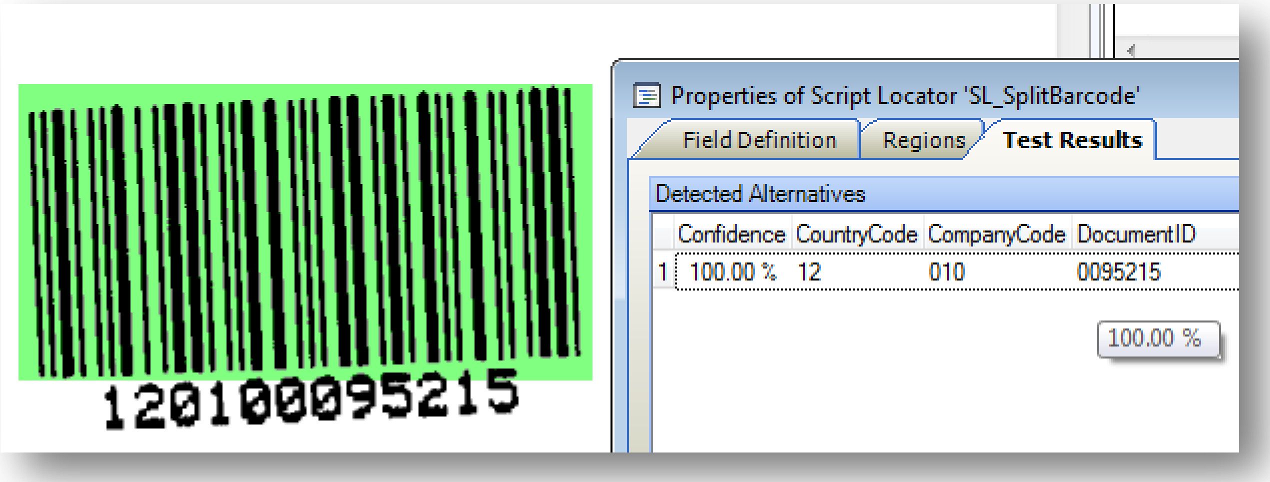
○ Simple field

● Group field

Sub field names

- CountryCode
- CompanyCode
- DocumentID

Below you can see the output of the script locator including alternative confidence in the first column and subfield confidence in the mouse hover text.



Properties of Script Locator 'SL_SplitBarcode'

Detected Alternatives

	Confidence	CountryCode	CompanyCode	DocumentID
1	100.00 %	12	010	0095215

100.00 %

```
Private Sub SL_SplitBarcode_LocateAlternatives(ByVal pXDoc As CASCADELib.CscXDocument,
ByVal pLocator As CASCADELib.CscXDocField)
   'Split a barcode into 3 pieces
   Dim barcode As CscXDocFieldAlternative, alternative As CscXDocFieldAlternative,
subfield As CscXDocSubField
   With pXDoc.Locators.ItemByName("BL").Alternatives
      If .Count=0 Then Exit Sub 'The barcode locator failed to find a barcode. Exit!
      Set barcode=.ItemByIndex(0) 'Get the first barcode found by the barcode locator
   End With
   If Len(barcode.Text)<>12 Then Exit Sub ' this is the wrong barcode!!
   'We now know we have a 12 digit barcode to split, so create the alternative to hold
the results of the script locator
   Set alternative=pLocator.Alternatives.Create
   alternative.Confidence=barcode.Confidence 'Copy the barcodes' confidence
   Set subfield=alternative.SubFields.Create("CountryCode")
   subfield.Text=Left(barcode,2)
   subfield.Confidence=barcode.Confidence
   Set subfield=alternative.SubFields.Create("CompanyCode")
   subfield.Text=Mid(barcode,3,3) ' the 3rd, 4th and 5th characters of the barcode
   subfield.Confidence=barcode.Confidence
   Set subfield=alternative.SubFields.Create("DocumentID")
   subfield.Text=Mid(barcode,6)  '6th character and following
   subfield.Confidence=barcode.Confidence
End Su
```

“In-Place” Locator Alternative Editing

In-place editing is a technique you can use to change the alternatives of preceding locators directly.

KTM runs all of the locators and afterwards copies locators into fields. This means if a locator changes a previous locator’s results then the changed results will ultimately be copied to the fields.

Using in-place editing is better than writing code in Document_AfterExtract event, because you are still using all of the field formatters, validation rules, and field thresholds and confidences correctly. You also do not interfere with the learning mechanisms.

The only disadvantage to using “in-place” editing is that you cannot see the results of your script locator when you press TEST. Also script locators don’t have the option to run all previous locators when testing. I usually put a breakpoint (F9) in my script and then process (F7) on a document to test and show the variables in the Watch Window (CTRL-W).

There are 3 occasions when this is important.

Multifield Script Locators

Let’s say that you want to change the results of the Amount Group Locator, which has 24 subfields.

Instead of creating the exact same 24 subfields in the script locator and copying all the values 24 times (and losing trainability for the fields) just do the following.

```
Private Sub SL_ChangeAGLResults(ByVal pXDoc As CASCADELib.CscXDocument, ByVal pLocator As
CASCADELib.CscXDocField)
   Dim alts As CscXDocFieldAlternatives, a As Long
   Set alts=pXDoc.Locators.ItemByName("AGL").Alternatives
   'If a currency is not found, set it to USD
   For a = 0 To alts.Count-1
      With alts(a).SubFields.ItemByName("Currency")
         If .Text="" Then .Text="USD": .Confidence=1.0
      End With
   Next
End Sub
```

Manipulating Trainable Locator Results

Script locators do not produce trainable results. So either use in-place editing on the trainable locator, or use an Evaluator to combine results together in the way you like.

Scripting Tables

Script locators do not support table objects. Table Locators are trainable. By editing or creating table rows with “in place” scripting, you can have automatic table location, specific knowledge bases, table interpolation in Validation Module and table learning all working together.

A Table Locator **always** creates a table object, even when no rows are detected.

The only way to give table cells coordinates is to use cell.AddWordData(word). Use either `pXDoc.GetWordsInRect()` or `Dim Word as new CSCXDocument` to make words.

If you delete rows from a table, make sure that you handle the row index carefully – this is easiest by starting at the last row of the table.

If specific training found a table that you want your script to ignore then use the following line

```
If pXDoc.Locators.ItemByName("TL").Alternatives(0).Source= _
CscXDocAlternativeSource.CscASSpecific Then Exit Sub
```

Example of “in-place” editing of a table.

```
Private Sub SL_CopyEmptyCellsFromAbove_LocateAlternatives( _
         ByVal pXDoc As CASCADELib.CscXDocument, _
         ByVal pLocator As CASCADELib.CscXDocField)
   'A table Locator's Table is stored in its first alternative
   Dim table As CscXDocTable
   Set table=pXDoc.Locators.ItemByName("TL").Alternatives(0).Table
   Table_CopyEmptyCellsFromAbove(table,pXDoc)
End Sub

Public Sub Table_CopyEmptyCellsFromAbove(table As CscXDocTable,pXDoc As CscXDocument)
   'Copies the values of cells to empty cells below
   Dim row As CscXDocTableRow,r As Long
   Dim cellAbove As CscXDocTableCell, cell As CscXDocTableCell, c As Long
   Dim words As CscXDocWords, w As Long
   For r =1 To table.Rows.Count-1 'start on second line of table
      Set row=table.Rows(r)
      For c =0 To row.Cells.Count-1
         Set cell=row.Cells(c)
         Set cellAbove=table.Rows(r-1).Cells(c)
         If cell.Text="" And  cellAbove.Text<>"" Then
            'Find the words in the cell above
            Set words=pXDoc.GetWordsInRect(cellAbove.PageIndex, _
                        cellAbove.Left,cellAbove.Top, _
                        cellAbove.Width,cellAbove.Height)
            For w =0 To words.Count-1
               'This is the ONLY way to set the coordinates of a table cell
               cell.AddWordData(words(w))
            Next
         End If
      Next
   Next
End Sub
```

A word about .Net and scripting

Content to be supplied later

Useful COM Objects & Win32 Functions

Object	Function
FileSystemObject	Deleting/Creating Folders. Winwrap is adequate for file input/output and

	Unicode
MicrosoftScriptingRuntime.	Dictionary. For creating lookup lists (also called hashes or associative arrays), counting words, removing duplicates, finding unique words, histograms. http://msdn.microsoft.com/en-us/library/x4k5wbx4.aspx
Microsoft VBScript Regular Expressions 5.5	Useful for splitting strings. Be aware that regex fails on OCR errors. Good for using in validation rules.
Microsoft ActiveX Data Objects 6.1 Library	SQL queries. (The KTM SQL object only supports SELECT and not INSERT) http://msdn.microsoft.com/en-us/library/windows/desktop/ms681504(v=vs.85).aspx
Microsoft XML, v 6.0	XML, XSL, Xpath, webservices, https, Kapow integration.
Private Declare Sub OutputDebugString Lib "kernel32" Alias "OutputDebugStringA" (ByVal msg As String)	Debugging with Sysinternals‘ DebugView
Private Declare Function QueryPerformanceCounter Lib "kernel32" (v As Long) As Boolean	Retrieves CPU time in the order or microseconds, but is not a true clock. Don‘t trust for timings.
Private Declare Function GetTickCount Lib "kernel32" () As Long	Retrieves the number of milliseconds (typical resolution of 10-16 ms) that have elapsed since the system was started, up to 49.7 days.

Barcodes

Content to be supplied later – barcode types, dimensions, quiet zones, Datamatrix, redundancy, checksums.

Unicode

Kofax Transformation is fully Unicode compliant, supporting almost any character set, including right-to-left languages.

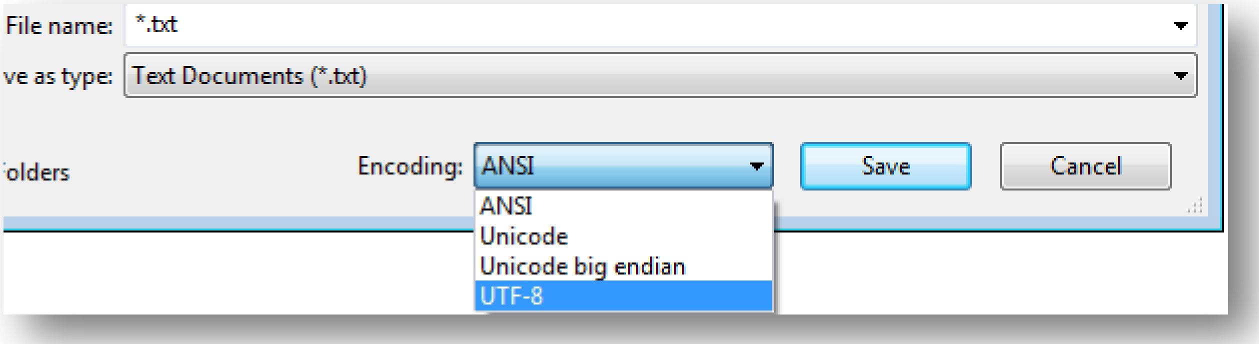
KTM has numerous XML configuration files which are all in Unicode.

However you need to take care that your **Databases** and **Dictionaries** are also in Unicode. In today’s global world with large customer databases, you really should always use Unicode.

Databases & Dictionaries

You should ALWAYS write your database and dictionary files using a Unicode encoding, either UTF-8 or UTF-16 (UTF-16 is also called Unicode). This will ensure that you have no character corruption or loss of data using characters outside of A-Z. Window’s **Notepad** can show and change the encoding in the File/SaveAs… Menu. **Unicode** is 16 bit. Use **UTF-8** for an 8 bit encoding and smaller file sizes.

In the image below from **Notepad.exe** the file is currently encoded in ANSI, and will be converted to UTF-8.



File name: *.txt

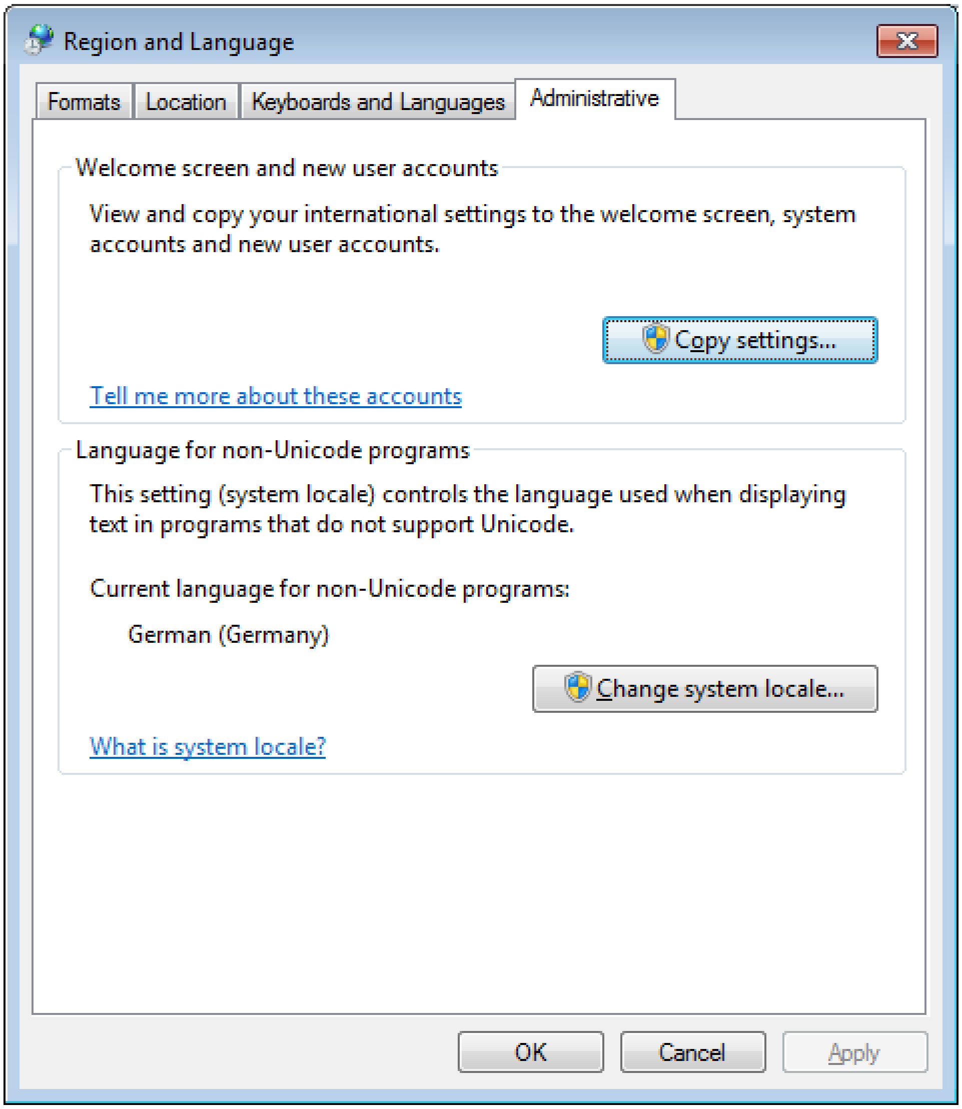
ve as type: Text Documents (*.txt)

Encoding: ANSI

When Kofax Transformation opens a database or dictionary file, it checks the first bytes of the file. If it finds a **http://en.wikipedia.org/wiki/Byte_order_mark** (BOM) it will parse the file according to the BOM. The UTF-8 BOM is **0xEF,0xBB,0xBF** and is seen as **ï»¿** in non-Unicode Text Editors using the Character set "Latin alphabet no. 1," ISO-8859-1.

If there is no BOM in the text file then Kofax Transformation will use the “Current Language for non-Unicode programs” in **ControlPanel/RegionAndLanguage/Administration** settings. KTM Server will use the “System Locale”. If your vendor searches work in Project Builder but fail in KTM server, you have possibly not encoded your databases in

Unicode.



Welcome screen and new user accounts

View and copy your international settings to the welcome screen, system accounts and new user accounts.

Language for non-Unicode programs

This setting (system locale) controls the language used when displaying text in programs that do not support Unicode.

Current language for non-Unicode programs:

German (Germany)

If you are exporting CSV databases for use as Fuzzy Databases, make sure that your system is inserting the BOM into the database files. If the system cannot do this, then you can use Search & Matching Server.

Scripting Unicode

The KTM scripting environment fully supports Unicode, except for the Debugger Windows. You can add Unicode characters directly into scripts.

```
   filename="Παρθενώνας.txt"
```

KTM scripts will automatically detect the encoding of a text file when you read it. Use the following code to create a Unicode file.

```
Open Filename For Output As #1
Print #1, vbUTF8BOM;
```

Corrupted File Names in Windows

Windows NTFS uses Unicode to store file names. However, if you unpack a zip file containing Russian or Greek filenames then the file names can be corrupted, and Project Builder will not be able to open the files. You have to change your regional settings before unzipping the files.

Summary

I hope this book has helped you to build a great KTM solution and make your customer very happy and productive.

This book will continue to improve as you provide feedback about what was good, bad, helpful or missing to field.enablement@kofax.com

Appendices

1. Document Collection With Kofax Express

This is your chance to obtain pristine images before people have stamped and marked them.

Note

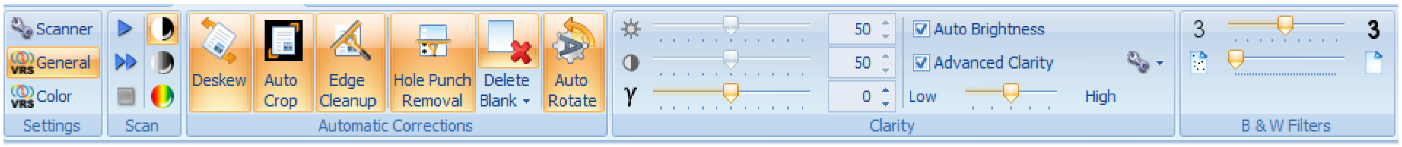
: If you are doing an invoice project, then you should take barcode stickers with you, or ask the customer to provide them.

Kofax Express is excellent for this task because:

- You can take Kofax Express to your customer's mailroom and scan documents before they stamp and mark them.
- It scans everything in color at the scanner's rated speed.
- You can change batch and export settings on the fly.
- You can manually or auto- separate documents.
- You can adjust VRS settings on each document in the batch after you have finished scanning (Kofax Capture can manipulate only the last scanned image)
- VRS adjustments are immediately seen on the document.

Using Kofax Express

- Make sure you have 300 dpi (Kofax Express defaults to 200 dpi)
- Set up VRS with Deskew, Autocrop, Edge Cleanup, Hole Punch Removal, auto brightness, auto-clarity 3.



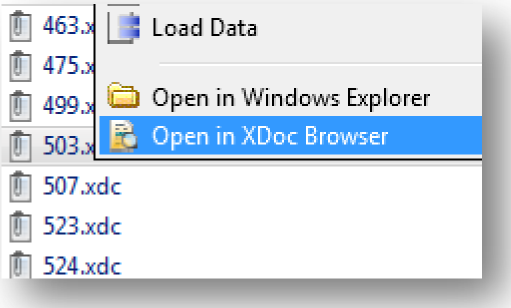
50
50
0
☑ Auto Brightness
☑ Advanced Clarity
3
3

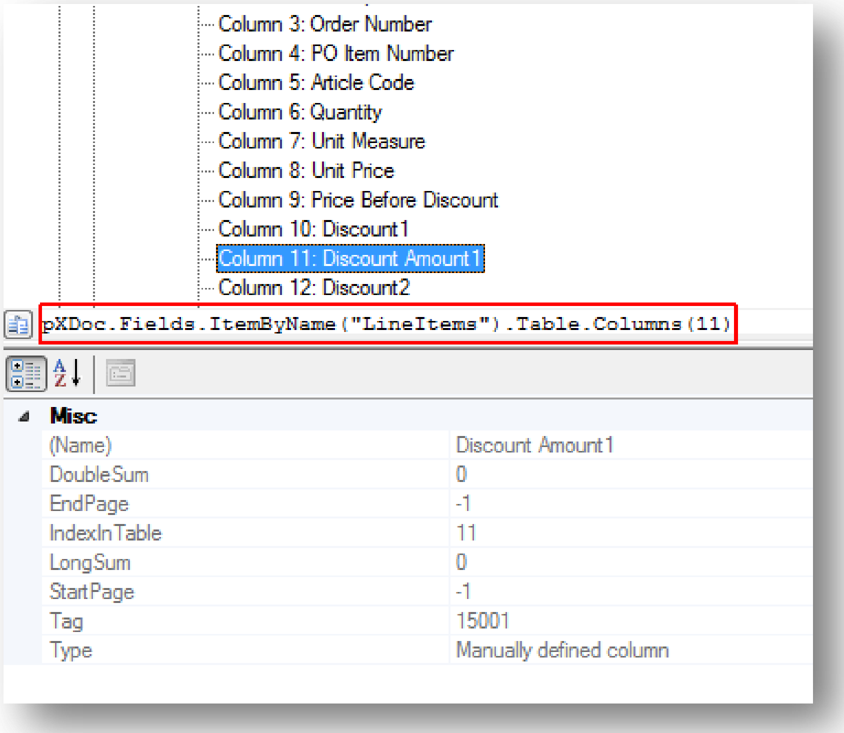
- Set up your batch export to be Multi-TIFF.
  - then you don't have page separation problems in KTM Project Builder.
- Set up your separation strategy, either fixed page, barcode, or manual.
- Scan documents at your customer.
- Do not export batches. Kofax Express can have many open batches.

- Go back home and check each document for VRS settings and document separation.
- Export your batches. They are now ready for use in KTM Project Builder.

2. Useful KTM Objects and Properties

The two easiest way to learn about the KTM scripting objects is to open any XDocument with the XDoc Browser in the right click menu and expanding the XDocument



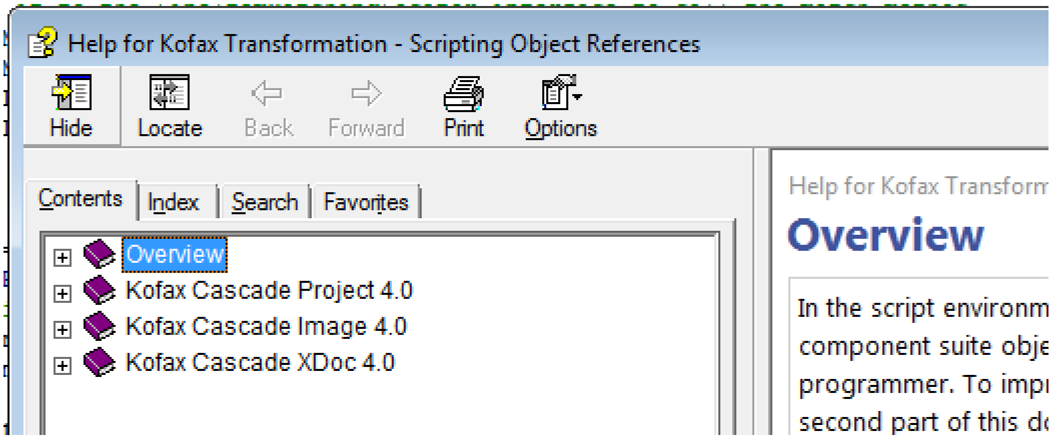


```
pXDoc.Fields.ItemByName("LineItems").Table.Columns(11)
```

Misc

(Name)	Discount Amount1
DoubleSum	0
EndPage	-1
IndexInTable	11
LongSum	0
StartPage	-1
Tag	15001
Type	Manually defined column

You can also open **Help/Scripting Object Reference** in the Script Editor



In the script environm
component suite obje
programmer. To impı
second part of this dı

You can also look at the Product Document at **Help/Scripting Help** in the Script Editor to learn about Script Events.

Expression	Comment
pXDoc.ExtractionClass	The className of a document
pxDoc.Pages(0).Words	All words on page 1
pXRootFolder.DocInfos(3).XDocument	The 4th document in the folder
pXDoc.GetWordsInRect(pageIndex,Left,Top,Width,Height)	Find words in a rectangle on a page (also used by Lassoing
pXDoc.TextLines(23).Words(2)	The 3rd word on the 23rd line of the document
pLocator.Alternatives(0).Words.Append(word)	Append a word to the first alternative of a locator. This handles text and coordinates properly.
pXDoc.CDoc.Pages.Count	Number of graphic pages of a document
pXDoc.Pages.Count	Number of OCR text pages of a document
tmpXDoc.CopyPages(pXDoc, 0, 3)	Copy pages 1, 2 & 3 from one document to another
pXDoc.Reclassify(ClassName, Confidence)	Reclassify a document (Do this either in Document_AfterClassify, ValidationForm_AfterFieldChanged, ValidationForm_ButtonClicked
pXDoc.Pages(2).TextLines.Count	The number of textlines on page 3
pXDoc.Words.Count	The number of words in the document.
pLocator.ItemByName("TL").Alternatives(0).Table.Rows(2).Cells(3).Text	The 4th cell of row 3 of the Table Locator "TL"
DefaultAmountLocator, DefaultDateLocator, Project	Global objects available in any script

pXDoc.ParentFolder.DocInfos(pXDoc.IndexInFolder-1).XDocument	The previous document
pField.PageIndex	The page on which the field appears. If this is -1, then the Field has no coordinates.
Project.TableModels.ItemByName(TABLEMODELNAME).ModelColumns.Count	The number of columns in a TableModel
Project.GlobalColumns.ItemByID(tablemodel.ModelColumns(3).GlobalColumnID).DisplayNameLocalizations.Default	The localized Name of the 3rd column of a table model.
Project.Databases, Project.Dictionaries	The fuzzy and SQL Databases, and the Dictionaries
pXDoc.CDoc.Pages(2).Xres	The horizontal dots per inch DPI of page 3.
pXDoc.CDoc.Pages(1).GetImage() as CSCImage	Returns the pixel image of page 2
pXdoc.CDoc.Pages(2).SourceFileName	The image filename of page 3
pXDoc.FileName	The filename of the XDocument
pXDoc.ReplacePageSourceFile(filename,"TIFF",2,0)	Replace page 2 of a document with a TIFF image.
Project.ClassByName(pXDoc.ExtractionClass).ParentClass	The Parent Class of a document

3. Visual Basic 6 tips

Use `With … end With` to make your code readable.

Use `For…Next` instead of copy/pasting code.

Use the following to loop through “Total”, “SubTotal”, etc…

```
For each fieldname in split("Total SubTotal TaxRate1 TaxAmount1")
```

Do error checking at beginning of functions.

```
If condition then exit sub.
```

Use the setting `'#Language "WWB-COM"` to get keywords `return, andalso, orelse, isnot`.

All four keywords will reduce nesting and increase readability.

Have tight logic loops and functionalize what is in them for clarity and easy debugging.

The following example reads every word on a line, fuzzy matches it to a database and then builds a score. It is quite complex, but the complexity has been pushed off into another reusable function, and this loop is now very simple.

```
For w = 0 To textline.Words.Count-1
      word=LCase(Trim(textline.Words(w).Text))
      match=DataBase_SearchString(databaseName,"headerword",word,conf)
      score=score+conf*Len(word)
Next
```

4. Fuzzy Database Queries from Script

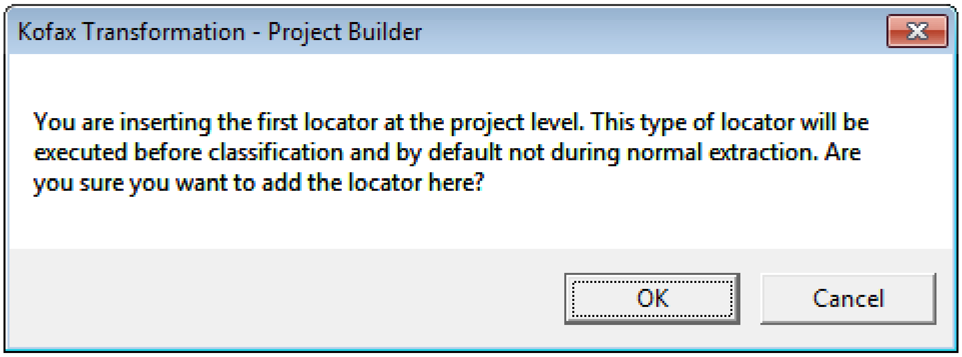
This is a useful and flexible script for retrieving one or many, fuzzy or precise results from a local or remote fuzzy database.

Combining an SQL Database with Kofax Search & Match Server and this script you can perform webqueries much faster and even perform fuzzy “webqueries.””.

```
Public Function Database_Search(dbname As String, column As String, searchString As String, numberHits As Integer, minimimConfidence As Double, Optional allColumns As Boolean=False) As CscXDocField
   'Searches inside a fuzzy database for the searchstring and returns the results in the alternatives of a new CSCField Object.
   'if column="" then all columns are returned as subfields, otherwise returns only the chosen column in the alternatives.
   'Set minimimConfidence=1.0 for exact match search.
   Dim DB As CscDatabase, Fields() As String,FieldIDs() As Long
   Dim col As Integer,c As Integer,i As Integer
   Dim hits As CscDatabaseResItems, alt As CscXDocFieldAlternative
   Dim results As New CscXDocField  'You are allowed to create a standalone field
   Dim value As String, substitute As String
   Set DB=Project.Databases.ItemByName(dbname)
   ' Replace all delimiters by blank
   For i = 1 To Len(DB.AdditionalDelimiterChars)
      searchString = Replace(searchString, Mid(DB.AdditionalDelimiterChars, i, 1), " ")
   Next
   ' Replace all ignore characters by blank
   For i = 1 To Len(DB.RemoveChars)
      searchString = Replace(searchString, Mid(DB.RemoveChars, i , 1), " ")
   Next
   ' Substitution pairs define which texts to be replaced by what.
   For i = 0 To DB.SubstitutionPairCount - 1
      DB.GetSubstitutionPair(i, value, substitute)
      searchString = Replace(searchString, value, substitute)
   Next
   Fields = Split(searchString, " ")
   ReDim FieldIDs(UBound(Fields))
   'Find the column we are looking for
   col=-1
   For i =0 To DB.FieldCount-1
      If DB.FieldName(i)=column Then col=i
   Next
   If col=-1 And column<>"" Then Err.Raise 34589,,"Column '" & column & "' does not exist in database '" & dbname & "'."
   If col<>-1 Then 'Force query in this column
      For c=0 To UBound(FieldIDs)
         FieldIDs(c)=col
      Next
   End If
   Set hits = DB.Search(Fields, FieldIDs, CscEvalMatchQuery, numberHits)

   For i = 0 To hits.Count-1
      If hits(i).Score>= minimimConfidence Then
         Set alt= results.Alternatives.Create()
         alt.Confidence=hits(i).Score
         If allColumns Then  'the column is "", so we return all fields
            For c = 0 To DB.FieldCount-1
               alt.SubFields.Create(DB.FieldName(c))
               alt.SubFields(c).Index=c
               alt.SubFields(c).Text=DB.GetRecordData(hits(i).RecID)(c)
               alt.SubFields(c).Confidence=hits(i).Score
            Next
            alt.Text=""
         Else
            alt.Text=DB.GetRecordData(hits(i).RecID)(col)
         End If
      End If
   Next
   Return results
End Function
```

5. How to Classify by Barcode in Script

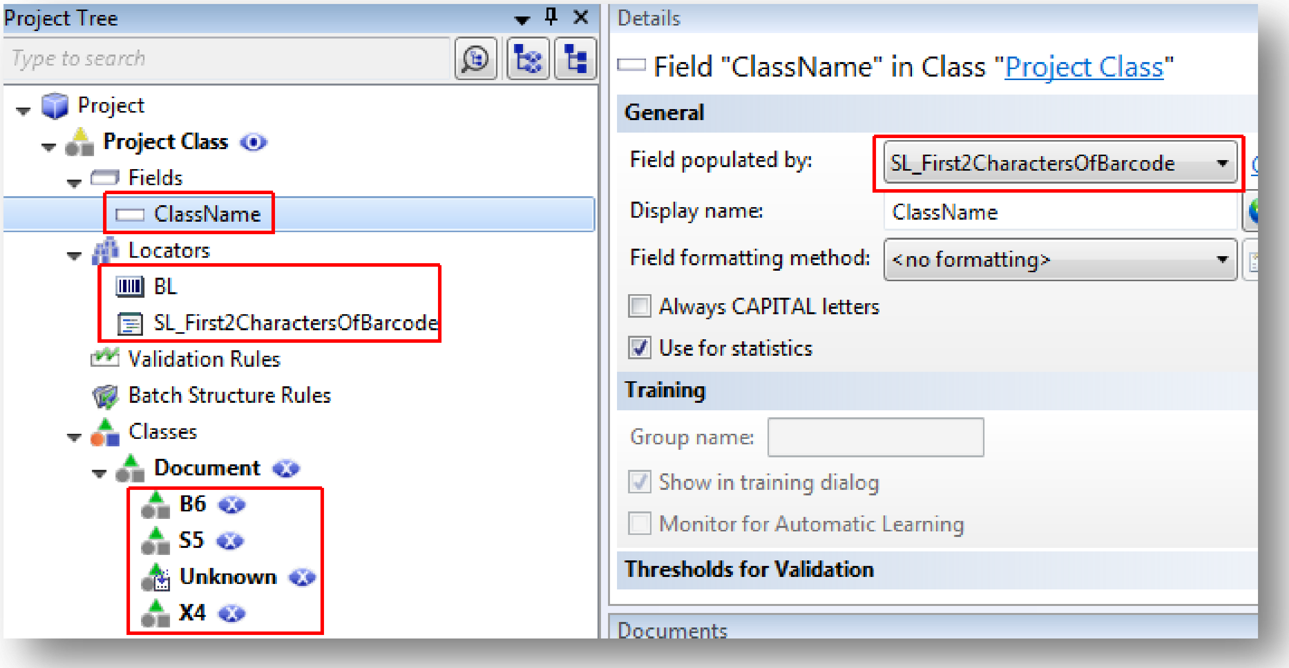
You can use Locators attached to the Project Class level are classify documents. If these locators require OCR, then OCR will be performed at this stage.



Kofax Transformation - Project Builder

You are inserting the first locator at the project level. This type of locator will be executed before classification and by default not during normal extraction. Are you sure you want to add the locator here?

This example below uses the first two characters of the barcode on the document to classify the document as either “B6” or “S5” or “X4”. If no barcode is found, then the document is classified as “Unknown”.



Field "ClassName" in Class "Project Class"

General

Field populated by: SL_First2CharactersOfBarcode

Display name: ClassName

Field formatting method: <no formatting>

□ Always CAPITAL letters

☑ Use for statistics

Training

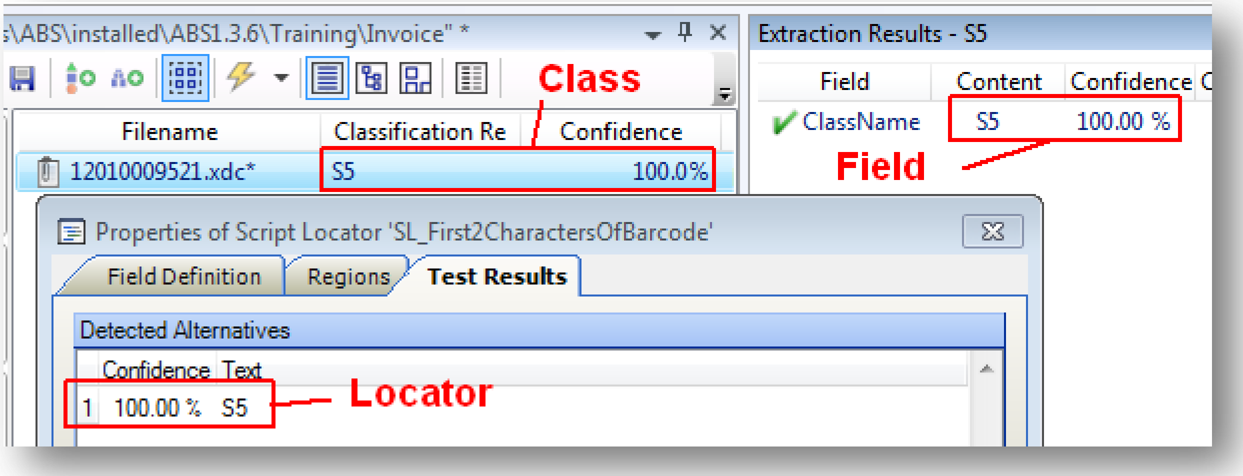
Group name:

☑ Show in training dialog

□ Monitor for Automatic Learning

Thresholds for Validation

Always use a script locator and put your script logic into it. This makes it easy for you to test, and it makes your project easy to understand as in the screenshot above. Make sure that ClassName is a project level field that will contain the confidence and the class name that you want.desire.


s\ABS\installed\ABS1.3.6\Training\Invoice" *
Class
Field
Locator
Properties of Script Locator 'SL_First2CharactersOfBarcode'
Field Definition
Regions
Test Results
Detected Alternatives

Filename	Classification Re	Confidence
12010009521.xdc*	S5	100.0%

Extraction Results - S5

Field	Content	Confidence
✓ ClassName	S5	100.00 %

	Confidence	Text
1	100.00 %	S5

Put this script into the project level script. The event Document_AfterClassifyXDoc can reclassify the xdocument.

Note: These locator and field values are not available during extraction. To pass values from classification scripts to extraction scripts, then you will need to use CSCXDocument.XValues to store them. Remember: that Extraction runs after Document Review in KTM.

```
Private Sub SL_First2CharactersOfBarcode_LocateAlternatives(ByVal pXDoc As CASCADELib.CscXDocument, ByVal pLocator
As CASCADELib.CscXDocField)
   Dim Barcodes As CscXDocFieldAlternatives
   Set Barcodes=pXDoc.Locators.ItemByName("BL").Alternatives
   'If Barcodes.Count=0 Then Exit Sub ' No barcode was found, so we cannot classify
   'If Len(Barcodes(0).Text)<2 Then Exit Sub 'This is not a valid barcode for classification
   'Create an output alternative for this script locator
   With pLocator.Alternatives.Create
      .Text=Left(Barcodes(0).Text,2)
      .Confidence=Barcodes(0).Confidence 'Copy the confidence from the barcode locator (it will always be 100%)
   End With
End Sub

Private Sub Document_AfterClassifyXDoc(ByVal pXDoc As CASCADELib.CscXDocument)
   Dim c As Long, ClassName As CscXDocField
   Set ClassName =pXDoc.Fields.ItemByName("ClassName")
   'See if the field ClassName contains the name of a class. if so reclassify the document to it
   For c =1 To Project.ClassCount ' ClassID is NOT zero-based.
      If Project.ClassByID(c).Name=ClassName.Text Then
         pXDoc.Reclassify(ClassName.Text,ClassName.Confidence)
         Exit Sub
      End If
   Next
   'leave the classification result alone
End Sub
```

6. How to Classify by Phrase in a Region on a Document

Instructional Classification looks everywhere on the document. Maybe you have a phrase at the bottom of the first page which clearly identifies the class.

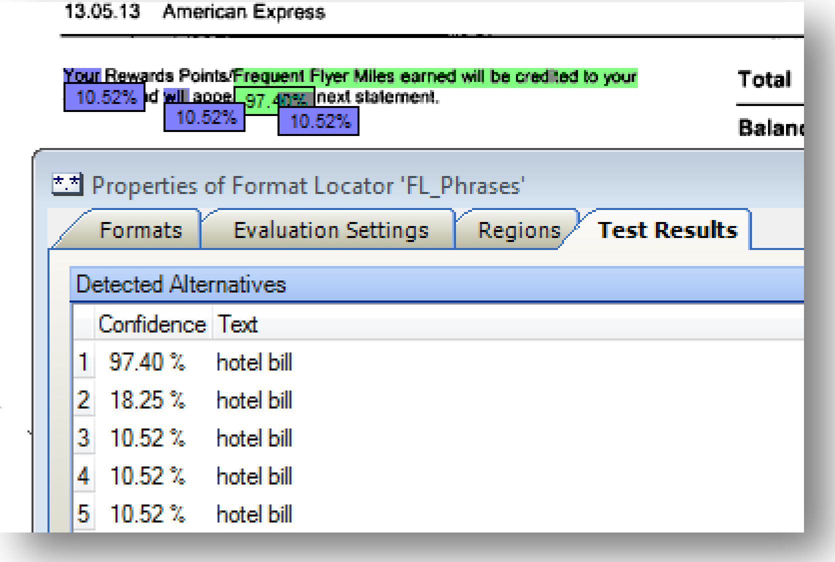
This method uses an auto-replace dictionary in a format locator to fuzzy match **long phrases** in a region. A great advantage of using such a dictionary over instructional classification is that the dictionary is outside of the project and can be managed by the customer directly.

Create a dictionary of all of these phrases with **Auto Replace Values** of the class name.

```
We appreciate your prompt payment and value you as our customer ; telephone bill

Frequent Flyer Miles will be credited to your;hotel bill
```

Here you can see that the Format Locator has fuzzy matched the phrase, as well as other words with lower confidence, and returned the ClassName of "hotel bill" each time.

Dictionaries are case-insensitive and you need to ignore alternatives with scores below about 80%


13.05.13 American Express
Your Rewards Points/Frequent Flyer Miles earned will be credited to your
next statement.
10.52%
10.52%
97.40%
10.52%
Total
Balanc
Properties of Format Locator 'FL_Phrases'
Formats
Evaluation Settings
Regions
Test Results
Detected Alternatives

	Confidence	Text
1	97.40 %	hotel bill
2	18.25 %	hotel bill
3	10.52 %	hotel bill
4	10.52 %	hotel bill
5	10.52 %	hotel bill

Follow the same method as in the previous example with barcodes.

7. SQL Queries from Script

KTM natively uses fuzzy databases. These are generally faster and simpler to use and configure than SQL.

In almost all cases, a fuzzy database is better than an SQL database.

- Is it possible that your query contains OCR or other errors? Use Fuzzy Database.
- Do you want to be able to search in any column in the database? Use Fuzzy Database.
- Do you want to keep SQL user password and connection string safe from client side scripts? Use Fuzzy Databases.
- Do you want to do an exact query and not a fuzzy query? Use Fuzzy Query with confidence set to 100%.
- Do you need to do an INSERT? Use SQL. But first ask yourself is this INSERT must happen during KTM Server or KTM Validation, and whether it would not be better to delay it until after KTM, in a BPM engine.
- Do you need to do interactive purchase order queries for the Line Item Matching Locator? Use SQL
- Do you need to look up long numeric values like customer IDS in databases with millions of records? Use SQL.. A fuzzy database query may be slower or even possibly miss records if there are many hundreds of entries in the database which differ by only 1 or 2 characters.

64 bit ODBC Connection

Use %systemroot%\SysWOW64\odbcad32.exe to create ODBC connections on 64 bit Windows 7.

Using CscSQLDataTable for SQL “SELECT”

KTM has scripting objects CscSQLDataTable, CscSQLQuery and CscSQLRecordSet that you can use for performing “SELECT” queries. This object has the advantage that you do not need to create, hold and destroy the connection to the database.

“INSERT” is not supported. You cannot connected to a database on Search & Matching Server.

```
'KTM supports SQL SELECT queries natively
   Dim SQLDataTable As CscSQLDataTable, SQLQuery As CscSQLQuery
   Dim r As Long, Recordset As CscSQLRecordset
   Set SQLDataTable = Project.Databases.ItemByName("VendorsSQL").SQLTable
   Set SQLQuery = SQLDataTable.CreateQuery()
   SQLQuery.AddSelectField(SQLDataTable.FieldByName("VendorID"))
   SQLQuery.AddSelectField(SQLDataTable.FieldByName("VendorName"))
   SQLQuery.AddWhereField(SQLDataTable.FieldByName("VendorID"), CscEqual, "123")
   Set Recordset = SQLQuery.ExecuteQuery()
   For r = 0 To Recordset.RecordCount-1
      With Recordset.RowByIndex(r).Cells
         'Do something with results
      End With
   Next
```

Using ActiveX Data Objects for SQL “INSERT” and others

Add a reference to “Microsoft ActiveX Data Objects 6.1 Library” to your script.

You will need to manage opening and closing connections yourself. You can use the project level script event **Application_InitializeScript** and **Application_DeinitializeScript** to open and close these once per session. Be aware that in KTM Server all Document Worker Threads will be using this same object in parallel.

See MSDN for code examples. http://msdn.microsoft.com/en-us/library/windows/desktop/ms675947(v=vs.85).aspx

8. Calling a Fuzzy Database in a Field Formatter for Spell Checking

This script calls a fuzzy database and checks if there are 0, 1 or more results and decides if the results are “good enough” for a match

It uses the **Database_Search** function from Visual Basic 6 tips

Use With … end `With` to make your code readable.

Use `For…Next` instead of copy/pasting code.

Use the following to loop through “Total”, “SubTotal”, etc…

```
For each fieldname in split("Total SubTotal TaxRate1 TaxAmount1")
```

Do error checking at beginning of functions.

```
If condition then exit sub.
```

Use the setting `'#Language "WWB-COM"` to get keywords `return, andalso, orelse, isnot.`

All four keywords will reduce nesting and increase readability.

Have tight logic loops and functionalize what is in them for clarity and easy debugging.

The following example reads every word on a line, fuzzy matches it to a database and then builds a score. It is quite complex, but the complexity has been pushed off into another reusable function, and this loop is now very simple.

```
For w = 0 To textline.Words.Count-1
      word=LCase(Trim(textline.Words(w).Text))
      match=DataBase_SearchString(databaseName,"headerword",word,conf)
      score=score+conf*Len(word)
Next
```

Fuzzy Database Queries from Script.

```
Private Sub USState_FormatField(ByVal FieldText As String, FormattedText As String,
ErrDescription As String, ValidFormat As Boolean)
   Dim results As CscXDocField
   If Len(FieldText) = 0 Then
      ValidFormat = False
      ErrDescription = "Field must not be empty"
      Exit Sub
   End If
   'Look for up to 5 fuzzy database matches with scores better than 80%
   results =Database_Search("USStates",FieldText,"",5,0.8)
   Select Case results.Alternatives.Count
   Case 0
      ErrDescription= FieldText  & " is an unknown US State"
      ValidFormat=False
   Case 1
      FormattedText=results.Alternatives(0).Text
      ValidFormat=True
   Case Is >1
      If results.Alternatives(0).Confidence-results.Alternatives(1).Confidence>0.3
```

```
Then
         'the first Result is much better than the second result
         FormattedText=results.Alternatives(0).Text
         ValidFormat=True
      Else
         'Show two options in the error message
         ErrDescription = results.Alternatives(0).Text & ";" &
results.Alternatives(1)
         ValidFormat=False
      End If
   End Select
End Sub
```

9. Calling a Fuzzy Database in a Validation Rule

This script is very much like the formatting script in the previous appendix, but it doesn’t change the value and only accepts perfect matches.

```
Private Sub USState_Validate(ByVal pValItem As CASCADELib.ICscXDocValidationItem, ByRef
ErrDescription As String, ByRef ValidField As Boolean)
   Dim results As CscXDocField
   If Len(pValItem.Text) =0  Then
      ValidField = False
      ErrDescription = "Field must not be empty"
      Exit Sub
   End If
    'Look for up to 1 perfect database matches with scores =100%
   results=Database_Search("USStates",pValItem.Text,"",1,0.8)
   If results.Alternatives.Count=0 Then
      ValidField = False
      ErrDescription = "Field must not be empty"
      Exit Sub
   ElseIf results.Alternatives(0).Confidence=1.0 Then
      'Perfect Match
      ValidField=True
   Else
      'Suggest the best match
      ErrDescription="Did you mean " & results.Alternatives(0).Text & "?"
      ValidField=False
   End If
End Sub
```

10. Create Golden Files from a Productive System

Add the following script to the project level script and republish the batch in Kofax Capture. It will save all XDocs both after KTMServer and after KTM Validation. You can then benchmark the project against the validation files as well as benchmarking the files from after KTM Server, which will show you if Project Builder has different results as the Productive System.

```
Private Sub Batch_Close(ByVal pXRootFolder As CASCADELib.CscXFolder, ByVal CloseMode As
CASCADELib.CscBatchCloseMode)
   'Create golden files in production system
   'make sure KTM Server and KTM Validation have write access to the following folder.
   XFolder_Backup(pXRootFolder,"\\Server\GoldenFiles\")
End Sub

Public Sub XFolder_Backup(ByVal XFolder As CASCADELib.CscXFolder, BackupFolder As String)
   'Add reference to "Microsoft Scripting Runtime" for FileSystemObject
   Dim fso As New FileSystemObject, source As String, BatchGUID As String
   'Use this for creating golden files form a productive KC-KTM system
   'Check which Module we are in.
   Select Case Project.ScriptExecutionMode
   Case CscScriptExecutionMode.CscScriptModeValidation
      'Check that we are in Validation Step 2
      'If Project.ScriptExecutionInstance<>2 Then Exit Sub
      BackupFolder=BackupFolder & "AfterValidation\"
   Case CscScriptExecutionMode.CscScriptModeServer
      'Check that we are in KTM Server 2
      'If Project.ScriptExecutionInstance<>2 Then Exit Sub
      BackupFolder=BackupFolder & "AfterKTMServer\"
   Case Else
      Exit Sub 'DocReview, Character Correction, Knowledge Base Modules
   End Select
   BatchGUID=XFolder.XValues.ItemByName("AC_BATCH_GUID").Value
   BatchGUID=Replace(BatchGUID, "{","")
   BatchGUID=Replace(BatchGUID, "}","")
   source=fso.GetParentFolderName(XFolder.FileName)
   If Not fso.FolderExists(BackupFolder) Then fso.CreateFolder(BackupFolder)
   fso.CopyFolder(source,BackupFolder & BatchGUID,True) 'Copy the entire KC batch folder
   Set fso = Nothing
End Sub
```

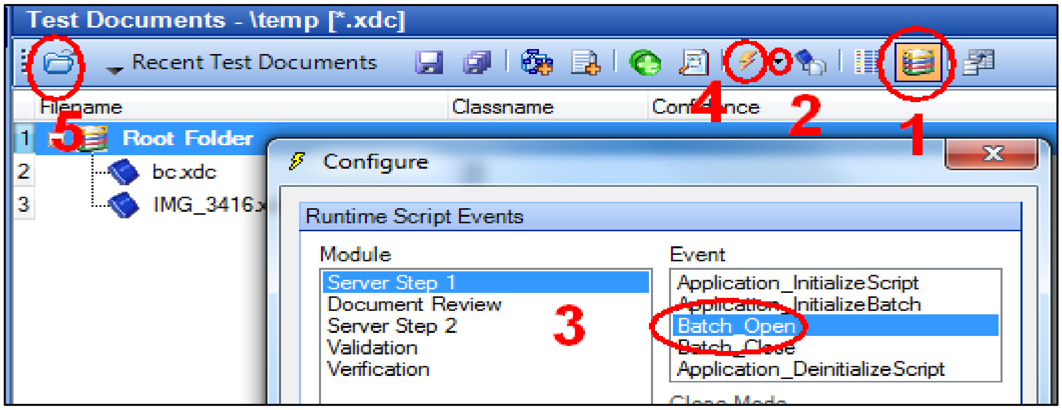
11. Create Golden Files from CSV Data

- Create a text file where the first row consists of fileName and all field headers separated by semicolons. Each other line contains the full path name to the Xdoc file and then all field values separated by semicolons.

- Load the Xdocs into project builder.

- Put the code below into the Project level script.

1. Switch to Batch View



2. Open Test Runtime Script Events/Configure…. (small black triangle)

3. Select event Batch_Open

4. Press the lightning icon (Ctrl-F11)

5. Reload the Xdocs.

Code for the Project level script:

```
Private Sub Batch_Open(ByVal pXRootFolder As CASCADELib.CscXFolder)
   Folder_ImportCSV(pXRootFolder,"c:\temp\goldenvalues.csv")
End Sub
Const CSVSEP=";"
Private Sub Folder_ImportCSV(ByVal pXRootFolder As CASCADELib.CscXFolder, csvFileName As String)
   'Include Reference to “Microsoft Scripting Runtime”
   'This imports from a CSV file all the values into the XDocs
   'The first column MUST contain the fully qualified XDoc FileName.
   'The second column MUST contain the class name.
   'The first row MUST contain “filename;classname;fieldname1;fieldname2;…”
   'Non-existing field values are ignored
   Dim x As Integer, f As Integer
   Dim xdoc As CscXDocument
   Dim txt, key, values() As String
   Dim dict As New Dictionary
   Dim fieldIds As New Dictionary

   Open csvFileName For Input As 1
   Line Input #1, txt 'First line of csv file
   For Each key In Split(txt, CSVSEP) 'make an index of field names to fieldID
      fieldIds.Add(key, f)
      f=f+1
   Next
   While Not EOF(1)
      Line Input #1, txt 'Load the rest of the csv file into a dictionary with filename as key.
      values=Split(txt,CSVSEP,2)
      dict.Add(values(0),values(1)) 'this makes the XDoc filename the key and
                                    '  “classname;fieldname1;fieldname2;…” the value
   Wend

   For x = 0 To pXRootFolder.DocInfos.Count-1
      Set xdoc=pXRootFolder.DocInfos(x).XDocument
      If dict.Exists(xdoc.FileName) Then
         values=Split(dict.FileName,CSVSEP)
         xDoc.Reclassify(values(0))
         For f =0 To xdoc.Fields.Count-1
            If fieldIds.Exists(xdoc.Fields(f).Name) Then xdoc.Fields(f).Text=values(fieldIds(xdoc.Fields(f).Name)-
1)
         Next
      End If
      xdoc.Save
   Next
End Sub
```

12. Integrating Webservices & Kapow with KTM

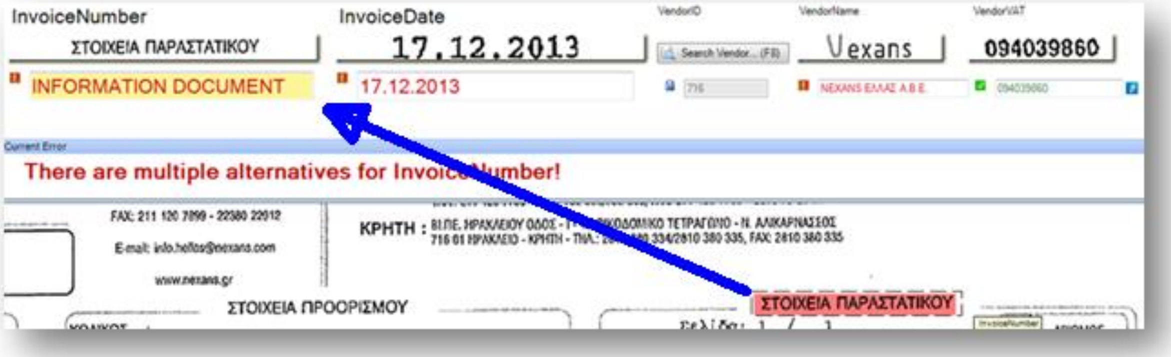
Kapow Software's synthetic APIs brings immense value to a KTM project.

Some points of integration

- Validation Rules checking with the internet.
- Lassoing Text on a Document.
- Creating Fuzzy Database Files from Websites.

The following Code calls Google Translate via Kapow to translate text on a document using the `ValidationForm_AfterViewerLassoDrawn` event.

In the example below the user has lassoed "ΣΤΟΙΧΕΙΑ ΠΑΡΑΣΤΑΤΙΚΟΥ" on the image and the translation "INFORMATION DOCUMENT" is inserted into the field.



InvoiceNumber: ΣΤΟΙΧΕΙΑ ΠΑΡΑΣΤΑΤΙΚΟΥ
INFORMATION DOCUMENT

InvoiceDate: 17.12.2013
17.12.2013

VendorID: 716

VendorName: Vexans
NEXANS ΕΛΛΑΣ Α.Β.Ε.

VendorVAT: 094039860
094039860

Current Error

There are multiple alternatives for InvoiceNumber!

```
Private Sub ValidationForm_AfterViewerLassoDrawn(ByVal pXDoc As CASCADELib.CscXDocument,
ByVal PageIndex As Long, ByVal pField As CASCADELib.CscXDocField, ByVal TopPos As Long,
ByVal LeftPos As Long, ByVal Width As Long, ByVal Height As Long, ByRef bCancel As
Boolean)
   Dim words As CscXDocWords, translation As String, ms As Long
   Set words=pXDoc.GetWordsInRect(PageIndex,LeftPos,TopPos,Width,Height)
   If words.Count=0 Then Exit Sub 'The user lassoed no words
   translation=Kapow_GoogleTranslate("http://localhost:50079/rest/ru2n/Default
project/GoogleTranslate_rpb",words.Text,"Greek","English", ms)
   pField.Text=translation
   pField.PageIndex=PageIndex
   pField.Left=LeftPos
   pField.Top=TopPos
   pField.Width=Width
   pField.Height=Height
   bCancel=True
End Sub

Public Function Kapow_GoogleTranslate(url As String, sourceText As String,sourceLang As
String, destLang As String, ByRef milliseconds As Long) As String
   'Add reference to "Microsoft XML 6.0"
   Dim xml As New MSXML2.DOMDocument60, responseXML As MSXML2.DOMDocument60
   Set xml=Kapow_CreateRESTRequest()
   Kapow_AddParameter(xml,"Text","translate.SourceLanguage",sourceLang)
   Kapow_AddParameter(xml,"Text","translate.DestinationLanguage",destLang)
   Kapow_AddParameter(xml,"Text","translate.SourceText",sourceText)
   Kapow_AddParameter(xml,"Text","translate.DestinationText","")
   Set responseXML=HTTP_POST(url,xml)
   If responseXML.selectNodes("//rest-result").Length=0 Then Return "Error: No Internet
Connection!"
   milliseconds=CInt(responseXML.selectSingleNode("//rest-result/@executionTime").Text)
   Return responseXML.selectSingleNode("//attribute[@name='DestinationText']").Text
End Function

Public Function Kapow_CreateRESTRequest() As MSXML2.DOMDocument60
   Dim xml As New MSXML2.DOMDocument60
   xml.appendChild(xml.createProcessingInstruction("xml", "version=""1.0"" encoding='UTF-
8' standalone='yes'"))
   xml.appendChild(xml.createElement("rest-request"
)).appendChild(xml.createElement("parameters"))
   Return xml
End Function

Public Sub Kapow_AddParameter(xml As MSXML2.DOMDocument60, ParameterType As String,
Parameter As String, value As String)
   Dim vars() As String, variable As  MSXML2.IXMLDOMNode
   vars=Split(Parameter,".")
   Set variable=xml.selectSingleNode("//variable[@variableName='"& vars(0) & "']")
   If variable Is Nothing Then
      Set variable=
xml.selectSingleNode("//parameters").appendChild(xml.createElement("variable"))
      variable.attributes.setNamedItem(xml.createAttribute("variableName")).Text=vars(0)
   End If
   With variable.appendChild(xml.createElement("attribute"))
      .attributes.setNamedItem(xml.createAttribute("type")).Text=ParameterType
      .attributes.setNamedItem(xml.createAttribute("name")).Text=vars(1)
      .Text=value
   End With
End Sub

Public Function HTTP_POST(url As String, xml As MSXML2.DOMDocument) As
MSXML2.DOMDocument60
   Dim XMLHTTP As New MSXML2.XMLHTTP60
   Dim response As MSXML2.DOMDocument60
   XMLHTTP.Open("POST", url,False)
   XMLHTTP.setRequestHeader("Content-Type", "text/xml")
   Open "c:\temp\out.xml" For Output As #1
   Print #1, vbUTF8BOM & xml.XML
   Close 1
   'On Error Resume Next 'Catch Any http errors
      XMLHTTP.send(xml)
   If XMLHTTP.status<>200 Then 'Some error happened
      With XMLHTTP.responseXML.appendChild(xml.createElement("status"))
         .Text=XMLHTTP.statusText
         .attributes.setNamedItem(xml.createAttribute("value")).Text=CStr(XMLHTTP.status)
      End With
   End If
   Open "c:\temp\response.xml" For Output As #1
   Print #1, vbUTF8BOM & XMLHTTP.responseXML.XML
   Close 1
   Return XMLHTTP.responseXML
```

```
End Function
```

13. Converting Fields to Dates and Amounts

You should avoid using the following functions in your scripting CDbl, CLng, CDate, CCurr as they can have very unpredictable results.

You have to assume that the input to these functions has come from OCR and hence contains errors. You also have to assume that you don’t know what the regional settings are on the client machine – you may not really know if the user has dates MM_DD or DD_MM. You don’t always know what the decimal and thousands separator is.

It is recommended to use these functions for converting Strings into Dates and Amounts. They use the standard formatters that you configure in your project. This keeps all of your number and date parsing consistent, and presents consistent error messages to the user.

The functions below always return a value. If the date is unformatted then you have an undefined value. If you want to check that the value formatted correctly check the Boolean values `f.DoubleFormatted` or `f.Dateformatted`.

```
Private Function String_ParseDouble(a As String,Optional amountFormatter As String) As
Double
   Dim f As New CscXDocField
   If amountFormatter="" Then amountFormatter=Project.DefaultAmountFormatter
   f.Text=a
   Project.FieldFormatters.ItemByName(amountFormatter).FormatField(f)
   Return f.DoubleValue
End Function

Private Function String_ParseDate(a As String,Optional dateFormatter As String) As Date
   Dim f As CscXDocField
   If dateFormatter="" Then dateFormatter=Project.DefaultDateFormatter
   f.Text=a
   Project.FieldFormatters.ItemByName(dateFormatter).FormatField(f)
   Return f.DateValue
End Function
```

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