

# Results of a Study on Invoice-Reading Systems in Germany

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**Abstract.** Companies order, receive, and pay for goods. Hence they continually receive and process invoices. For the most part these are printed on paper and are dealt with manually, so that each invoice after receipt involves processing costs of about 9 Euro on average. Often, human searching and typing of data into computer forms is required to transfer the information from paper into the computer, e.g. into ERP-systems, like SAP, that many companies run. This article presents the main results of our 300-page market survey of 11 suppliers of invoice reading systems (*I-R-S*), which automate the transfer of invoice data to ERP-systems. For the scientific *I-R-S* community we hope to provide the service of a better visibility of our discipline to potential investors and users.

## 1 Introduction

This paper reports on a collection of selected results, worked out by about 15 people, mostly seniors in their fields, in a period of more than 12 months. It was a (controversial) decision not to take up room to explain the starting conditions and to limit the description of the (extensive) methodology to its core. (For this paper, this also implied a limitation of references, basically to our own work.) However, an interesting document analysis application field is introduced. Then those of our results are presented, which we consider most promising and fruitful for further scientific treatment by document analysis researchers and others.

It is natural that our results incorporate already a considerable amount of interpretation by us, even though this is not further explicated in the paper. This goes beyond the sketch of important parameters of the invoice reading scenario provided in the next section. Whether system demos and interviews bring interesting information about, depends very much on the individual preparation and alertness of the interviewers. However, we feel that with no further comments by us, the presented results call for interpretation by the reader. We selected those results, which we think to feed the thoughts of the interested reader and activate him to derive interesting, hopefully new conclusions; conclusions which we would perhaps not dare to formulate or could not even think of.

Our consortium of four companies (their specific experiences are each in brackets) with experience in the *I-R-S* field, interim2000 (documents analysis marketing and

consulting), Pylon (document process consulting), Integra (market analysis), and DFKI (document analysis science, [1,2,3]), detected the emergence of a demand for invoice reading systems (*I-R-S*) on the German market. Eleven companies supply systems for invoice reading, see Table 1. However, the two issues of guidelines for a systematic elicitation of individual necessities and constraints of invoice reading problems, as well as a knowledgeable survey and comparison of the 11 available systems has remained completely open. In other words:

- As a business owner or his consultant: which system fits which exact problems?
- As a system supplier: what does your system lack to fit certain (sub-) problems?
- As a researcher: what goes on outside the ivory tower?

These issues are considered interesting for the Document Analysis and Understanding (DAU) discipline; given that the topic of *I-R-S* at hand, is a subset within DAU. The above consortium engaged in an approach to these issues, and prepared a study.<sup>1</sup>[6] The building blocks were 1) a market analysis (i.e., 70 telephone interviews with likely user companies), 2) a compilation of information asked from the companies on their products and success stories, 3) a detailed questionnaire used in a poll of the system suppliers, each completed with 4) an attendance system demonstration and interview. All the information is probably an interesting source for scientific considerations.

| <b>Table 1.:<br/>Suppliers and<br/>systems<sup>2</sup></b> | <b>Supplier</b>                 | <b>Name of the system</b>    |
|--|---------------------------------|------------------------------|
|  | BasWare GmbH                    | BasWare invoice processing   |
|  | Captiva                         | InvoicePack                  |
|  | DICOM Deutschland AG            | DICOM Invoice 123            |
|  | Docutec AG                      | Docutec Xtract for Documents |
|  | FreeFormation GmbH              | 4invoice                     |
|  | INSIDERS Technologies GmbH      | smartFIX INVOICE             |
|  | ITESOFT                         | FreeMind für Invoices        |
|  | Kleindienst Solutions           | FrontCollect® Invoices       |
|  | Océ Document Technologies (ODT) | DOkuStar V3.1                |
|  | Paradatec GmbH                  | PROSAR-AIDA                  |
|  | SER Solutions Deutschland GmbH  | SER InvoiceMaster            |

This paper aims to present the results most informative to the document analysis systems community. In the remainder, first our preparatory modeling of the DAU application of invoice reading is reported. Then, very briefly, the most interesting numbers from the customer telephone interviews are enumerated. In a necessarily cautious business style the supplier companies and their systems are presented. Some important, generalized interpretations or “strategic disclosures” are reported thereafter and a short discussion is provided.

<sup>1</sup> The study is in German, in order to sell it to German companies to refinance the effort.

<sup>2</sup> Two further suppliers, Futuresoft and TIS, appear in the study, however, could not make it to come and demonstrate their systems to us, due to project duties. As the demonstrations are the core basis of this paper, they are not listed in this article.

## 2 Invoice Reading

Companies order, receive, and pay for goods, be they basics for their business, or as trivial things as pencils, cleaner, computers, and services like daily office cleaning or hardware maintenance. Most companies run ERP-systems (“Enterprise Resource Planning”) —in Germany the market poll revealed that this is to 75% SAP— to store and organize their orders, delivery notes, invoices, invoice acknowledgements, and money transfers. Despite the availability of a standard like EDIFACT (supported by the United Nations) on the basis of which systems can be connected so that invoices can be sent and received electronically, it is current practice to send and receive invoices and the like as letters, i.e., printed on paper sent via “snail-mail”.

These invoices contain always rather similar information, fostered by legal requirements for information items on invoices. However, the information items are distributed according to all different layout styles. Information items are differentiated into a) *head data*, like invoicing party, legal invoice date, invoice number code, VAT, invoice amount, additional charges, and b) *table data*, comprising the invoice line items, the single positions accumulated by the invoice. All the single information items are needed for the downstream invoice processing, up to and including archiving.

### Integration of Invoice Reading Systems

In a department that processes invoices, “digitization” has two effects. It allows for 1) an overview over all processes, progress and status, and for 2) support of the processes. The effects of both are an improved quality and a higher speed, where both relate to money. Thus, clearly achievable goals are:

- Strongly reduce the delivery times and the rate of unexplainably lost data, through the use of electronic media (especially effective, if sub-processes are spatially distributed).
- Overview the progress of all current processes and discover problems and delays (also automatically) through an automatic central bookkeeping.
- Reduce human errors by supplying supportive information, automation of repetitive manual actions (e.g., applying notices of receipt), and supportive checking mechanisms (check for missing data, plausibility checks, etc.).

However, *I-R-S* allows to support the processes even more deeply; one can penetrate the invoice data, reconcile them with company databases, perform all sorts of plausibility calculations and comparisons, immediately search or prepare search for missing data, thus significantly reducing the probability of human errors. The only precondition is that the *I-R-S* must access the available information, i.e., it needs the technical interfacing modules and know-how to effectively exploit them. [5] Then, this creates exactly that freedom for the invoice personnel, to deal with those aspects of invoice processing which profit most from the genuine human power of cognition and creativity.

### Verifier User Interface

The first step is the digitization of the incoming invoices, with scanners and OCR. One part of the verification in an *I-R-S* is focused to assure that these steps went right.

Thus all systems provide a verifier user interface. Verifiers should be ergonomically prepared for the conditions of bulk processing.

### **Template versus Freeform Information Spotting**

Spotting an information item, e.g., finding the legal date of a letter, can either rely on how it looks like (freeform), or where it is (template). [4] Human cognition combines both strategies smartly. However, for the design of systems, a conscious distinction and application is crucial.

Touchtyping on a keyboard is an analogy for template-based-ness, as the keys are hit by, relying on their learned positions. On the other hand, if one searches for the key with the label “A” to type an “A” and so forth, this is an analogy for freeform-based-ness, as the right key is recognized by its look alone.

Whereas the freeform approach is slower due to the necessity to search all the labels/looks of the items again and again, the template approach is more brittle, as it relies on the match of learned positions of items and the actual search space. Not knowing Japanese, I cannot spot the street in an address on Japanese invoices freeform-based. I might be able to spot it template-based if the positions are like on European invoices. However, if the positions on Japanese invoices are different, I may consider an item the street, which is not in fact the street. And I have no chance to know.

For DAU in general one will almost always need to combine both strategies. However, at *I-R-S* one searches:

- A finite set of information items
- Information items with a distinct look
- Always a similar set of information items (not differing very much from invoice to invoice)

Consequently, at *I-R-S* the freeform approach is generally superior. In a number of practical cases a supplement with the template approach is worthwhile. And, certainly, every softening of the above constraints requires more and more template-methods.

### **Online ERP-connection**

With an ERP-connection, an *I-R-S* can retrieve a list of all creditors (the invoicing party, i.e., the sender of the invoice), including their addresses, tax numbers, bank account numbers, etc. Then not only does it know how these information items generally look like, but it can discern, which names and numbers can appear on the invoice. The matching is extremely accurate and fast.

If the connection is online, i.e., accessible at all times, the *I-R-S* can further retrieve a list of all those goods and services which were delivered to a given creditor and not paid to date. Then the invoice line items can be matched just as accurately and quickly.

### **Classification and Page Collation**

Invoices most often span more than one page. (This was reassured by the market poll.) Systems should be able to intelligently collate pages to documents. Otherwise human support is necessary, as incomplete invoices imply inconveniences. Tradition-

ally, a document classification feature was required, because out of a set of pre-configured analysis recipes the system had to choose the appropriate one for the document under consideration, i.e. its class. (cf. [1,2,5]) However, in *I-R-S* it is sensible to simply consider the creditor as the classification. Then, as explained above, the creditor can be used to retrieve from an online ERP-connection the list of possible invoice line items.

### **Multiple Mandators**

Many practical settings require the *I-R-S* to handle invoices from more than one input source (mandator) in parallel, and to keep them separated at all times. Basically, the system needs to be able to import invoices together with labels, distinguish the invoices with the labels, and finally export them to different targets. Actually, however, systems should be able to analyze invoices from different sources with completely different analysis recipes. One supplier (SER GmbH) offers an even smarter feature: encryption of the analysis recipes. Then, human operators of one mandator cannot peek into the analysis recipes of the other mandators.

## **3 Telephone Interviews with User Companies**

70 companies —trading, manufacturing, and combinations— were chosen, out of 350 companies initially called. These 70 receive more than 500 invoices per day and have from 1000 up to several 10000 employees. This section very briefly enumerates a few of the results.

- Process costs for one invoice (opening, sorting, internal delivery, data typing, archiving) were estimated as 9 Euro.
- 70% use an archive system. (Ixo 23%, Docuware 12%, ...). Most of the remaining 30% are planning to launch an archive.
- 97% involve their specialist departments for the invoice acknowledgement.
- 99% cross-check their orders and delivery notes with their invoices.
- Temporary peak loads rise up to 20% over normal.
- Companies with more than 2000 creditors (75%) consider only 20% of them “active”, i.e., they send invoices frequently.
- Invoices take 6.5 days on average from reception to clearance.
- 50% use electronic invoicing. 70% of the other 50% consider or plan electronic invoicing. However, of the first 50%, 80% of invoices still come on paper.
- 29% scan received invoices. Most, thus, type the data from paper into their systems.
- 30% archive their invoices early so that they are accessible during processing. 70% archive only after the invoice processing is finished.
- Interview partners subjectively guessed the error rates of mistyped/misread invoice data to be between 0 and 20%, with an average of 5%.
- The average of processed invoices per employee per day are 126.
- 85% consider the future of invoice processing to be digital.
- 60% plan to automate invoice processing. Of these, 40% plan to implement it in the next 12 months; 25% in the next 6 months.

- Information on intended investments were sparse: from 50 000 € to 200 000 €.
- 77% decline to test prototype systems.
- 73% dislike to think of outsourcing the capturing of their invoice data.

## 4 Systems Overview

This section enumerates the systems in alphabetical order of their suppliers names. The 11 presentations took place from 25. August 2003 to 1. September 2003, at Pylon, in Frankfurt, Germany. The last sentences of the subsections are recommended to read in order to start and get an overview. The further requires to read between the lines, however, the style of presentation transports an idea of what we consider good at least. To conquer the true promise of this section requires, to compare the formulations, and to digest the spread details. For professionals some suggestions were deposited.

### BasWare

The philosophy “process-orientation instead of archive-orientation” shows that BasWare identify a greater potential in the support of processes with invoices than in invoice computer analysis. At least in Scandinavia they could not be much closer to the mark. The *I-R-S* module is more an amendatory component, is only template-based and does not use image preprocessing. The verifier is rather convenient and allows Drag&Drop from the image into the entry mask data fields, demonstrating that ancillary tools can be taken seriously. For projects with stronger demands on *I-R-S*, BasWare is willing to cooperate with stronger analysis suppliers. The Scandinavian mother of the German sales department, which is quoted at the stock exchange and top rated, has its focus on e-procurement and has more than 500 users in the area of invoice workflow support. There are interfaces for 50 ERP-systems. BasWare is Microsoft certified (offers MS Exchange for Workflows). User-tailored systems are configured from building blocks with parameters within 4 to 8 weeks. Basware is interesting for customers, whose optimization potential is mainly concentrated in the invoice acknowledgment workflows.

### Captiva

In the area of data capture Captiva has been active for quite a while; however, a software platform to plug document analysis components together has been in their portfolio for a long time. The German Captiva has existed since 1999. Having realized that it is a big, strategic mistake to anticipate a German market for form recognition, the German Captiva is now correcting this mistake. The technology, a template-based approach, still has some minor deficiencies. There is no module for the collation of pages to documents. The verifier has potential for ergonomic improvement. The system has no user management, i.e., cannot administer rights and duties to users. Multiple mandators are not implemented, due to no demand from respective projects yet. The number of invoice line items is limited to 30 per page. The strengths of Captiva are the online-connection to SAP, with which the available order data can be ex-

ploited for the analysis of invoice line items, thus achieving the best results possible. Further, Captiva have their own OCR modules, e.g., for such special cases as to recognize checkboxes that were ticked and later revised. Captiva has understood and successively corrected the mistakes at the first generation of *I-R-S* solutions. They have the resources to further the development of a standard product. Captiva is on the right track.

### **Dicom**

The technological roots of Dicom are in the USA. Since 2002 Kofax has been owned by the corporation. The product of Dicom consists of AscentCapture, DOKuStar from OCE, and a pre-prepared set of rules, which is configured for specific projects. The added value of their solution is claimed to lie in the use of AscentCapture (many standard interfaces and decentral scan workflow). Sales in Germany focuses on medium-sized businesses. In the German market, the potential of a multi-national company group with strengths in forms data capture is only of limited advantage. However, Dicom has a good network of sites and features user interfaces in many languages. The ergonomics of the verifier will probably change with some more practical experience from projects; e.g., there will probably be a view to allow to zoom in on invoice image parts. The strength of Dicom is in the area of scanning of invoices and their capture platform.

### **Docutec**

Docutec is an established player in the German arena of document analysis and understanding. The Docutec technology is designed for the whole paper mail in-box. Thus, analysis of 100 to 60 000 invoices per day is no great challenge to them. For tailor-made add-ons the Docutec technicians have some tools ready in their toolbox. Self-made OCR tools and a number of obviously successfully finished projects indicate that. Docutec has a remarkable concept of approaching the scenarios of customers, the "DocuWay": after analysis of the customer's document-processes their best optimization potentials are determined via a quality-assured process cooperatively with the customer. The implementation is individually fine-tuned, achieving a complement of technical and organizational measures. The customer-to-Docutec-contact is continually handled by one and the same Docutec person from the outset, through the whole project, up to the aftercare. It is possible to extend or optimize the standard *I-R-S* system. The then necessary specification of document classes and analysis recipes, uses a nice paradigm: the recipes are created in an object-oriented manner from smaller analysis recipe fragments. Beyond the standard connection to SAP (creditors and order data), Docutec offers modules for verification and acknowledge workflows in or parallel to SAP by partners. Docutec's main strength is their „DocuWay“.

### **FreeFormation**

The technology of the German analysis expert FreeFormation is in the form of Prof. Bläsius, Trier, for many years a figure on the German market. His approach, referred to by many as "alternative" (actually "constraint based") is rather efficient and suited for the analysis of the whole paper mail inbox. However, its specific strengths come to bear especially at *I-R-S* in the respective standard system. The method does not

need pre-defined templates (hence the “freeform” in the company name). The flexibility of the technology together with the experience of the technicians allows them to master even complicated and unique *I-R-S* challenges. The connection to the most frequent ERP-systems is an explicit part of the philosophy of FreeFormation for a long time. FreeFormation approaches customer scenarios with the analysis and support of the processes. With a self-made engine, independent of the ERP-system, FreeFormation presents themselves strong in the area of verification and acknowledge workflows for the invoices. Hitherto, customers were large- and medium-sized companies with 100 to 15 000 invoices per day, many with international invoices. The verifier is very convenient, e.g., it offers Drag&Drop from the TIFF-image to the data entry fields. “System teaching”, i.e., human advice of the location of non-system-spotted data, is available to the system instantly to overcome similar cases. Also, accumulated statistically, this information is used in other, not-so-similar cases. By and by, the information ages and is forgotten, so that the system does not “learn dumb”. FreeFormation presents a round, integral, and complete solution.

### **Insiders**

The German analysis expert Insiders has been on the market with its *I-R-S* since Q1/2003. This system can at any time be flexibly extended to the full-fledged system for the whole mail inbox, paper and e-mail. Special modules, like for crossed-out words with colored lines, have been implemented for projects. Insiders is also experienced with special standard developments for given classes of business. Even though Insiders had no customer for the simpler case of *I-R-S*, they have a lot of experience with medical invoices. This allows them to assess a complete *I-R-S* project, from the analysis of the customers processes, a pilot, up to the launch of a productive system within 10 to 20 working days. From experience this time is necessary mainly for the customer to connect the *I-R-S* with their IT infrastructure. The analysis approach for invoices does not require to set up templates. For customer specific optimization, however, this technique is ready and optionally available. Then documents can be classified according to tables, layout features, and with respect to content, and can be separately treated. The state-of-the-art connection to SAP imports creditor data and accesses order data. ERP-external workflow is realized with partners. New knowledge, which comes into the system from corrections at the verifiers, is immediately applied to all invoices in the system, i.e., it is applied also to those documents which were already completely analyzed and are in the queue to be verified. Insiders features the most technologically complete product.

### **ITESOFT**

The German ITESOFT has its roots in the systems house FormConsult. The software of ITESOFT, with a strong 20 years history in forms reading, comes from its French mother company. The German market is served by ITESOFT with a standard product for *I-R-S* for customers with more than 50 000 invoices per year. For fine planning and implementation of the product ITESOFT assesses 8 to 12 weeks. More complicated scenarios can be served as well, perhaps partly involving the development department in France. The system is templated-based and, thus, must be configured. Unknown invoices make the system automatically create a new template, which needs



to be manually validated. Stacks of invoices with different numbers of pages must be structured with separating pages. The ERP-connection is implemented individually for projects. The verifier interface features a document structure view. The mask automatically adapts, i.e., changes, when viewing either invoice heads or invoice line items. ITESOFT offers a module for the graphical configuration and control of the internal system workflow.

### **Kleindienst**

Kleindienst have their roots in services for banks and thrift institutions. Since the acquisition of the former German ICR they can be counted within the category of companies ready to analyze mail inboxes. The standard product for *I-R-S* is immediately executable at the customer's site without extra configuration, and is already aware of international specifics like French date formats. It is installed largely by partners. In projects up to 35 000 active creditors were realized. Data fields that are manually changed at the verifiers, are automatically retrieved on the invoice image and their position(s), and near keywords are stored. After some reiterations the information is sent to the central knowledge base to improve the analysis and is also shown as colored boxes to verifier personnel. With some interesting tools, e.g., a standard two-level OCR strategy (fast first, slow but more accurate second), Kleindienst is able to analyze difficult images like faxes and small fonts reliably. In order to save space at archiving, a converter from 300 to 200 dpi is offered. The SAP-connection is state-of-the-art (creditor and order data). An extra module is available to find and remove duplicates in SAP-master data, which usually greatly reduces the number of entries. The verifier is easily configurable, by editing a file. The experience of Kleindienst showed in seemingly simple remarks, e.g., that systems in larger scenarios often need to be installed as NT-services. Kleindienst impressed us with a comfortably controllable and administrable tool.

### **OCE Document Technologies (ODT)**

ODT has worked in the document analysis sector for a long time, *inter alia* in the analysis of the whole mail inbox. Traditional customers have been greater businesses, however the trend is also toward medium-sized businesses. The ODT standard product for *I-R-S* works without templates. Common scenarios can be served in very short time, sometimes in only a couple of days. ODT has acquired substantial experience in a number of projects, e.g., dedicated to image pre-processing and has participated in research projects. The feature to distinguish invoices of different mandators can be implemented for projects. A learning mechanism is underway. The SAP-connection can only access the creditor data. The analysis modules and verifier do not share the same set of plausibility rules. The SAP-integration is taken seriously. Partners assure a strong SAP-competence. It should be noted that the RecoStar OCR from ODT is bought and used by a number of competitors. ODT is characterized by a remarkable volume of experience, which shows in a plethora of different document-centric algorithms. They can solve a multitude of special problems.

### **Paradatec**

Paradatec is a small document analysis specialist with a traditional focus on the mail inbox. Paradatec serves large businesses as well as small- and medium-sized businesses exclusively over partners. However, they like to be involved in large or critical projects. The standard product is pre-configured for mail inboxes and is adapted for specific projects. No configuration of templates is required. The system has very good performance. It is based on an ingenious, self-made OCR, which allows them also to analyze difficult images, like faxes. The external interfaces, also including the connection to ERP-systems, is assured through the embedding of the system into Ascent-Capture. Creditor data can be imported; up-to-date order data cannot be used. The verifier user interface offers a nice stack structure view. With the mouse one can move a magnifying glass over the invoice image. The interface has far developed ergonomics and indicates of some experience with bulk processing. Compared to the other suppliers, Paradatec seems to be closest to the (positive!) cliché of the high-tech garage company. Paradatec is always worth an inquiry call for complicated document analysis and understanding problems.

### **SER**

SER were recently awarded a prize for the best DMS. Their *I-R-S* technology is designed for the whole paper mail inbox. The largest project to date processes 32 million invoices per year. With a standardized procedure, analyzing scenarios process-orientedly, their standard *I-R-S* can be launched very quickly—in typical scenarios, sometimes faster than a week. The technicians of SER and their technology are prepared for individual and special problems. The SAP connection accesses creditor and order data. The analysis recipes for documents of different mandators are encrypted, so that documents and analysis recipes are secured against meddlers. For non-found data items (typically only the invoice number, because crosscheck information is hardly available) the candidates on the invoice image are highlighted in the verifier. With a mouse-click the right candidate can be adopted. Learning knowledge from corrections at verifiers can be harmonized with corrections from other verifiers and activated at a validation user interface. The knowledge is represented with a so-called learning set, i.e., a set of invoices, together with marks, which indicate where the system searches. A self-made module for invoice validation workflows will be available soon. SER has a comprehensive product portfolio and thus also masters related tasks of *I-R-S* in businesses, like archiving and knowledge management.

## **6 Strategic Disclosures**

All suppliers have consistently referred to the fact that, at first, customers cannot believe that the systems actually work.

Except for Insiders (a spin-out of DFKI) and ODT, the suppliers do not employ innovative technology, and do not build on available scientific results, nor other literature; or they pretend not to. Perhaps related to this, most of the suppliers misjudged the capabilities, strengths, and weaknesses of their competitors.

The suppliers substantiated, that in most scenarios, with an online ERP-connection the recognition rates and recognition qualities were very high in the 90 percents.

The required broad spectrum of technological competences (like OCR, invoice verification workflow, ERP-connection, etc.) and the necessary knowledge of the branches of business of users, seem to be reliably realizable with partner networks.

The experience of the study authors was that after a careful problem analysis the return on investment (ROI) of *I-R-S* projects can be reached within one year. This perception was (without solicitation) supported by BasWare, OCE, and Kleindienst. This fact should certainly not be misinterpreted that projects launching *I-R-S* are inevitably successful. Naturally the common rules and methods to make projects successful have to be obeyed here as well.

Even interested customers react tremendously negative on terminology they consider technical (e.g. “pattern matching”).

The distinction between template and freeform strategy is not only technologically sensible, but very important politically: we were told about large customers, which had invited suppliers for demos, who immediately cancelled the demo when the supplier said, that their system uses templates. Note, that the buzzword “forms” or “form recognition” is considered comparably.

*I-R-S* requires the classification of invoices according to creditors only. Such classification does not require a so-called “semantic” methodology, working on the basis of textual (i.e. content) similarities. Three suppliers, however, have this methodology: at their disposal SER and Insiders own components; Docutec has a contract with Amenotec.

If a module is marketed with a buzzword (like “artificial neural networks”) the particular rationale for this technology for the task at hand should be explicated. In our case, the supplier could not explain the use of artificial neural networks, as the module was a “black box” from another supplier. Perhaps due to the stereotypical German rudeness we asked if they believed that the module can do its job with an artificial neural network particularly well. They admitted that the latest advice was no longer to mention artificial neural networks being used by this module. These people were really nice, however, they had to market their system. Many have to do that, don’t we?

If in scenarios order data or delivery notes are not available, it is necessary to employ methods for the analysis of free tables. The presentations were used only by Insiders, Paradatec, and —with restrictions— SER and Kleindienst, to demonstrate some respective features of their systems. Interestingly, in the questionnaires, almost all suppliers claimed to be able to analyze tables. However, they referred only to the ability to analyze the invoice line items, assuming the availability of the order data. Thus, they actually analyze the table data, but do not employ specific table methods at all.

The launching of an *I-R-S* should always prioritize the optimization of the invoice handling processes. Approaches which are motivated software-technologically are thus seldom adequate.

## 7 Discussion

This paper introduced to “invoice reading”, a document analysis application field, to be found anywhere, where companies run ERP systems and receive printed invoices. We reported about 11 companies and systems that are available on the German market for this purpose. We further reported very briefly some results from 70 telephone interviews with potential customer companies about their thoughts, requirements, and constraints.

We hope, readers started drawing their own conclusions. However, we provide some templates here. If we say about a system “*The verifier is very convenient, e.g., it offers Drag&Drop from the TIFF-image to the data entry fields*” this shows that the usability and thus also the GUI of a system and even special features like Drag&Drop, are crucial for us (not alone the authors) to consider a system mature.

Because “*All suppliers have consistently referred to the fact that, at first, customers cannot believe that the systems actually work*”, we conclude that even those individuals in public, which are professionally searching for document analysis technology, do not know what our document analysis technology is capable of. We believe that this is both, disadvantageous for our discipline, and different in other fields of computer science and artificial intelligence and that this is a strong motivation to get active and change this. The fact that “*Even interested customers react tremendously negative on terminology they consider technical (e.g. “pattern matching”)*” can be interpreted, as it was worth to try to better adapt or connect our language to the public language. Where could we publish respective papers?

Because “*77% [of the customer companies] decline to test prototype systems*”, we conclude that it is necessary to try to design standard-systems for standard-problems. And further, because “*The launching of an I-R-S should always prioritize the optimization of the invoice handling processes*” such standard problems should be tried to be derived from typical invoice handling processes of typical companies.

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