



# **Recommended Course of Action for the Implementation of Electronic Invoicing in Public Administrations**

## **Final Report on the eRechnung Project**

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in cooperation with



Recommended Course of Action for the Implementation of Electronic Invoicing in Public Administrations – Final Report in the eRechnung Project

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## Executive summary

Around 32 billion invoices are exchanged annually in Germany,<sup>1</sup> with the share of electronic invoices presently in the single-figure percentage range. However, the EU Commission has called on its Member States to establish electronic invoicing as the predominant method for handling invoices by 2020. In Spain, Italy, Denmark, Austria and Sweden, for example, companies are being required to handle all business transactions with public administration systems by electronic means. Corresponding administrative and legislative measures have been introduced or are in the implementation phase. Initial measures have also been implemented in Germany in accordance with the Tax Simplification Bill (StVereinfG) of 2011 and the circular issued by the Federal Ministry of Finance on 2 July 2012<sup>2</sup>, with the aim of reducing costs in the area of paper-based invoicing, which may currently be as high as EUR 23. On the basis of current technological and legislative developments, the **challenge** lies in selecting the appropriate solution for public administration systems with regard to cost and sustainability from among a large number of alternatives for electronic invoicing (e-invoicing).

The aim of this study is thus to define potential solutions for the transition to electronic invoicing and to undertake a comparative assessment of these options in order to establish recommendations for the implementation of electronic invoicing in transactions with public administration systems – focusing initially on the Federal level.

The **method** employed takes the form of a cost-utility analysis, a classic, multi-dimensional means of cost-benefit analysis. Requirements pertaining to a new invoicing process are first of all identified and weighted from the point of view of both the private-sector sender of the invoice and the public administration as recipient. An objective assessment of the suitability of different alternatives is then carried out by reference to various surveys and other sources of analytical information in order to establish the extent to which the established requirements are fulfilled.

On the basis of the derived system of goals, hierarchically structured **goal criteria** can be established which determine the utility value of an e-invoicing alternative. Firstly, the solution must be efficient, i.e. above all it must reduce process times and process costs. Secondly, a solution must be simple. Ensuring compatibility, flexibility and the use of standards are of relevance here with regard to the technological aspects of realisation. From the point of view of public administration, a solution's simplicity also has a direct impact on the reduction of bureaucracy, for example by virtue of the fact that electronic invoicing establishes transparency and minimises the degree of interaction between recipient and sender. Thirdly, an electronic invoicing process must be effective with regard to security, conformity and quality aspects. In this context, the authenticity and integrity of an invoice must be ensured, national and European law must be observed and the highest possible level of process quality (for example, with regard to traceability, transparency) and data quality (minimisation of errors on the invoice itself and at the data input stage) must be achieved. Sustainability can be identified as the fourth overarching goal category. In addition to the ecological sustainability resulting from the conservation of resources

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<sup>1</sup> Statement of the Council for the Review of Legal Norms (NKR) on the Tax Simplification Bill, 2011.

<sup>2</sup>[http://www.bundesfinanzministerium.de/Content/DE/Downloads/BMF\\_Schreiben/Steuerarten/Umsatzsteuer/Umsatzsteuer-Anwendungserlass/2012-07-02-Vereinfachung-der-elektronischen-Rechnungsstellung.pdf?\\_\\_blob=publicationFile&v=4](http://www.bundesfinanzministerium.de/Content/DE/Downloads/BMF_Schreiben/Steuerarten/Umsatzsteuer/Umsatzsteuer-Anwendungserlass/2012-07-02-Vereinfachung-der-elektronischen-Rechnungsstellung.pdf?__blob=publicationFile&v=4).

and optimisation of the carbon footprint, future economic viability is also of relevance in this connection. Possible network effects must therefore be considered and misinvestments ("sunk costs") avoided. The new SEPA regulations, which are to become mandatory in the near future, need to be taken into account in payment transactions, for example, with appropriate solutions to be integrated in anticipation of the new regulations. The fifth and final category at the highest level is the enforceability of a solution, which is directly dependent on its acceptance at organisational and, above all, individual level. Implementation will only be successful when the entire workforce accepts a new solution and the solution concerned is also called for and promoted by the management at the enterprises and administrative authorities concerned. Special aspects relating to administration are thus to be considered in this context. The exchange of invoices is furthermore a bilateral process, which needs to be accepted by both business partners.

Possible **variants** for the exchange of invoices result primarily from the invoice format (read-only format/PDF, PDF + header data, PDF + full data) and the mode of transmission for invoices (e-mail, DE-Mail, https, web portal). Including the conventional paper-based solution and the application of an EDI solution, a total of 14 distinctive alternatives can be identified whose utility value can be evaluated by reference to the perspectives and goal criteria included in the analysis process.

The **results** of the evaluation (excluding "exceptions" resulting from different types of invoices, for example, i.e. with/without order reference or with high/low security requirements) show that **the receipt of invoices by e-mail in read-only format plus data record (containing both header and item data) is the best solution for public administration**. This assessment is due in part to vast cost advantages for the sender (elimination of postage, time savings resulting from reduction in errors) and the opportunity for effective integration in an electronic workflow at the receiving end, which results in improved process quality and is conducive to reducing bureaucracy.

For the purposes of practical **implementation** it is important to involve all the parties concerned, while also taking exceptions into account. Wherever possible, general standards (such as XML) should be chosen and simple implementation which will be feasible even for micro-enterprises is to be ensured. This will enable broad acceptance in the interests of the Federal Government's aim of reducing bureaucracy. The authenticity and integrity of "sensitive" invoices must also be ensured (for example, by sending via DE-Mail). From an organisational point of view, it is also recommendable to combine the introduction of electronic invoicing with streamlining and centralisation of the overall process relating to the receipt and processing of invoices. In view of this, corresponding measures initialised at various points in the federal administration to date require further consolidation.

Concrete routes for implementation will be established and evaluated in the course of various **pilot projects** which cover electronic invoicing between institutions of public administration (at various levels and with different software setups) and various partners from the private sector.

## Contents

1	Introduction.....	1
2	Focus and methodology of the study.....	3
2.1	Perspectives: Private sector / public administration.....	3
2.2	Cost utility analysis procedure.....	3
2.3	Data sources .....	4
2.3.1	Analysis of relevant literature .....	5
2.3.2	Secondary data .....	6
2.3.3	Survey of experts at international level .....	6
2.3.4	Quantitative surveys within public administration .....	7
2.3.5	Studies in the private sector.....	7
3	System of goals.....	8
3.1	Goal criteria .....	8
3.1.1	Efficiency.....	8
3.1.2	Simplicity.....	9
3.1.3	Effectiveness.....	9
3.1.4	Sustainability.....	9
3.1.5	Enforceability.....	10
3.2	Weighting of goals.....	10
4	Identification of alternatives for electronic invoicing .....	12
4.1	Drafting of invoices: data formats.....	13
4.2	Forwarding of invoices: transmission methods.....	14
4.2.1	E-mail .....	14
4.2.2	Web portal.....	14
4.2.3	https transmission .....	15
4.2.4	DE-Mail .....	15
4.2.5	EDI methods .....	15
4.3	Resultant alternatives.....	15
4.4	Processing of invoices.....	16
4.4.1	Incoming invoices .....	16
4.4.2	Examination of form and content .....	16
4.4.3	Ordering of payment .....	17
4.4.4	Booking.....	18

4.4.5	Archiving .....	18
5	Assessment of the different alternatives .....	18
5.1	From the point of view of the public administration .....	18
5.1.1	Utility assessment with regard to efficiency .....	18
5.1.2	Utility assessment with regard to simplicity.....	21
5.1.3	Utility assessment with regard to effectiveness.....	22
5.1.4	Utility assessment with regard to sustainability .....	23
5.1.5	Utility assessment with regard to enforceability.....	24
5.2	Overall perspective taking in the entire business community .....	24
6	Organisational aspects of implementation .....	25
6.1	Lessons learned from other countries.....	25
6.1.1	Status quo .....	25
6.1.2	Obstacles / implementation problems .....	27
6.2	Legal basis.....	29
6.2.1	Aspects of turnover tax law .....	29
6.2.2	Accounting aspects .....	33
6.2.3	<i>Budgetary aspects</i> .....	35
6.2.4	<i>Data protection aspects</i> .....	35
6.3	Consideration of security-related exceptions .....	35
6.4	Implementation .....	36
6.4.1	General requirements pertaining to implementation.....	37
6.4.2	Recourse to standards.....	37
6.4.3	Underlying framework for implementation .....	38
6.4.4	Selection of tools/solutions .....	38
6.4.5	Internal process setup and application in pilot projects .....	39
7	References .....	43

## 1 Introduction

Networked computers have become established in widespread use not only at companies of various sizes and in public administration systems but also at smaller set-ups and among private individuals. Despite this fact, a paper-based infrastructure still prevails for the purposes of exchanging invoices. An annual total of some 32 billion invoices are printed out, inserted in envelopes and duly dispatched in Germany alone. At the receiving end, the invoice data are commonly transferred manually to back-end systems for further processing. This process is around 10 times more expensive than exchanging invoices by electronic means. The lifecycle of an invoice also extends to supplementary processes such as dunning. In view of the fact that electronic invoicing still only accounts for less than 10% of the total invoicing volume in Germany and Europe and mindful of the fact that paper-based invoicing slows down business activities, the Federal Government has recently announced its intention to render electronic invoicing attractive both for business enterprises and – in particular – for public administration systems.

As such, electronic invoicing (or e-invoicing) constitutes a key element of so-called electronic government (e-government) – the generic term employed for the use of information technology in the public sector to support authorities, to involve the public and to reduce bureaucracy in general. E-government is intended to enhance the efficiency, effectiveness and transparency of processes first and foremost by replacing the manual handling of documents with digital processes and integration into an electronic workflow. These developments relate primarily to G2B relationships ("government-to-business") and G2G relationships ("government-to-government"). This also includes those areas in which the administration invoices members of the public directly for services, namely the area of G2C ("government to citizen").

Electronic invoicing offers both economical and ecological advantages over paper-based invoicing, with the savings potential harboured by e-invoicing within the EU is estimated at EUR 243 billion (EU 2007). However, the blanket implementation of e-invoicing throughout Europe – and particularly in the public administration in Germany – has yet to materialise, but there are pioneering projects in countries such as Denmark or Sweden which demonstrate how a successful transition to electronic invoicing can be achieved in the public sector.

Alongside economic and ecological considerations, the pertinence of introducing e-invoicing is defined first and foremost by EU directives. In December 2010, for example, the European Commission presented a package of technical and legal parameters aimed at establishing electronic invoicing as the predominant method of invoicing by 2020 and enabling the simple exchange of electronic invoice data, above all for small and medium-sized enterprises (SMEs). The Federal Government has also recognised the central importance of information and communications technology (ICT) for the German economy and sees strengthening the ICT area as the key to consolidating and expanding productivity in all branches of industry and in the public administration. The Federal Government's "Deutschland Digital 2015" ICT strategy is thus geared to the objectives of the "Digital Agenda for Europe" and aims to enhance and safeguard the competitiveness of the German economy on a sustained basis and to create new jobs. In this

context, the Federal Government has explicitly stipulated facilitating electronic invoicing (Turnover Tax Act, Section 14) as one of 40 measures in the 2011 "Tax Simplification Bill"<sup>3</sup>.

Electronic invoicing has also been adopted into the Federal Government's "Better Regulation" work programme by virtue of a cabinet decision on 28 March 2012. In this context, improving electronic invoicing between public administration and the business community is aimed in particular at reducing the costs of red tape to the private sector over the long term. This objective thus constitutes a key factor in drawing up a roadmap for electronic invoicing.

The relevance of the project at Federal level is substantiated by various studies and strategy papers, including research commissioned by the Federal Ministry of the Interior and the Federal Ministry of Economics. The study "E-Business-Standards in Deutschland" shows that just under half of all German companies carry out e-business, whereby the term "e-business" covers all forms of automated and computer-assisted data interchange within companies and between business partners (B2B) via electronic networks. Standards and standardised processes play an important role in this connection, ensuring that standardised information is available in the correct format, at the right point and at the right time along the entire value-added chain. The findings of studies show that almost 80% of surveyed companies have accelerated their business processes and two thirds have been able to improve the quality of their data by applying set standards (Skiera et al., 2004). The studies ultimately reveal that the benefits of standardised data and business processes increase with the number of business partners and the number of electronic business transactions. The more clearly defined, accepted and established an applied standard is, the greater the potential for cost cutting and for speeding up processes will be.

The difficulties (and the subsequent need for studies presenting sound scientific findings) arise from the large number of diverse solutions which result from the different combinations which are possible between the three main standardisation levels of content standards, transport standards and process standards. In addition, a plethora of different technologies and connection variants is also involved. Criteria which are identifiable in relation to electronic invoicing include:

- type of document (e.g., Word document, PDF document, data),
- data content and standard (e.g., EDI, XML),
- mode of transfer (e.g., e-mail, DE-Mail, https),
- ensuring authenticity and integrity (e.g., digital signature, verification methods).

At present it is unclear which of the approaches and models available on the market represent the best and most promising options for systems of public administration and private-sector enterprises.

This study thus seeks to define potential solutions for the transition to electronic invoicing and to undertake a comparative assessment of these options in order to establish recommendations for the implementation of electronic invoicing with public administration systems – focusing initially on the Federal level.

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<sup>3</sup> <http://gesetzgebung.beck.de/sites/gesetzgebung.beck.de/files/RefE-Steuervereinfachungsgesetz.pdf>.



The subsequent chapters concern the applied method of cost utility analysis and the data collected as a basis for this analysis (chapter 2), the objectives pertaining to the transition to electronic invoicing (chapter 3) and the subsequently determined alternatives for electronic invoicing with an administration (chapter 4). The alternative courses of action are evaluated in terms of utility values from the point of view of public administration and the private sector and in aggregated form in a macro-economic context (chapter 5). Aspects relating to concrete implementation are then considered (chapter 6).

## **2 Focus and methodology of the study**

### **2.1 Perspectives: Private sector / public administration**

While the evaluation of optimum solutions for electronic invoicing between the private sector and the public administration systems was initiated by the public sector – in the guise of the Federal Ministry of the Interior –, viable solutions can only be achieved by considering the matter in hand from all perspectives. A simple distinction between the private sector and public administration is not expedient here, as enterprises of different sizes in the private sector have different requirements and different implementation options with regard to e-invoicing.

Different roles similarly apply according to whether the issue is evaluated from the point of view of the recipient or the sender of the invoice. This project focuses on public administration as a recipient of invoices. Its role as a sender of invoices is of only secondary importance in terms of the volumes of invoices in circulation – though it should not be entirely neglected. The envisaged pilot project also includes a sub-project on electronic invoicing with the administration as the sender. As the primary focus of this project is on enabling an electronic payment process and as invoicing merely provides the essential basis for such a process, this sub-project is understood as a necessary annex to the main project to be considered here. The private sector is defined as the sender of invoices.

What emerges are the following main perspectives which are considered in the present analysis (cf. chapters 5 and 6):

- public administration as the recipient of invoices,
- large-scale enterprises as the senders of invoices,
- SMEs as the senders of invoices,
- micro-enterprises as the senders of invoices.

Additional perspectives, including consideration of different types of invoices (e.g., with/without order reference; high/low security requirements pertaining to transmission) will be addressed in the course of the discussion of aspects relating to practical viability.

### **2.2 Cost utility analysis procedure**

Cost utility analysis is one of the classic, multi-dimensional methods of cost-benefit analysis. Its aim is to select the best alternative course of action (in this case, selection of the method to be

implemented for electronic invoicing) from the decision-maker's point of view. The appurtenant procedure breaks down into the following steps (cf. Schmidt 1996):

1. Definition of a system of goals covering the collective requirements pertaining to the alternatives
2. Development of a goal hierarchy with overriding goals to which various subordinate goal criteria  $k_j$  ( $j=1,...,m$ ) are assigned
3. Weighting of these goal criteria ( $g_j$ )
4. Most objective possible evaluation of the degree of goal attainment (dimensionless points scale as rating key) by the alternatives  $A_i$  ( $i=1,...,n$ ) with the respective goal yields,  $e_{ij}$
5. Multiplication of the goal yields
6. Selection of the best alternative,  $A_i$ , for the respective decision-maker on the basis of the cumulative sub-utility values,  $n_{ij}$

Figure 1 presents the calculation formulae for cost utility analysis.

Goal criteria	Criteria weightings	Project alternatives					
		$A_1$		$A_i$		$A_n$	
		Goal outcome	Partial utility value	Goal outcome	Partial utility value	Goal outcome	Partial utility value
$k_1$	$g_1$	$e_{11}$	$n_{11} = g_1 \cdot e_{11}$	$e_{i1}$	$n_{i1} = g_1 \cdot e_{i1}$	$e_{n1}$	$n_{n1} = g_1 \cdot e_{n1}$
$k_j$	$g_j$	$e_{1j}$	$n_{1j} = g_j \cdot e_{1j}$	$e_{ij}$	$n_{ij} = g_j \cdot e_{ij}$	$e_{nj}$	$n_{nj} = g_j \cdot e_{nj}$
$k_m$	$g_m$	$e_{1m}$	$n_{1m} = g_m \cdot e_{1m}$	$e_{im}$	$n_{im} = g_m \cdot e_{im}$	$e_{nm}$	$n_{nm} = g_m \cdot e_{nm}$
Total weights	$\sum g_j$	Utility Value of $A_1$	$\sum n_{1j}$	Utility Value of $A_i$	$\sum n_{ij}$	Utility Value of $A_n$	$\sum n_{nj}$

Figure 1: Formal presentation of cost utility analysis (with reference to: Bechmann 1978, Hanusch 1994, Lenk 2010)

The two central tasks in the course of cost utility analysis thus comprise defining the goal criteria and assessing the suitability of various alternatives for attaining the goals concerned. In order to ensure maximum objectivity in the decision-making process, in addition to the acquisition of expertise in the matter concerned by collecting comprehensive data, a high degree of neutrality is also to be maintained. With this in mind, the following section illuminates the employed data sources in detail.

### 2.3 Data sources

The data serving as the reference basis for the cost utility analysis were generated from various sources by means of diverse collection methods. In addition to a structured analysis of relevant literature, quantitative and qualitative studies were conducted in the private sector (across all sizes of enterprise) and in public administration systems (at European, Federal, Land and local level). In connection with case studies at government agencies and authorities, a wealth of substantial secondary materials was also made available – in particular by the Federal Ministry of the Interior and the federal province of Hesse (e.g., process models, internal reports, figures and data relating to the receipt and processing of invoices and the deployment of software). A number of the most important sources of information for the analysis process are presented below.

### 2.3.1 Analysis of relevant literature

The analysis of relevant literature provides the essential foundation in scientific practice for assessing the current status of research into a specific topic. Various methodical approaches are possible here, depending on the subject matter concerned. The essential differences between the approaches described below relate to their methodical breadth and depth, in view of which they are mutually complementary, rather than substitutional. The structured analysis of relevant literature serves to obtain the broadest and most comprehensive possible assessment of the level of research into a given topic. The extent of the efforts to find relevant sources is generally limited to scientific literature databases and – when a large number of results is expected – to a specific timeframe. Where topics possess a high level of public relevance, however, it is also expedient to include studies and sources from the private sector, as the examination process behind scientific literature requires a certain lead time, which may impose certain restrictions on the up-to-dateness of the information concerned. Search terms are used to scan the selected databases, the relevance of the results are then checked manually and subsequently categorised and encoded according to content. For the purposes of this project, the search terms "e-government", "e-billing", "e-payment", "electronic invoicing" and "e-invoicing" were first of all used to scan the Ebsohost database, the online library of the Association for Information Systems (AIS) and Google Scholar. The resultant tally of approximately 230 articles and studies was sorted according to factors driving or inhibiting the acceptance of electronic invoicing in government quarters.

In addition to this form of literature analysis, a so-called "scientometric approach" was also subsequently pursued, in order to cover the respective methodical approaches and quantitative results in addition to the scope of driving and inhibiting factors. Scientometrics is a scientific study concerned with the scientific process. The object of the study is the scientific article itself, rather than the scientists or the authors (cf. Lowry et al., 2004). It constitutes "research into research", as it were (cf. Straub, 2006). Scientometrics is used to analyse science as an information process, applying quantitative methods to research results (cf. Jokic and Ball, 2006). The analysis of citations, meta-analysis and opinion polls are methods employed in scientometrics (cf. Lowry et al., 2004). Scientometrics is closely linked to the concept of bibliometrics, but while bibliometrics is limited to the quantitative assessment of scientific publications, scientometrics involves a broad-based quantitative analysis of scientific works (cf. Neuhaus, 2010). This method was applied to search 82 specialist journals and conference reviews according to the terms "electronic invoicing", "e-invoicing", "e-billing" and "electronic billing". The search yielded 26 articles published in six different journals and eight conference reviews. The content of the articles was then encoded similarly to in the analysis of relevant literature, but to a far more detailed extent.

While the analysis of relevant literature provides a general overview of factors driving and inhibiting the introduction of electronic invoices, the scientometric approach thus additionally offers a means of specifically filtering out gaps in the research and central issues of research in the area of e-invoicing.

Results of this examination process are also to be found in the paper "A Unified View of Electronic Invoicing Adoption: Developing a Meta-Model on the Governmental Level" by Kreuzer et al., (2013).

### 2.3.2 Secondary data

In recent months, the project team has carried out various case studies at institutions of public administration (e.g. Federal Office of Administration, Federal Office for Cartography and Geodesy, Federal Statistical Office, Hessian State Ministry), as well as at SMEs and software manufacturing companies. The aim of these studies, which were based for the most part on expert interviews, was to triangulate the findings of the analysis of relevant literature, i.e., to supplement these findings with additional data sources and to compare them with these data. In addition to the direct results from the interviews, a wealth of secondary data was thus also collected and analysed. The ongoing involvement in work and bodies such as the FeRD (Forum for Electronic Billing in Germany) also contributed to this data yield.

These secondary data are commonly characterised by the fact that they are not accessible to outsiders and in some instances they may only be used in anonymised form. The following list thus contains only a general enumeration of secondary data which have been used in the present study. As a rule, these data "types" are available to us for cases relating to private-sector enterprises as well as for systems of public administration at all federal levels:

- administrative structures,
- models of ACTUAL and TARGET processes for handling invoices,
- process models of the document workflow,
- figures and data relating to the processing of invoices and the deployment of software,
- budgets, costing,
- company codes,
- invoice volumes,
- internal reports, presentations, lessons learned, etc.

### 2.3.3 Survey of experts at international level

In order to evaluate examples of best practice at international level, a survey of representatives responsible for e-invoicing in various countries ("County Information Managers") was carried out. All 35 people who are listed on the "E-Invoice Gateway" platform were contacted by telephone and subsequently sent a semi-structured questionnaire. This platform in turn forms part of a project by the Comité Européen de Normalisation (CEN, European Committee for Standardisation). To date, experts from the following countries have taken part in the survey: Germany, Estonia, Ireland, Iceland, Croatia, Latvia, Lithuania, Mexico, Netherlands, Norway, Sweden, Switzerland and Spain.

The questionnaire breaks down into three blocks. The first block was comprised of demographic details relating to the respondents' professional functions, together with questions relating to their understanding of the concept of e-invoicing, the level of acceptance of electronic invoices in the country concerned and the urgency with which the respective governments are pushing ahead with e-invoicing. The second block concerned open questions on the advantages and disadvantages of electronic invoices and on government initiatives in the respective countries.

The third block served to validate the factors driving and inhibiting the acceptance of electronic invoicing which had been ascertained from the analysis of relevant literature. Likert scales were used to poll the positive and negative effects of these factors on acceptance.

This international survey of experts served as a reference source in the above-mentioned analysis of acceptance factors for e-invoicing (Kreuzer et al. 2013).

#### **2.3.4 Quantitative surveys within public administration**

The available options for the electronic exchange of invoices with the public administration had not previously undergone any detailed examination at Federal, Land or local government level. Consequently, various surveys tailored specifically to the administration were initiated in the course of the project, with the aim of collecting a pool of data on the basis of which a common solution can be evolved for suppliers to federal authorities, provincial administrations, municipal and local government bodies.

A substantial database is provided by the inter-ministerial survey to assess the status quo in the federal administration which was carried out during the project with the aid of the Federal Ministry of the Interior. In this survey, which ran from April to May 2012, the experts from the federal ministries and some 25 authorities concerned with the respective spheres of business answered questions relating to matters such as the involved personnel, invoice volumes and processes, document workflow systems, processing times, needs for modifications and expected developments.

Very similarly designed surveys at local government level (addressed to representatives of the Hessian towns and local government units and of selected towns in other federal provinces) and interviews with administrative assistants at Hessian universities who are entrusted with invoice processing duties were completed at the beginning of October 2012. These surveys are for the most part still in the evaluation phase.

The descriptive results of the surveys at federal, provincial and local government level are attached in the annex to this report.

#### **2.3.5 Studies in the private sector**

Bonpago and the University of Frankfurt have been conducting surveys in the private sector on the topic of electronic invoicing for over 10 years now (cf. Spann und Pfaff, 2001, Pfaff et al. 2004a and 2004b, Skiera et al., 2004, Pfaff et al., 2007, Pfaff, 2009, for example). This provides recourse to a substantial pool of data for the purposes of the project, whereby it goes without saying that the existing data requires continual updating in order to take account of technological and strategic developments. As first and foremost SMEs and micro-enterprises are to be supported and supervised in their issuance of electronic invoices for the public administration, the project team has been carrying out case studies and preparing pilot projects in this sector since April 2012 (see [www.e-docs-standards.de](http://www.e-docs-standards.de)).

### 3 System of goals

The following sections present the results of analysis steps 1 to 3. On the basis of the data sources described in the previous chapter, a target system was first of all defined comprising the full scope of requirements pertaining to the alternatives intended for evaluation at a later stage in the process. The more than 30 individual requirements identified from surveys and case studies or described in the relevant literature can be broken down into 12 overriding goals which, in turn, can be pooled into five overriding goals at the highest level: efficiency, simplicity, effectiveness, sustainability and enforceability. Figure 2 shows the defined goal tree.

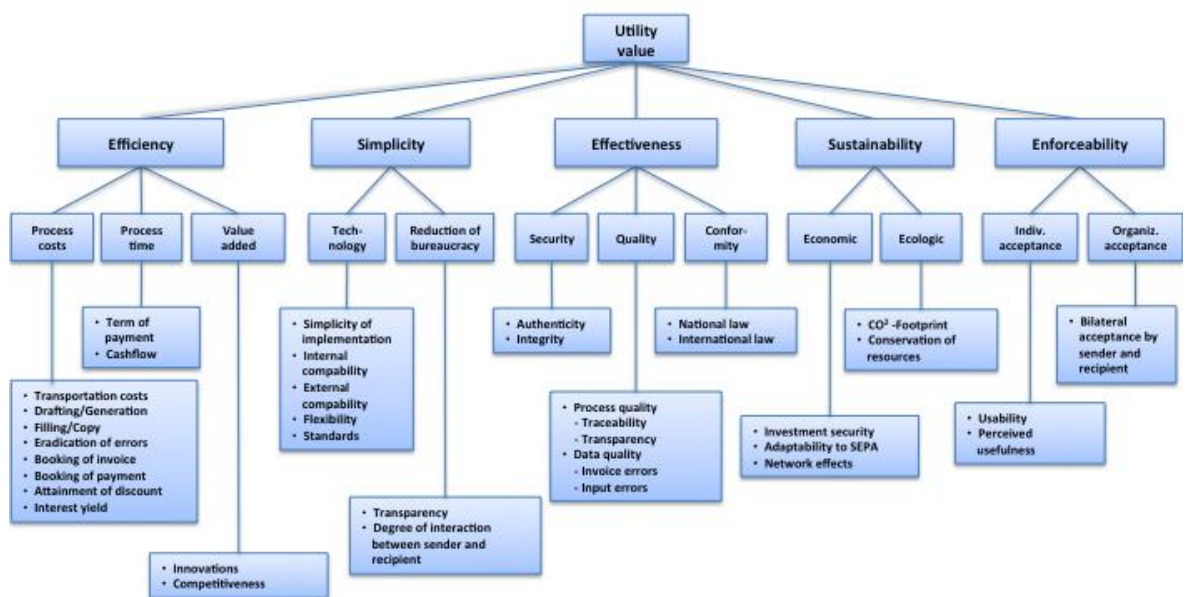


Figure 2: Goal hierarchy

Chapter 3.1 below describes the five branches of this goal tree in greater detail. Chapter 3.2 then examines the weighting of these goal criteria from the point of view of public administration.

## 3.1 Goal criteria

### 3.1.1 Efficiency

Economic benefits which accrue to the state or companies as a result of the use of e-invoicing as opposed to paper-based invoicing are a key driving factor with regard to the introduction of electronic invoicing. In general, an efficient solution first of all lowers the attendant process costs. The savings potential harboured by e-invoicing within the EU is estimated at EUR 243 billion (EU 2007). The use of electronic invoicing is capable of cutting administrative costs by up to 80% (Penttinen and Hyytiäinen, 2008). This cost-cutting potential arises from various factors, such as changes to the transport route, savings in the drafting, generation and duplication of invoices, lower levels of errors and complaints (see also 3.1.3) and gains from discount and interest.

The latter points are directly linked to the goal of shortening the duration of processes, which in turn is directly related to the reduction of costs (see also Bertelè and Rangone, 2008). The findings relating to secondary data in the case studies – in contrast to the personal assessments in interviews and questionnaires – reveal that the period allowed for payment is very commonly and

regularly exceeded in paper-based processes. This affects liquidity for the party making out the invoice and opportunities to secure discount for prompt payment on the recipient's side. A final factor which is particularly important for businesses is a solution's value added contribution. Innovative quality and competitive edge are key factors here.

### **3.1.2 Simplicity**

Simplicity is a further requirement for a solution. From the point of view of the public administration, a solution's simplicity has a direct impact on the reduction of bureaucracy, for example by establishing transparency and, in the case of invoices, by minimising the degree of interaction between recipient and sender. Reducing the over-regulation of "official practice" helps to simplify processes and to reduce throughput times. In the public administration sector, human resources are tied to activities which could be handled more simply by way of automation.

Ensuring compatibility, flexibility and the use of standards are of relevance with regard to the technological aspects of "simple" realisation. The technological readiness of an organisation or institution has been identified as a central impediment to the realisation of e-invoicing. The high fragmentation of software solutions and processes leads to a barely manageable degree of complexity, for example, which in turn gives rise to the (cost-intensive) need to establish external and internal compatibility for systems (DB Research, 2010, Legner and Wende, 2006). Simplicity is ensured in all these cases by using an appropriate technology, but also by applying appropriate standards. In this context, an appropriate technology ensures a minimum level of technological complexity, while the use of appropriate standards ensures maximum compatibility, both internally (compatibility of a potential solution with other employed systems, e.g. ERP, within the organisation) and externally (compatibility with the systems used by other organisations, business partners, etc.). In order to be "simple", a system must meet all the defined requirements (Rogers, 1995).

### **3.1.3 Effectiveness**

Thirdly, an invoicing process should be effective with regard to security, conformity and quality aspects. A distinction is to be made here in the invoicing process between process security and document security. It is imperative that authenticity and integrity be ensured throughout the process, from making out the invoice through dispatch to processing by the issuer (cf. chapter 4). The highest possible standards of process quality (for example, with regard to traceability, transparency) and data quality (minimisation of errors on the invoice itself and at the data entry stage) should also be attained. The implementation of e-Invoicing also commonly fails due to uncertainty regarding national and international legislation (TrustWeaver, 2011).

### **3.1.4 Sustainability**

The sustainability of a potential solution comprises both ecological and economic aspects which are to be considered in the course of implementation. Sustainability is aimed at ensuring that the solution protects the environment over the long term, while also safeguarding economic efficiency.

Just under 30 billion invoices are sent out annually in Europe, 95% of which are paper-based (Innopay, 2010). Sending electronic invoices is thus a sustainable means of protecting the environment and fulfilling social responsibilities. 400,000 tonnes of paper (corresponding to around 12 million trees), 2,700 tonnes of ink, 165 million litres of diesel and 1,350 GWh of energy



can be saved through electronic invoicing (Penttinen und Hyytiäinen, 2008). CO<sub>2</sub> emissions can also be lowered by as much as 63% by way of electronic invoicing (Tenhunen und Penttinen, 2010). The actual savings involved here of course vary according to the type of e-invoicing process deployed. Electronic invoicing with structured data attachments entail more process stages and a subsequently greater degree of manual work employing a read-only format which requires preliminary data input (details of these assessments of alternatives are to be found in section 5).

In addition to the ecological sustainability resulting from the conservation of resources and optimisation of the carbon footprint, future economic viability is also of relevance in this connection. Possible network effects are thus to be considered and misinvestments ("sunk costs") avoided. The new SEPA regulations which are to become mandatory in the near future require to be taken into account in payment transactions, for example. From 2014, SEPA will enable companies and consumers to effect non-cash payments in euros to recipients in all 27 EU member states and in Iceland, Liechtenstein, Monaco, Norway and Switzerland from a single bank account by means of standardised means of payment. Within SEPA, all payments in euros will be treated as European payments, i.e. there will no longer be any distinctions made between national and cross-border payments in euros (Tumpel-Gugerell, 2010). Adaptation to SEPA is proving particularly difficult at SMEs, as long-established processes require to be modified (the accounting department has to enter IBAN, BIC and mandate data for debtors and creditors in the course of master data maintenance; new lead periods need to be observed and the management of accounts adapted accordingly, etc.; Bitkom, 2012). In sustainable solutions it is possible to integrate these aspects in advance.

#### **3.1.5 Enforceability**

The fifth and final category at the highest level is the enforceability of a solution, which is directly dependent on its acceptance at organisational and, above all, individual level. The implementation of a new solution will only be successful if it is accepted by the personnel concerned. The exchange of invoices is furthermore a bilateral process which needs to be accepted by both business partners. A lack of knowledge with regard to processes, technologies and e-invoicing in general obstructs changeovers to a new system. Decision-makers clearly require education in this respect, in addition to which users need to receive training in how to handle the new technology (Penttinen et al., 2009). The more serious the failings in familiarising users with the new technology, the lower the degree of acceptance will be.

### **3.2 Weighting of goals**

As outlined in the preceding sections, various institutions and levels of public administration were investigated for the purposes of this project by means of interviews with experts or more broad-ranging surveys. The weighting of the goals as presented in the preceding section on the basis of surveys covering experts at federal level were validated in follow-up surveys at provincial and local government level. The respective results on this matter then provide an overall picture of the importance of different requirements for electronic invoicing.

Figure 3 presents these results for the local government level. Just under 70 experts at Hessian municipal and local government authorities were surveyed across all sizes of government unit. The respondents were for the most part municipal finance directors, heads of the fiscal administration, treasurers or heads of financial administration/accounting. Shortening the



duration of the invoicing process was regarded as the most important goal (1st place), while as expected the public administration attached little importance to the contribution of value added.

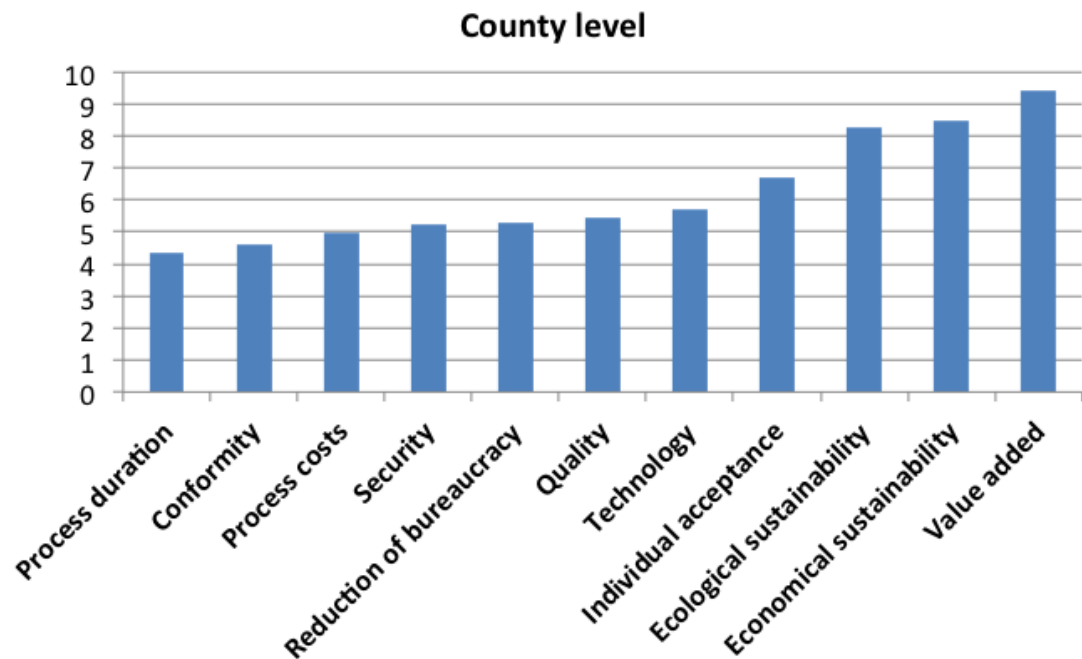


Figure 3: Results of a survey of Hessian county authorities: Average ranking for the second-tier goal criteria (n=69; survey is currently being expanded to cover all of Germany)

In addition to the financial experts at the local authorities, it is appropriate to include an additional group here, representing the clerical staff who are directly involved in the invoicing process. 60 administrative staff at Johann Wolfgang Goethe University were surveyed for this purpose. The answers to the question as to how the goals pertaining to a potential changeover to electronic invoicing are to be assessed in order of importance are summarised in Figure 4 below.

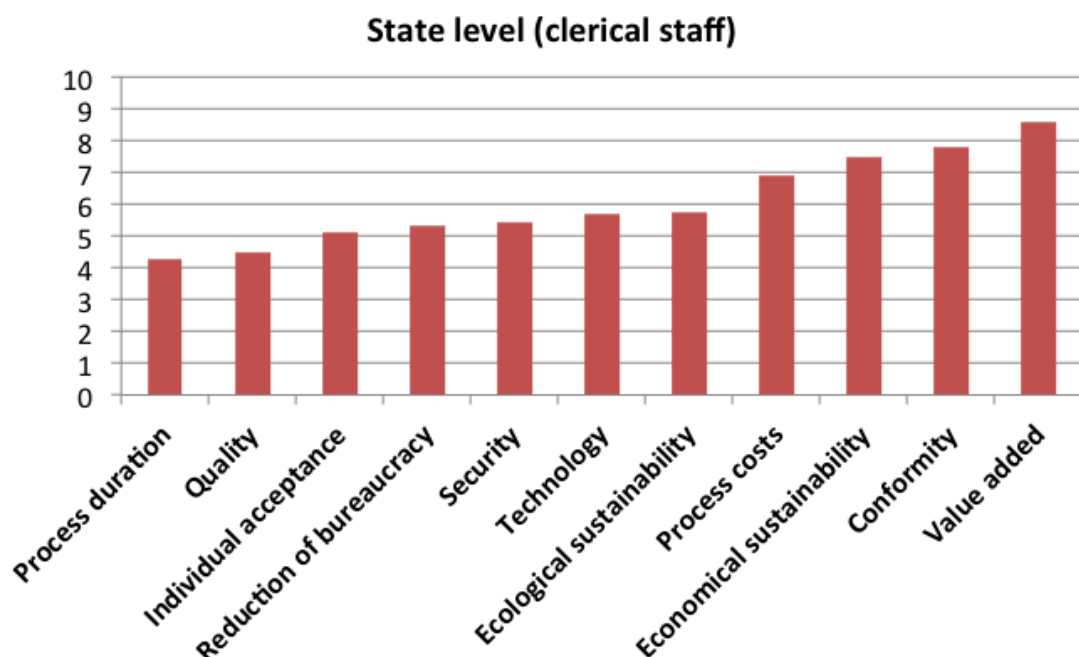


Figure 4: Results of a survey of clerical staff at state level: Average rankings for the second-tier goal criteria (n=58)

In comparison to the findings among financial experts, approx. 70% of whom stated that they were directly involved in decisions on the potential introduction of new technologies and processes, clerical staff attach substantially greater importance to the individual acceptance (manifested in its usefulness and simplicity of use) of a solution, for example (3rd place as opposed to 8th place in the order of priority). Conversely, the (legal) conformity of a new solution does not play such a major role at the level of processing staff (10th place as opposed to 2nd place).

Table 1 presents the aggregated results of the surveys within public administration.

**Table 1: Weighting of goals within the public administration, aggregated**

Level 1	Weighting (in %)	Level 2	Weighting (in %)
Efficiency	25	Process duration	45
		Process costs	50
		Value added	5
Simplicity	20	Technology	40
		Reduction of bureaucracy	60
Effectiveness	20	Conformity	40
		Security	30
		Quality	30
Sustainability	15	Ecological	55
		Economical	45
Enforceability	20	Indiv. acceptance	50
		Organisational acceptance	50

At the highest level the five goals are assigned virtually the same weighting, with only the efficiency aspects slightly above the mean and sustainability slightly below the mean. The simplicity of implementation, the effectiveness of a variant and enforceability are weighted virtually identically. It was not possible to survey the final goal value in the same "straightforward", direct manner as the other goals, for as in acceptance at organisational level (decision-making level) enforceability also incorporates a dimension which is and must be correlated with the other goals to varying degrees because the goal hierarchy structure would otherwise be false.

#### 4 Identification of alternatives for electronic invoicing

There are a number of variants for invoicing between enterprises (incl. authorities). These variants essentially break down into the drafting, forwarding and processing of invoices.

According to a study by Pfaff et al. (2007), electronic invoices can save the recipient up to EUR 15 per invoice. The relevant literature covers various models for electronic invoicing, such as the biller direct, buyer direct or consolidator models (Spann und Pfaff, 2001, DB Research, 2010).

There is also a plethora of different technologies, standards and connection variants. Diverse criteria for electronic invoicing are identifiable on this basis.

At present it is unclear which of the approaches and models available on the market represent the best and most promising options for the public administration and SMEs. The cited criteria and variants highlight the above-mentioned diversity of standards pertaining to content, transport and processes in the area of e-invoicing. According to a recent survey by Bonpago, there are over 100 different solutions for electronic invoicing in Germany alone. In view of the growing levels of usage (see Table 2), there is a need to quickly identify ideal solutions and to push ahead with these solutions by way of a standardisation process – as envisaged in the presented project.

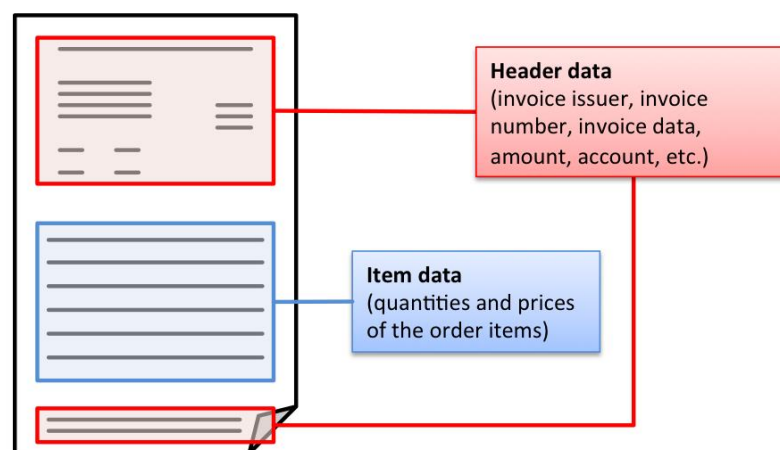
**Table 3: Electronic invoicing in the EU – Development of usage (Source: Koch, 2011)**

Year	2006	2007	2008	2009	2010
No. of electr. invoices (in millions)	510 B2C: 250 B2B: 260	730 B2C: 300 B2B: 430	1,010 B2C: 400 B2B: 610	1,360 B2C: 500 B2B: 860	2,190 B2C: 925 B2B: 1,265
Market penetration	1.7%	2.4%	3.4%	4.5%	7%

#### 4.1 Drafting of invoices: data formats

The process for drafting an electronic invoice is virtually identical in each instance and offers three different variants. The supplier drafts the invoices using an ERP system or another computer programme (e.g. Word, Excel).

This process may result in a read-only format (PDF)<sup>4</sup>, a PDF-plus-header-data file or a PDF-plus-full-data file. The full data here comprise header and item data (cf. Figure 5). Depending on the particular embodiment of this process, it may involve a greater scope of work and complexity for the supplier.



**Figure 5: Diagram of a typical invoice with header and item data**

<sup>4</sup> In principle, other image formats such as JPEG or TIFF are also possible for use as read-only formats. PDF is the most widespread standard in this respect, however, in view of which PDF and "read-only format" are treated as being identical below. A directly generated PDF is furthermore "simple" to read out at the recipient's end by means of parsing services.

The data should be provided in the format recommended by the Forum electronic billing Germany (FeRD). The data record is simple to integrate and explicitly does not contain an EDI data record. A description of the implementation process is to be found in section 6.4.2.

## **4.2 Forwarding of invoices: transmission methods**

Various transmission methods are possible for forwarding electronic invoices. These methods vary substantially in some cases with regard to user-friendliness and the security of the data transfer process. As a general principle, the sender of an invoice should observe the elementary IT security measures as published by the Federal Office for Information Security (BSI), for example.<sup>5</sup>

### **4.2.1 E-mail**

The simplest method of transfer is by "standard" e-mail. The invoice document is attached to the e-mail and duly dispatched. The sending and receipt of e-mails is a well established process which is particularly simple to use.

As this means of transport does not provide an adequate guarantee of authenticity and integrity, the recipient is required to undertake corresponding verification measures – for example, by checking the contents of the invoice and the sender's details. Such an audit procedure is firmly established, as stipulated in the administrative budgetary regulations.

The security of an e-mail (or an attachment) can further be improved substantially by means of encryption and a digital signature. The appurtenant processes (e.g. PGP- or SMIME-encrypted e-mail) require a corresponding IT infrastructure and IT affinity on the part of the sender and recipient.

### **4.2.2 Web portal**

A web portal can be used in various ways. With the so-called "direct model" from the issuer's point of view, recipients are able to carry out electronic auditing of an issuer's invoices (e.g., Deutsche Telekom invoices). In this case, an addressee who receives electronic invoices from n issuers is required to log in to n different websites. The invoices are generally provided at the sender's portal in the form of PDF files. With the "direct model" from the addressee's point of view, the sender compiles the invoice data at a portal belonging to the addressee. In addition to the read-only format, corresponding data are then generally available. Log-in data are required in order to access a portal. The BSI recommends signing the data and encrypting them via a suitable process prior to transmission, in order to ensure their integrity and authenticity. To this end, the issuer signs the document and the addressee subsequently verifies the signature and saves the invoice and the verification log. Depending on the required level of protection, possible methods here range from simple SSL to encryption via certified hardware crypto-components.

When using a portal, it must always be considered that a portal offers a central target for attack. Depending on the required level of protection, securing a portal may involve a highly complex and

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<sup>5</sup> Information is available, for example, at [https://www.bsi-fuer-buerger.de/BSIFB/DE/Home/home\\_node.html](https://www.bsi-fuer-buerger.de/BSIFB/DE/Home/home_node.html) und [https://www.bsi.bund.de/DE/Themen/Cyber-Sicherheit/Empfehlungen/cs\\_Empfehlungen\\_node.html](https://www.bsi.bund.de/DE/Themen/Cyber-Sicherheit/Empfehlungen/cs_Empfehlungen_node.html).

correspondingly expensive process. A portal also imposes high requirements with regard to availability, as downtimes will affect the entire clientele.

As a general principle, it is recommended to observe the corresponding measures specified in the baseline IT security catalogues when setting up or using a portal. A security management system should be set up in accordance with BSI standards 100-1 to 100-4.<sup>6</sup>

#### 4.2.3 https transmission

Where the transmission of electronic invoices takes place directly between two computers, using a protocol for the secure online transmission of HTML pages, SSL/TLS should serve to secure the client-server communications. This entails mutual authentication between the two computers and a private session key is negotiated to secure further communications.

#### 4.2.4 DE-Mail

Invoices can also be sent via DE-Mail services. The invoice document is attached to the DE-Mail and duly dispatched. Authenticity and (with a corresponding signature) integrity are ensured in this process. This method developed in cooperation with the BSI provides a useful alternative to the transmission of invoices by "standard" e-mail (where confidential content is involved, for example).

#### 4.2.5 EDI methods

These methods involve the direct electronic interchange of data between sender and recipient of the invoice. The corresponding processes, which guarantee integrity and authenticity, are established and based on well-known standards. In order to introduce such processes, both parties are required to have the necessary technical set-up in place for EDI.

### 4.3 Resultant alternatives

The means of transmission and types of invoice described above result in a total of 14 possible electronic invoicing variants for the public administration.

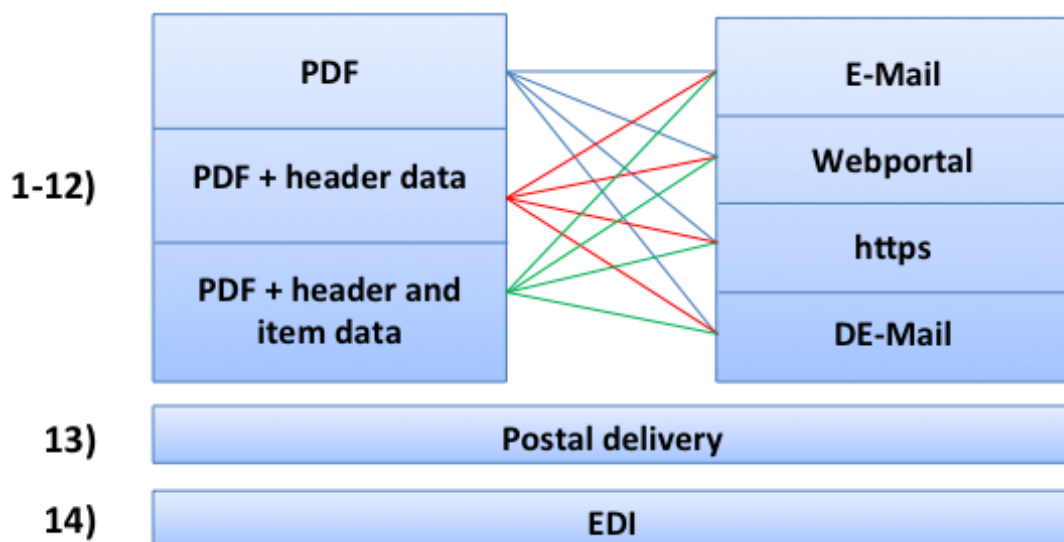


Figure 6: Alternatives for electronic invoicing with the public administration

<sup>6</sup> Further information on setup, operation and secure use are to be found in the BSI's ISI series; [https://www.bsi.bund.de/DE/Themen/Cyber-Sicherheit/ISi-Reihe/ISi-Reihe\\_node.html](https://www.bsi.bund.de/DE/Themen/Cyber-Sicherheit/ISi-Reihe/ISi-Reihe_node.html)

Figure 6 presents an overview of these variants in diagram form. As the possibilities offered by the respective variants for the further processing of invoices is also of crucial importance to a final assessment of the benefits arising from the respective alternatives, the following section presents the typical route for an invoice after receipt by the public administration, by reference to an example process.

#### 4.4 Processing of invoices

The process for receiving invoices is dependent both on the type of data transmitted and on the chosen transmission method. The compatibility of an incoming invoice for further processing is of crucial importance in assessing the benefits of the respective variants. An invoice in PDF form without any data which is suitable for further processing avoids the need for scanning, but necessitates read-out of the data by means of appropriate software (OCR recognition) or manual data acquisition, for example. For example, when the invoice contains data records, these can be processed directly in the recipient's ERP system.

When an EDI method, digital signature or Web EDI are employed in transmitting the data, their authenticity and integrity are ensured from the outset. When invoices are sent by "simple" e-mail, their authenticity and integrity require verification by means of a corresponding process to be provided by the addressee.

Figure 7 presents the component elements of invoice processing in abstract form. The receipt and subsequent processing of invoices are described below by reference to an example process involving receipt of a PDF invoice by e-mail.



Figure 7: Component elements of invoice processing

##### 4.4.1 Incoming invoices

Incoming electronic invoices require to be viewed within a reasonable period. The supplying company generates its invoice from an ERP system, for example, and sends it as a PDF attachment to a "simple" e-mail. The invoices are received by the authority at a central e-mail address dedicated to the receipt of invoices (e.g., invoiceinbox@authority-x.de). This mailbox is checked on a daily basis, along with the spam filter. On receipt, incoming invoices are saved immediately on a non-alterable data medium. When checking through the inbox, the legibility of the invoice is promptly verified. The invoice is designated as 'received'. This may take place by means of an electronic workflow or by moving the invoice to a special folder, for example. The invoice data are entered in the authority's ERP system.

##### 4.4.2 Examination of form and content

The invoices must comply with the formal requirements of federal budget law and the Turnover Tax Act (UstG) and must establish an obligation to effect payment. While the requirements pertaining to a secure verification process have yet to be finalised, the processing of invoices including the two-person rule for the public administration satisfies the requirements of a secure verification process particularly effectively.

The origin of the invoice is first of all checked. This may entail checking the sender's address with the state bank details or tax number, for example. It is then verified whether all the information required in accordance with budget law is included on the invoice and correct. In particular, it is checked here whether the name of the company is correct and whether a date of delivery or service is stated. It is also verified whether the invoice is a duplicate.

The contents of the electronic invoice and the stated figures are then scrutinised. This involves an examination of the invoiced quantities and the agreed prices and calculation of the invoice total. In case of incorrect invoices, a specified process is initiated and the issuer is requested to forward a corrected invoice, for example. The contents are verified by checking the invoice against documents confirming orders, deliveries or the provision of services, for example. The checked invoices are designated as 'checked'. Again, this may take place in an electronic workflow or by moving the invoices to a special folder.

In the above-stated case, all measures relating to execution of the budget, the handling of transactions, accounting and invoicing are booked in a hierarchical system of interlinked accounts in the automated process for the Federation's system for budgetary management, cash management and accounting (HKR system).

The electronic transmission of data is regulated by corresponding provisions for the HKR system. In- and out-payments are regulated by the administrative regulations for payments, accounting and invoicing, which stipulate the responsibilities for rendering invoices payable and compliance with the two-person rule (see administrative regulation no. 1.1.2 for payments, accounting and invoicing [Federal Budget Code, Sections 70 to 72 and 74 to 80] (ascertainment of correct contents and arithmetic, authority to order payment)).

#### **4.4.3 Ordering of payment**

According to administrative regulation no. 1.1.1 for payments, accounting, and invoicing, a payment order is the result of sequential decisions to insure the liability and verification of the mandated payment. Since no electronic signature has been introduced in the federal administration, the appendix of administrative regulation no. 9.2 for payments, accounting, and invoicing shall be applied (additional provisions for manual methods). Accordingly, no payment can be authorized unless the accuracy of accounting and factual information has been verified. Conversely, a payment order confirms the correctness of the invoice data. For the purpose of payment, it is verified whether a discount can be claimed and no further payment orders exist. Payment orders are generally sent from a bank account, ensuring that a corresponding receipt exists. In the course of the payment authorization, a link will be established between the payment order and the invoice to mark the invoice as paid. The link can be established either through a dedicated invoice workflow or through simply by moving the invoice into a dedicated folder for paid invoices. The actual payment will be made after the payment order has been transferred to the Federal Cash Office through the HKR system.

After establishing that the contents and arithmetic are correct, payment is effected. Conversely, payment confirms that the invoice is proper and correct. For the purposes of payment it is first of all checked whether discount can be claimed and double payments are ruled out. The invoice amounts are generally transferred via an account, thus ensuring that a corresponding receipt exists. In the course of the transfer a link is established between payment and invoice, for

example by stating the date and number of the invoice. The invoice is then designated as 'paid'. Once again, this may take place as part of a workflow or by moving the invoice to the 'paid' folder.

#### **4.4.4 Booking**

The invoice receipts are booked promptly after payment in unaltered form and transferred to the accounting department. The appropriate account is designated on the receipt or a link is established between the electronic invoice receipt and the corresponding accounting record. The invoice is to be designated as 'booked' (via workflow or by relocation to a corresponding folder).

#### **4.4.5 Archiving**

Electronic records pertaining to the Federation's budgetary management are to be stored permanently in unalterable form. The requirements regarding archiving, retention periods, etc. are stipulated in the safekeeping provisions for records pertaining to the Federation's system for budgetary management, cash management and accounting (ABestB-HKR)<sup>7</sup>. The e-mail is also archived when it contains relevant information on the invoice.

## **5 Assessment of the different alternatives**

### **5.1 From the point of view of the public administration**

The 14 alternatives were evaluated by reference to the presented goal tree in close cooperation with the surveyed experts and a ranking order was established (cf. Table 3). The assessment of the alternatives takes the respective goal attainment levels into consideration with regard to both the transport process and document content. Between 0 and 5 points were allocated to each variant for the transport process and content respectively, with a higher score denoting a greater benefit to the handling of invoices in the public administration in the goal category concerned. The sub-utility values specified for the individual variants in the cells of the table above are obtained in each instance by adding together the goal attainment values for content and transport process (example: with regard to process duration, the variant PDF + full data by e-mail achieved a score of 5+5 = 10 points, while the variant PDF by e-mail scored only 1+5 = 6 points). The E-Postbrief service offered by Deutsche Post was treated identically to exchange via DE-Mail.

The individual utility values are explained in sections 5.1.1 to 5.1.5 below.

#### **5.1.1 Utility assessment with regard to efficiency**

As outlined in chapter 3, the efficiency value is comprised of the factors duration, costs and value added. In the course of allocating the utility values, individual variants were clustered in consultation with the experts. The duration of transport and of processing for invoices sent by post score the worst value of 0 utility points. This is attributable to the longer physical transportation of the letters, as well as the longer handling process for incoming invoices (receipt by mail room; presorting; preparation, scanning or transport of paper, etc.). Downloading invoice documents from a portal entails one task (e.g. downloading of the documents) in the public administration and is allocated 3 points. In contrast to the postal variant, the document can be downloaded directly – through active intervention by a member of staff –, in addition to which

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<sup>7</sup> [http://www.verwaltungsvorschriften-im-internet.de/bsvwvbund\\_02012004\\_II.htm](http://www.verwaltungsvorschriften-im-internet.de/bsvwvbund_02012004_II.htm)



processes relating to the handling of incoming invoices are also avoided. The transport routes e-mail, DE-Mail, https and EDI receive the full score of 5 points.

**Table 1: Assessment of the 14 variants by reference to the goal tree**

Goals level 1 (weighting in %)	Goals level 2 (weighting in %)	Alternatives													
		PDF	PDF + header data	PDF + full data	PDF	PDF + header data	PDF + full data	PDF	PDF + header data	PDF + full data	PDF	PDF + header data	PDF + full data	Paper	EDI
		E-mail			Web portal			https			DE-Mail				
Efficiency (25)	Process duration (50)	6	8	10	4	6	8	6	8	10	6	8	10	0	10
	Process costs (45)	6	9	10	3	6	7	6	9	10	5	8	9	0	7
	Value added (5)	6	9	10	3	6	7	6	9	10	5	8	9	0	7
		6	8.5	10	3.5	6	7.5	6	8.5	10	5.5	8	9.5	0	8.5
Simplicity (20)	Technology (40)	8	6	5	5	3	2	7	5	4	6	4	3	10	1
	Reduction of	6	8	10	4	6	8	5	7	9	4	6	8	0	8
		6,8	7.2	8	4.4	4.8	5.6	5.8	6.2	7	4.8	5.2	6	4	5.2
Effective-ness (20)	Conformity (40)	9	9	9	9	9	9	9	9	9	8	8	8	10	10
	Security (30)	2	5	5	4	7	7	4	7	7	6	9	9	10	9
	Quality (30)	2	4	6	4	6	8	2	4	6	6	8	10	0	10
		5,5	6.75	7.25	6.5	7.75	8.25	6	7.25	7.75	7	8.25	8.75	7.5	9.75
Sustain-ability (15)	Ecological (55)	8	10	10	8	10	10	8	10	10	8	10	10	0	10
	Economical (45)	10	8	6	8	6	4	9	7	5	7	5	3	5	1
		8,9	9.1	8.2	8	8.2	7.3	8.45	8.65	7.75	7.55	7.75	6.85	2.25	5.95
Enforce-ability (20)	Individual (50)	7	6	6	4	3	3	7	6	6	5	4	4	10	2
	Organisational (50)	8	9	9	5	6	6	7	8	8	6	7	7	4	7
		7,5	7.5	7.5	4.5	4.5	4.5	7	7	7	5.5	5.5	5.5	7	4.5
Total utility value		6,66	7.69	8.21	5.06	6.09	6.61	6.41	7.44	7.96	5.93	6.96	7.48	3.94	6.90
Ranking		8	3	1	13	11	9	10	5	2	12	6	4	14	7

With these variants, the invoice documents are delivered directly – generally without requiring any action on the part of a member of staff – and are consequently immediately available. As these transport variants involve electronic transmission and the data can be relayed on immediately, the internal processes are also accelerated by this form of communication.

A corresponding procedure was applied to evaluate the contents. Here, a distinction was made between the four variants physical (i.e. paper-based), without data (e.g. as PDF), with header data and with full data. With regard to the duration of the process, it was assessed how many steps are

subsequently required in the public administration in order to duly enter the invoices in the accounts and to initiate payment. On the basis of the undertaken analyses, it is also possible to distinguish here between the different types of invoice – invoices containing an order reference enable the item data from the order to be used for the purpose of entering the invoice in the accounts, for example. The analysis of public administration systems has revealed, however, that the proportion of invoices with order references is substantially lower than in the private sector. Consequently, for the sake of simplicity only the aggregated values are included in this presentation. The paper document necessitates the highest number of manual tasks in order to enter the invoice in the accounts and to initiate payment. This leads to a protracted internal process, resulting in 0 utility points. The electronic receipt of a read-only format at least cuts out a number of tasks for the addressee, e.g. in the incoming mail department. This generally enables the process to be speeded up – at least in comparison to today's paper-based receipt of invoices. Receipt of a read-only format is consequently allocated a utility value of 1. The figure below presents the results of the survey in public administration (federal level) with regard to time savings. These results are reflected in the respective utility values.<sup>8</sup>

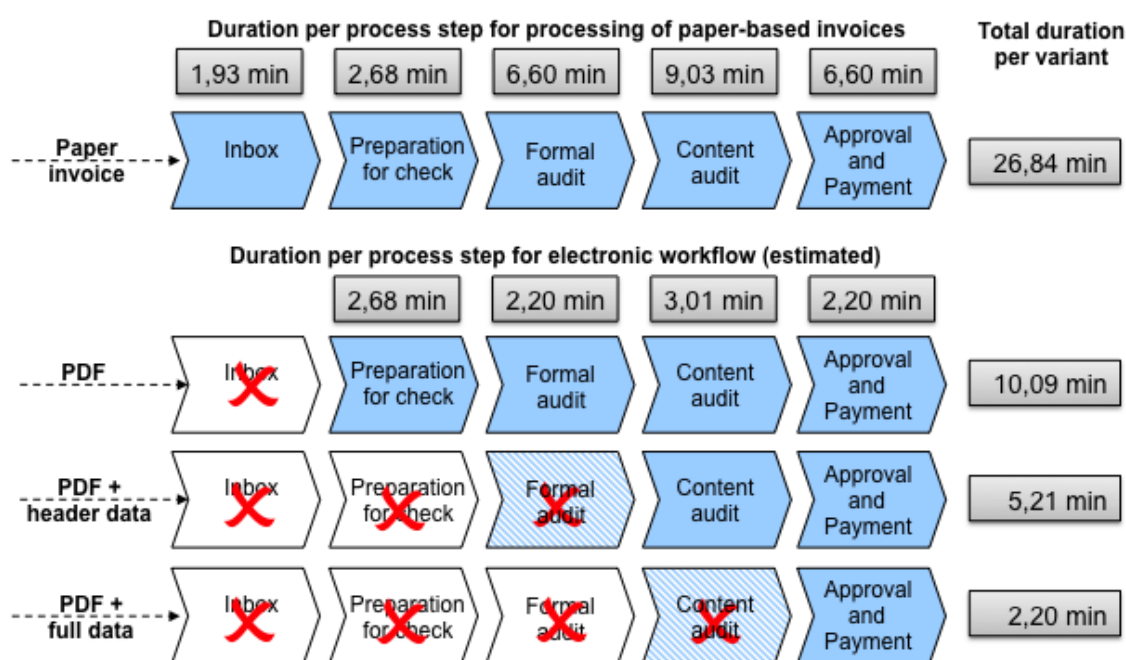


Figure 8: Time savings with different data formats, calculated on basis of omitted process tasks (source: survey of experts at ministries and federal authorities; simplified presentation of the overall process)

The target values include the costs of the mode of transport concerned (e.g., "postage" for DE-Mail or EDI costs) and the costs of handling the documents. With regard to the transport process, traditional delivery by post again emerges as the variant with a utility value of 0. Costs accrue to the sender and handling by the addressee is correspondingly complex (cf. Pfaff et al., 2007, for

<sup>8</sup> Note: The estimate of time savings is conservative, i.e., it represents minimum values. Figures were abstracted from the duration of transportation of a paper invoice between the process steps, for example. Furthermore, the additional time savings in the auditing and approval processes attained through an electronic workflow in comparison to paper invoicing are based on experts' statements and empirical values from practice and have been estimated at 2/3 of the actually determined values. In reality, these values may well be higher. Figures are also abstracted from booking and archiving processes in this assessment.

example). The transport variant EDI and the sending of invoices by a portal each received 2 points. While the transport process here is "paperless" and electronic, costs nevertheless arise for the EDI connection and for collecting the data from a portal. The new DE-Mail services were allocated 4 points. The costs involved here are higher than for transport by means of e-mail and https, which received the full tally of 5 points. The same procedure was adopted to evaluate the data formats and data content variants. Physical receipt by post is by far the most expensive variant with regard to the handling of incoming invoices, resulting in a utility value of 0. In comparison to the paper-based process, receipt of a read-only format (e.g. PDF) cuts out the incoming post stage and the need to carry out scanning. This variant is thus awarded one utility point. When data are exchanged together with the invoices, the utility values rise accordingly. The data can undergo automated checking for formal errors, for example, or they can be integrated directly into the corresponding back-office systems. 4 utility points are consequently awarded for the supply of header data, while the full scope of data, which results in added utility value in the case of invoices without an order reference, for example, receives the full score.

The third category pertaining to efficiency is added value. Invoicing harbours potential for added value deriving from innovative quality and competitive edge. Examples here include financial supply chain solutions (see Pfaff et al., 2004a, for example) or special supplier assessments. The surveyed experts assess the importance of the value added category in the public administration as very low. The allocation of utility values here is to be regarded as corresponding to the breakdown regarding costs. In the case of DE-Mail the emphasis here is less on costs and rather on the restrictions of a closed system.

### **5.1.2 Utility assessment with regard to simplicity**

Experience (for example, in the handling of digital signatures) in recent years shows that solutions must offer simplicity. Only then will small and medium-sized enterprises be able to participate in electronic invoicing – which has always been one of the objectives of the EU Commission and the Federal Government. The changes brought about by the Tax Simplification Bill and the possibility which now exists of sending invoices by simple e-mail (provided that the corresponding verification processes are implemented) have made a crucial contribution to ensuring such simplicity. On the basis of these aspirations, today's familiar and established form of delivery by post receives maximum points as a transport variant in the context of the criterion "simplicity of technological implementation". All invoice variants (including hand-written invoices, for example) can be made out and delivered to the supplier by this means. Sending invoices by e-mail was awarded a utility value of 4. Invoices can be sent to the supplier by means of a simple e-mail, e.g. as an attachment. At an internet penetration level of 75.9 per cent in Germany (van Eimeren und Frees, 2012) and an assumed higher level of penetration among invoice-issuing enterprises, this means of transport is a simple option which can be used by all enterprises. Transport via https is another simple option for use by enterprises, for example by installing a printer driver (e.g., TASK eDoc or b4value). Companies are not required to alter their established invoicing process here, instead simply using a "different" printer to send their invoices. The new DE-Mail service requires one-off registration with the service providers and corresponding modification of the invoicing process. Experience with digital signatures has clearly shown that this technology is not always accepted by small and medium-sized enterprises. Over one million private customers and around 100 large companies are currently registered for the E-Postbrief service offered by Deutsche Post, for example. On the basis of these considerations, 2 utility points for transport were allocated to

the DE-Mail services. The portal solutions tend to have become outmoded. The portal solutions interrupt the established processes at the sending and receiving end and data require to be entered manually or manually uploaded and/or downloaded. A utility value of 1 is nevertheless allocated in recognition of the fact that the process of participating in electronic invoicing is a simple matter – notwithstanding the stated interruptions to existing processes. Invoicing via traditional EDI is assigned a utility value of 0 for transport. Participation and data maintenance are more complex here than with any other method. This applies equally to the sender and the recipient of invoices. On the basis of the current infrastructure and set up at the surveyed public administration authorities, this is the method which proves most difficult to implement.

A clear picture emerges on the question of simplicity with regard to the provision of data for the invoice recipient. Physical supply of the paper document is the simplest method on the basis of acquired experience, long-standing processes and established standards, and is thus allocated a utility value of 5. Generation of a PDF follows up in second place with a utility value of 4. The data generation process becomes more complex as more data are required. The provision of header data thus receives a utility value of 2 and the provision of full data a utility value of 1. In addition to the complex processes, this low rating for the provision of data is also attributable to the lack of standards in electronic data interchange. Work aimed at achieving standardisation here is currently in progress at the Forum elektronische Rechnung Deutschland, including involvement on the part of the authors. These aspects are also being examined and corresponding solutions developed in the E-Docs research project sponsored by the Federal Ministry of Economics ([www.e-docs-standards.de](http://www.e-docs-standards.de)).

From the point of view of public administration, a solution's simplicity has a direct impact on the reduction of bureaucracy, for example by minimising the degree of interaction between recipient and sender. Consequently, the dispatch of a paper document by post is allocated a utility value of 0. Transparency and simplicity from the point of view of the public administration also play an important role in assessing the reduction in bureaucracy. Receipt of the full data is thus awarded the full 5 points, while receipt of a read-only PDF receives 1 point. The header data which, in conjunction with an order reference, are also suitable for direct further processing, are allocated a utility value of 3. The reduction in bureaucracy is intended to facilitate electronic invoicing for business enterprises. Transport by e-mail thus receives the full score of 5 points. Invoicing via https scores 4 utility points, while invoicing via EDI, portal or DE-Mail receives 3 points.

### **5.1.3 Utility assessment with regard to effectiveness**

The third category for utility assessment, effectiveness, categorises the respective methods with regard to security, conformity and quality aspects. While the main focus here is on national requirements, international aspects are also considered. Numerous discussions were held in this connection with experts from the Federal Office for Information Security (BSI) as well as with experts in the international arena. The attendant findings were included in the assessment process (see also the observations in section 6.1.2).

For the purposes of assessing conformity, no differentiation was made between the different forms of content. It is assumed that the data are correct in each case and that the data on paper/in PDF-form are identical to the corresponding processable data. All the methods are furthermore permissible in accordance with the national law on electronic invoicing. Divergences

apply here solely with regard to the mode of transport. While EDI and postal delivery are internationally recognised and established and thus receive a score of 5, the DE-Mail standard has only received due attention in Germany to date. A utility value of 3 was allocated for this reason. Invoicing by e-mail and via appropriate portals or https is already recognised in numerous countries and corresponding laws are in place.

In terms of security, transport via EDI and DE-Mail is to be regarded as being on a par with transport in paper form. In view of the constellation of processes and the necessary registrations and agreements, the full number of points is to be awarded here. Delivery by post is relatively secure, as it is difficult to manipulate a consignment and, in contrast to the electronic process, any manipulation requires to be carried out manually and for each individual invoice. Transport via a secure connection, transport via https and downloading via a portal were allocated 3 points, while transmission by e-mail received 1 point. It is to be noted that this assessment pertains solely to transport of the invoice. "Weak points" during transport can be eliminated by corresponding warranties in the area of process security. Invoicing by e-mail may serve as a possible alternative, for example, when the authenticity and integrity of the invoice are ensured by subsequent checking. Where high security requirements apply (cf. section 6.3), the DE-Mail method should be applied rather than e-mail.

In terms of data security, paper receives the highest score of 5. This corresponds to the traditional process and it is difficult to alter the data. The security benefits increase as the volume of data to be transported rises. The greater the volume of data transmitted, the greater the number of internal monitoring processes which can be carried out automatically to detect any manipulation. Consequently, provision of the full data is allocated a utility value of 4, provision of header data scores 3 and the receipt of a read-only PDF receives a value of 1.

Quality is a key factor determining the effectiveness of electronic invoicing. This applies equally to the transport channel and the exchanged data. On the basis of the requirements pertaining to the transport channel and the incorporated bilateral coordination / the necessary registrations and log-ins, EDI and DE-Mail are allocated the highest utility value of 5. A portal generally also requires registration prior to accessing the invoice data. Here, however, there is no simple means of ensuring that the user is really the person he claims to be. 3 points are thus awarded for transfer via portal. Transfer via https and e-mail each receive 1 point, while postal delivery receives 0 points. A similar picture applies with regard to the invoice data. The greater the volume of data supplied, the higher the corresponding quality will be in the downstream processes. The full scope of data (incl. EDI) thus receives full points here. The transfer of header data receives 3 utility points, while transfer via PDF scores 1 point. This point is granted because the quality of a PDF document is higher than that of a purely paper-based invoice delivered by post, which received 0 points.

#### **5.1.4 Utility assessment with regard to sustainability**

The fourth goal category is sustainability. A distinction is made here between economical and ecological aspects. With regard to the mode of transport, the primary emphasis is on avoiding the use of paper. Consequently, all variants which avoid physical transport receive 5 points here. Today's paper-based process scores 0 points. In assessing the data category, it is considered what resources are required in order to enter the invoice in the accounts. Relevant aspects here include

internal transport, keeping physical accounts of invoices received, the production of copies and the read-out of data. Paper requires the highest use of resources in this category, too, resulting in zero points. 3 points are awarded for the read-only PDF, while the invoices incorporating data each receive 5 points.

In addition to the ecological sustainability resulting from the conservation of resources and optimisation of the carbon footprint, future economic viability is also considered in this category. Network effects and misinvestments are primary factors in this connection. With regard to the mode of transport, e-mail is regarded as the most sustainable medium, followed by https transfer and the web portal. These are followed by DE-Mail, physical delivery by post and EDI. With regard to data, a slightly different picture applies at present on account of the lack of standards. Provision of the full scope of data receives a score of 0 here, as requirements and standards may alter on a frequent basis, necessitating modifications. Header data are relatively stable on account of the statutory specifications, resulting in a score of 3 points in due consideration of the fact that, in contrast to paper-based and PDF invoices, initial investments are necessary here.

#### **5.1.5 Utility assessment with regard to enforceability**

The fifth and final goal category at the highest level is the enforceability of a solution. This is directly influenced by its degree of acceptance. Particular efforts are required in this context, as it is crucial that all the parties involved in the overall process participate in its implementation. At individual level in particular, a summary of end users in the public administration has revealed reservations concerning the topic of electronic invoicing. Consequently, the traditional delivery of a paper-based invoice receives the full score in this category. The greater the instance of "dark" data in the processes, the lower the initial level of acceptance will be at individual level. This appraisal by the relevant clerical staff was duly incorporated in the assessment process. With regard to the mode of transport, e-mail ranks ahead of DE-Mail and invoicing via EDI and portals. A fundamental problem with regard to acceptance by the end user is force of habit, which engenders a wish to hold onto familiar technologies and processes. In the light of this situation, it is important to acquaint the target groups with new solutions by imparting the required knowledge in the course of change management.

A different picture arises at management level. Here, header data and full data (5) rank ahead of PDF (4) and paper (2), as they harbour the greatest benefits from the management perspective. In view of the expected costs, EDI receives only 3 points here. With regard to mode of transport, the established method of invoicing by e-mail receives 4 points, DE-Mail and EDI each score 2 points and portals score 1 point. Here too, the established method of postal delivery ranks best, with 5 points, as "no change" still implies the highest level of enforceability in this instance.

The analysis of the individual variants gives rise to numerous starting points for the sustainable propagation of electronic invoicing. It is clear that even the variants harbouring the highest utility potential require adaptation in some aspects.

## **5.2 Overall perspective taking in the entire business community**

The sender's perspective must also receive due consideration when assessing the enforceability of an electronic invoicing variant. A summary of the results of the cost utility analysis reveals that from the point of view of the public administration it is most expedient to receive invoices by e-mail in PDF form, including a file containing the full scope of data (Table 4 provides a clear

overview of the rankings once again). From the point of view of large enterprises it could equally be argued that sending invoices via EDI represents the best variant, while a micro-enterprise could insist on sending a PDF file by e-mail if it is forced to dispense with postal delivery, because the other data and transfer variants are too complicated. It is thus necessary to reach a compromise with the respective parties in the invoicing process.

**Table 7: Ranking of variants according to utility value**

Ranking	Variant	Utility value
1	PDF + full data by e-mail	8.21
2	PDF + full data by https	7.96
3	PDF + header data by e-mail	7.69
4	PDF + full data by DE-Mail	7.48
5	PDF + header data by https	7.44
6	PDF + header data by DE-Mail	6.96
7	EDI	6.90
8	PDF by e-mail	6.66
9	PDF + full data via web portal	6.61
10	PDF via https	6.41
11	PDF + header data via web portal	6.09
12	PDF by DE-Mail	5.93
13	PDF via web portal	5.06
14	Paper	3.94

While the introduction of EDI in the public administration entails vast costs, it should be within the bounds of large and medium-sized enterprises' capabilities to send an invoice including a data file. Existing EDV connections should first of all be retained. Small and micro-enterprises must also be offered the option of sending a simple read-only format by e-mail, however.

One of the central tasks arising from the findings presented here is to provide these small-scale senders of invoices with solutions (e.g., download of an appropriate, user-friendly tool from the authority's website) which will enable them to generate and send data files. The immediate priority is to introduce electronic invoicing swiftly and by a simple process. This may take place in the form of PDF files - but without losing sight of the ultimate aim of exchanging read-only and data formats (e.g. to FeRD standard).

## **6 Organisational aspects of implementation**

### **6.1 Lessons learned from other countries**

#### **6.1.1 Status quo**

In Europe, the Nordic countries in particular have pressed ahead with electronic invoicing for transactions with the public administration. In this connection, Table 5 presents the key milestones relating to developments in Finland and Denmark.



**Table 2: Milestones in the implementation of electronic invoicing within public administration in Finland and Denmark**

Year	Finland	Denmark
2003	2003: Launch of Finvoice: Banks and service providers agree on fundamental procedures for electronic invoicing	
2005	(law enables use of electronic archives for records and accounts)	2005: Resolution: Electronic invoicing is to become mandatory for suppliers to the public administration
2007		2007: The Danish National IT & Telecom Agency (NITA) launches "NemHandel", a platform for the secure exchange of documents, including SMEs in particular
2009	2010: Government authorities accept electronic invoices only	2010: 30% of all Danish enterprises have used NemHandel
2011		Since May 2011: Invoicing of public bodies only possible in electronic form

In the USA, an initiative for the use of electronic invoicing at public authorities was launched as early as 1998. The potential savings from the use of electronic invoicing were estimated at over US\$ 18 billion over seven years (Donselaar, 2000). Some 5.1 billion electronic invoices were sent in North America in 2010 (Jong, 2011), with the annual growth rate estimated at around 23-25%. Apart from Latin America, where growth rates for e-invoicing of up to 200% are to be observed in some instances, Australia and the Asia-Pacific countries also show continuous growth, while China and Africa lag behind and electronic invoicing even remains prohibited in many countries, such as Thailand, India and Egypt. By comparison, the estimated saturation level for electronic invoicing stands at around 56% in Europe, 35% in the USA and only around seven per cent in the Asia-Pacific region (Bryant/Nienhaus, 2010).

Figure 9 presents the findings from our survey of international experts. The question as to how high they estimate the overall share of electronic invoices in their country was answered as follows:



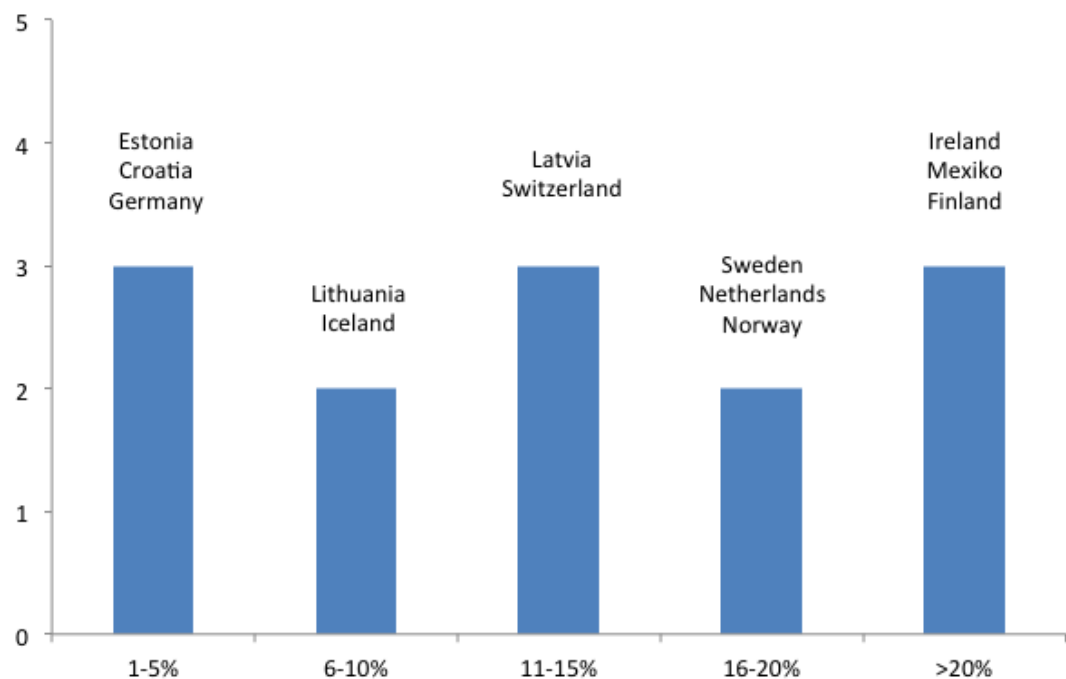


Figure 9: Estimated adoption rates for e-invoicing based on survey of experts

The Nordic countries' lead in the propagation of electronic invoicing is also apparent here – notwithstanding the fact that these findings only constitute estimates which, while based on expert knowledge, are for the most part not substantiated by any current scientific studies.<sup>9</sup>

### 6.1.2 Obstacles / implementation problems

As indicated, various countries are substantially ahead of Germany in their efforts to introduce and propagate electronic invoicing with the public administration. On the other hand, there are also countries which find themselves at a similar stage to Germany, despite their governments having undertaken concerted efforts to promote e-invoicing.

In the course of the survey of experts at international level which has already been cited in several instances, the respondents were consequently asked explicitly about their experiences regarding obstacles to/problems with the switch to e-invoicing. A number of statements from the experts in response to this question are presented in Table 6.

<sup>9</sup> Findings from a current study on the topic of "Invoice volumes and proportion of electronic invoices in Germany", which is being carried out by the University of Frankfurt in conjunction with Bonpago GmbH as part of the E-Docs projects, show the complexity involved in obtaining an exact estimate of these figures. Unfortunately, the relevant literature does not include any figures on invoice volumes accompanied by detailed explanations of the methodology behind the calculations, so as to enable the quality of the estimates to be assessed by third parties.

Table 6: Selection of quotations from experts on the topic of obstacles to the implementation of e-invoicing

In your opinion, what are the greatest problems relating to the changeover to electronic invoicing?
<p><b>"Too complex technology"</b> [Netherlands]</p> <p>"Currently because of the <b>lack of agreed standards</b>, a sender/receiver may have to deal with multiple formats. The lack of standards also means that ERP/Accounting solution providers typically do not incorporate it into their systems which means they need to buy in solutions" [Ireland]</p> <p>"Maybe <b>lack of interoperability</b> and lock in by operators" [Sweden]</p> <p>"(...) <b>different formats</b> of e-invoice --&gt; cost for semantic definition and conversion, traditional companies don't rely on automated "no touch" processes" [Switzerland]</p> <p>"Several means of <b>data interpretation</b> leading to different consequences" [Estonia]</p> <p>"Questionable cost savings for SMEs, (...) increased <b>risk of data theft or loss</b> (...) " [Lithuania]</p> <p>"<b>Legal uncertainty</b>, --&gt; as a result many consultants, lawyers and service providers that make too much money out of it" [Switzerland]</p> <p>"Very important to avoid that agencies and business introduce new <b>barriers to trade by specially designed e-invoicing solutions</b> which risk excluding small business and businesses from other countries from cross-border trade" [Sweden]</p>

Table 7 summarizes the five inhibiting factors which represent the greatest obstacles to the introduction of e-invoicing. Complexity, costs and technical problems relating to changeover (positions 1, 3 and 4) were adopted into the target tree forming the basis for the cost utility analysis, according due consideration to these specific findings. A lack of initiatives by the government (position 5) is another reason why some countries lag behind others. The example of Denmark shows how a rigorous approach can virtually "bulldoze" a changeover. When making such comparisons, however, it is to be noted that Denmark and Germany differ greatly in terms of the size and structure of their public sectors and their economies as a whole. Finally, a lack of knowledge about available solutions (and/or their significance and relevance) is identified as a key obstacle to the successful implementation of electronic invoicing (position 2). As an initial step, the Federal Ministry of the Interior aims to generate this knowledge with the eRechnung project. This cost utility analysis thus constitutes the core of this project and will be supplemented by pilot projects at various federal authorities in the coming months (cf. section 6.4).

Table 7: Obstacles to the implementation of e-invoicing (findings from survey of experts)

Top 5: Obstacles to the adoption of e-invoicing	
1	"Complexity of transition to electronic invoicing solutions"
2	"Little overall knowledge about electronic invoicing solutions"
3	"Costs of transition from paper-based to electronic invoicing"
4	"Incompatibilities of e-invoicing solutions with present invoicing processes"
5	"Insufficient government initiatives"

A necessary second step which must be undertaken in parallel is to propagate this knowledge among the transacting partners, by imparting it on the one hand to decision-makers whose authority extends to decisions on the introduction of e-invoicing and on the other hand to the relevant clerical staff (e.g. by means of training measures), so as to ensure that the technology enters into lasting use.<sup>10</sup>

## 6.2 Legal basis

### 6.2.1 Aspects of turnover tax law

As briefly outlined in the preceding chapters, legal conformity is a key consideration with regard to electronic invoicing in the context of turnover tax law. In order to provide those readers with an overview who are not yet closely acquainted with the handling of electronic invoices, the most important developments in the area of turnover tax which are of relevance to electronic invoicing are recapitulated below – from the promulgation of EU provisions through to their implementation in Germany.

Invoicing regulations with regard to turnover tax for electronic invoices are defined by the EU in Directive 2006/112/EC on the common system of value added tax (VAT Directive) and Directive 2010/45/EU, which entered into force on 1 January 2013, amending Directive 2006/112/EC.<sup>11</sup> On deciding to introduce an IT structure for electronic invoicing, the investor is obliged to acquire knowledge of the legal requirements pertaining to e-invoices which are of relevance to matters of value added tax.<sup>12</sup> As the respective EU Member States have varying invoicing standards, parties making out invoices must at least have knowledge of the requirements of those countries with which they have business relations.

In order to meet the requirements of EU law on value added tax, an invoice must include the following items of information (Article 226 of the VAT Directive as amended on 1 January 2013):

<sup>10</sup> For a comprehensive presentation of potential influencing factors regarding the adoption of e-invoicing, see also the paper "A Unified View of Electronic Invoicing Adoption: Developing a Meta-Model on the Governmental Level", by Kreuzer/Eckhardt/Bernius/Krönung (2013).

<sup>11</sup> 2010/45/EU of 13.7.2010, Official EU Journal no. L 189, p. 1

<sup>12</sup> In accordance with Section 2 (3) of the Turnover Tax Act, legal entities under public law are also liable to sales tax with regard to their activities of a commercial nature or their agricultural or forestry operations.

1. *the date of issue;*
  2. *invoice identification number: a sequential number based on one or more series, which is uniquely allocated to identify the invoice;*
  3. *the VAT identification number pursuant to Article 214, under which the party liable to pay tax has supplied goods or rendered services;*
  4. *the VAT identification number pursuant to Article 214, under which the customer has received goods or services in respect of which it is liable to pay tax or under which it has received goods pursuant to Article 138;*
  5. *the full name and address of the taxable party and of the party receiving the goods or services;*
  6. *the quantity and nature of the goods supplied or the extent and nature of the services rendered;*
  7. *the data on which the goods were delivered or the service was rendered or completed, or the date on which the payment on account pursuant to Article 220, points 4 and 5, was made, where this date can be determined and differs from the date of issue of the invoice;*
  - 7a. *the declaration "Cash accounting", where the tax claim pursuant to Article 66 b) arises at the time when the payment is received and the right of deduction arises at the time the deductible tax becomes chargeable;*
  8. *the taxable amount per rate or exemption, the unit price exclusive of VAT and any discounts or rebates if they are not included in the unit price;*
  9. *the applicable rate of VAT;*
  10. *the VAT amount payable, except where a special arrangement is applied under which, in accordance with this Directive, such a detail is excluded;*
  - 10a. *where the customer receiving goods or services issues the invoice instead of the supplier, the mention "Self-billing";*
  11. *reference to the applicable provision of this Directive or to the corresponding national provision or reference to the fact that the supply of good or services is exempt from taxation;*
  - 11a. *where the customer is liable for payment of the VAT, the mention: "Reverse charge";*
- [...].*

Article 226b of the VAT Directive further stipulates that in connection with simplified invoices pursuant to Article 220a and Article 221 (1) and (2), Member States are only obliged to require the following items of information:

- a) *the date of issue;*
- b) *identification of the taxable party supplying the goods or services;*

- c) *the type of goods or services supplied;*
- d) *the amount of VAT payable or the information required to calculate this amount;*
- e) *where the invoice issued is a document or message treated as an invoice pursuant to Article 219, specific and unambiguous reference to this initial invoice and the specific details amended.*

With regard to electronic invoices, the amendments to the previous VAT Directive, 2006/112/EC, apply as adopted by the Council of the European Union as part of Directive 2010/45/EU on 13 July 2010. The Member States are required to implement this amending directive by 31 December 2012 and to apply the amended legal provisions as of 1 January 2013. The status of implementation forms part of the interim report Activity 3 by the European Multistakeholder Forum of 26 September 2012.<sup>13</sup> From 1 January 2013 it will be left to the discretion of the transacting parties how they ensure the authenticity, integrity and legibility of an invoice. All methods which reliably establish the connection between an invoice and the supply of goods or services are permissible. In its version which applies as of 1 January 2013, the VAT Directive refers to the previously mandatory digital signature and the EDI method solely by way of example. Article 233 of the version of the VAT Directive which applies as of 1 January 2013 reads as follows<sup>14</sup>:

*(1) The authenticity of the origin, the integrity of the content and the legibility of an invoice, whether on paper or in electronic form, shall be ensured from the point in time of issue until the end of the period for storage of the invoice.*

*Each taxable person shall determine the way to ensure the authenticity of the origin, the integrity of the content and the legibility of the invoice. This may be achieved by any business controls which create a reliable audit trail between an invoice and a supply of goods or services.*

*“Authenticity of the origin” means the assurance of the identity of the supplier or the issuer of the invoice.*

*“Integrity of the content” means that the content required according to this Directive has not been altered.*

*(1) Other than by way of the type of business controls described in paragraph 1, the following are examples of technologies that ensure the authenticity of the origin and the integrity of the content of an electronic invoice:*

*a) an advanced electronic signature within the meaning of point (2) of Article 2 of Directive 1999/93/EC of the European Parliament and of the Council of 13 December 1999 on a Community framework for electronic signatures, based on a qualified certificate and created by a secure signature creation device, within the meaning of points (6) and (10) of Article 2 of Directive 1999/93/EC;*

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<sup>13</sup> [http://ec.europa.eu/internal\\_market/payments/einvoicing/index\\_en.htm](http://ec.europa.eu/internal_market/payments/einvoicing/index_en.htm) or [http://ec.europa.eu/enterprise/sectors/ict/e-invoicing/benefits/invoicing\\_forum\\_en.htm](http://ec.europa.eu/enterprise/sectors/ict/e-invoicing/benefits/invoicing_forum_en.htm)

<sup>14</sup> 2010/45/EU of 13.7.2010, Official EU Journal no. L 189, p. 1

*b) electronic data interchange (EDI), as defined in Article 2 of Annex 1 to Commission Recommendation 1994/820/EC of 19 October 1994 relating to the legal aspects of electronic data interchange, where the agreement relating to the exchange provides for the use of procedures guaranteeing the authenticity of the origin and integrity of the data.*

This EU Directive has been adopted at national level in Germany and incorporated into the Turnover Tax Act (UStG). The Tax Simplification Bill (StVereinfG) of 1 November 2011 includes a simplification of Section 14 (1) and (3) of UStG, which is based on the Council's specifications. Previously, it had only been possible to ensure the integrity and authenticity of an electronic invoice by means of a qualified electronic signature or an EDI process. The Tax Simplification Bill transformed these two alternatives into options. The lifting of this restriction means that electronic invoices can be sent as PDF documents by e-mail or DE-Mail, by web download or EDI and via computer fax or fax server, for example. The authenticity, integrity and legibility of the invoice must be ensured, despite simplification.

A letter dated 2 July 2012 on this subject from the Federal Ministry of Finance states the following<sup>15</sup>:

*Where no qualified digital signature is used or the invoice is transmitted via electronic data interchange (EDI), the authenticity of origin, the integrity of the content and the legibility of the invoice must be ensured by an internal control procedure which is capable of establishing a reliable verification path between invoice and supplied goods or services (Turnover Tax Act, Section 14 (1), sentence 5 and 6).*

*(5) <sup>1</sup>A procedure which the enterprise deploys in order to check the invoice against its obligation to pay, so as to ensure that only such invoices which it is obliged to settle are actually settled, shall suffice as an internal control procedure pursuant to Section 14 (1) of the Turnover Tax Act.<sup>2</sup>The enterprise may employ existing invoice auditing systems for this purpose.<sup>3</sup>No technical methods are stipulated which the enterprise is required to apply. <sup>4</sup>The procedure may therefore be IT-based or manual.*

*(6) <sup>1</sup>An internal control system meets the requirements of Section 14 (1) of the Turnover Tax Act when it incorporates a reliable verification path enabling a link to be established between the invoice and the supplied goods or services on which the invoice is based. <sup>2</sup>This verification path can be ensured, for example, by (manually) checking the invoice against existing business records (e.g. copy of the order, commission, contract of sale, delivery note, transfer voucher or receipt for payment). <sup>3</sup>There is no special obligation to document the internal control procedure and the reliable verification path. <sup>4</sup>An invoice whose contents are correct – in particular with regard to goods or services supplied, payment, supplying enterprise and payee – justifies the assumption that no errors compromising the authenticity of origin or the integrity of the contents have occurred in the course of transmission.*

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<sup>15</sup>[http://www.bundesfinanzministerium.de/Content/DE/Downloads/BMF\\_Schreiben/Steuerarten/Umsatzsteuer/Umsatzsteuer-Anwendungserlass/2012-07-02-Vereinfachung-der-elektronischen-Rechnungsstellung.pdf?\\_\\_blob=publicationFile&v=4](http://www.bundesfinanzministerium.de/Content/DE/Downloads/BMF_Schreiben/Steuerarten/Umsatzsteuer/Umsatzsteuer-Anwendungserlass/2012-07-02-Vereinfachung-der-elektronischen-Rechnungsstellung.pdf?__blob=publicationFile&v=4)

### 6.2.2 Accounting aspects

The following aspects apply to the public administration when it operates undertakings of a commercial nature as defined in the Turnover Tax Act. In particular, the general requirements of the German Fiscal Code then apply and, in the case of electronic invoicing, the requirements of the Generally Accepted Principles of Computer-assisted Accounting Systems (GoBS) and the General Principles regarding Data Access and the Verifiability of Digital Records (GDPdU). This section applies accordingly to private-sector enterprises acting as invoice recipients, although these do not form the subject of this study.

The recommended proposal for implementation here (cf. chapter 5.2 and 6.4) provides for the invoice to be transferred as a standardised PDF document (i.e. PDF/A-3) containing an image of the invoice and embedded XML (invoice data record). Both the legibility required by Section 14 (1) of the Turnover Tax Act and the possibility of automatic processing in downstream processes are ensured by this document.

The following aspects are to be considered here in the context of sound accounting practice (GoBS, GDPdU):

The invoice recipient is to stipulate in its procedural specification whether the invoice image or the invoice data record serves as the electronic record for accounting purposes. The invoice recipient is free to choose between these two methods.

The following questions arise in this connection:

- *What special aspects does the proposal for implementation require to be considered in the internal control procedure?*
- *What is the original invoice – the invoice image or the invoice data – which serves as the accounting record?*
- *Is the taxable party obliged to check the invoice image against the transferred invoice data record?*

Assuming that the contents of the invoice image and the invoice data in the PDF document are identical with regard to the mandatory information required in accordance with Section 14 (4) of the Turnover Tax Act, image and data constitute two copies of one and the same invoice. Where several invoices are issued for one and the same supply of goods or services and these respective invoices are not marked as duplicates or copies, the enterprise is liable to pay the tax amount shown in the invoices pursuant to Section 14c (1) of the Turnover Tax Act (cf. Section 14c.1 (4) of the ordinance on application of the Turnover Tax Act (UstAE)). This does not apply when several copies of one and the same invoice with identical contents are sent, however (see Turnover Tax Act, Section 14 (4)). Where the legally relevant contents (pursuant to Section 14 (4) of the Turnover Tax Act) of the invoice image and the invoice data (in the form of the XML data structure) differ, these no longer constitute identical copies with identical contents, but two distinct invoices. The fact that one of the two invoices contains errors does not mean that both invoices are incorrect. The crucial factor is that the invoice which is entered into the accounts and thus serves as the basis for calculating the amount of input tax deduction should be correct and should be available for presentation on request.

The invoice recipient should ensure this in the course of its defined internal control procedure. Internal control procedures pursuant to Section 14 (1) of the Turnover Tax Act as most recently amended are procedures which the enterprise applies to check the invoice against its payment obligations and the received goods and/or services.

Where the invoice recipient has no provisions in place for automated further processing of the electronic invoice, the invoice will generally be processed on the basis of the invoice image. In this case it is not discernible that an XML file is embedded in the PDF document. In this context, the attached invoice data record serves at best as a possible aid to data acquisition and is of no significance to accounting operations in its own right. If the invoice image is correct, it will serve as the basis for entry in the accounts and – where necessary – for the turnover tax advance return. If the invoice image is not correct, the invoice recipient will declare the invoice to be incorrect and will reject it. It is of no relevance whether the invoice data which are also transferred in the document are correct or not, as these data do not enter into the internal control procedure or into the accounts.

Where the control procedure has been carried out on the basis of the invoice data and there are divergences from the invoice image, the invoice image does not constitute an appropriate legible version of the invoice's contents. This is comparable to the simply structured electronic exchange of invoice data (invoice data only, no invoice images), whereby the transferred data record is typically rendered legible with the aid of a special programme (viewer). Such viewers may also be subject to errors. An error in the viewer does not mean that the invoice visualised by means of the viewer is necessarily incorrect, however.

Mixed variants whereby the internal control procedure based on the invoice image is combined with an entry in the accounts based on the invoice data require special scrutiny. Adequate precautions are to be taken here to ensure that auditing and entry in the accounts respectively are not based on different data.

*The overall situation can be summarised as follows:*

It should be ensured that the individual steps in the internal control procedure take place on the same basis. This means on the basis either of the invoice image or of the invoice data. Combined procedures are prone to errors. It should furthermore be specified in advance what procedure the invoice recipient is to apply.

The relevant invoice is the invoice which is entered in the accounts and thus constitutes the basis for calculating the amount of input tax deduction. It is imperative that the invoice is proper and correct. This is ensured by the internal control procedure. It is at the invoice recipient's discretion which of the copies of an invoice is to be used in the internal control procedure.

There is no obligation to check the invoice image against the transferred invoice data record, as image and record generally constitute copies of one and the same invoice, with identical contents. The relevant copy for the purposes of company audits is the copy which was entered into the accounts.



### **6.2.3 Budgetary aspects**

Electronic invoicing transactions with the public administration are furthermore required to comply with the provisions of federal budget law. The Federal Ministry of Finance expressly points out in a circular dated 17 August 2012 – II A 6 – H 3001/07/0001 – that the sending of electronic invoices does not require any legal supplementation or modification with regard to administrative regulation no. 4.7 for payments, accounting and invoicing or with regard to the safekeeping provisions for records pertaining to the Federation's system for budgetary management, cash management and accounting.

In detail, the circular states the following:

"In accordance with administrative regulation 4.3 for payments, accounting and invoicing (Federal Budget Code, Sections 70-72 and 74-80), no. 2.1 of the safekeeping provisions for records pertaining to the Federation's system for budgetary management, cash management and accounting (ABestB-HKR) and no. 2.1 of the provisions on minimum standards for the use of automatic processes in the Federation's system for budgetary management, cash management and accounting (BestMaVB-HKR), documents subject to safekeeping requirements are all records in electronic or written form which are necessary for accounting purposes and in order to verify sound accounting practice. These include the reference documents for invoices. Neither ABestB-HKR nor BestMaVB-HKR contains any restrictions regarding the electronic form of records.

The third part of ABestB-HKR is applicable to the safekeeping of electronic records. As a general principle, records for safekeeping are to be provided with a signature which is permissible under the Digital Signature Act. Accordingly, a qualified signature is not compulsory. Where it is not possible to provide the records with an electronic signature, a different, secure method of safekeeping for such records may be permitted with the approval of the Federal Ministry of Finance in consultation with the Federal Audit Office.

The second part of BestMaVB-HKR is applicable to the processing of electronic records. In accordance with BestMaVB-HKR, no. 6.2.2.1.1, the transfer of collected data to an automated system for further processing may take place through the input of data from written documents by manual or other means or by adopting electronic data. Data may only be adopted after verifying that they are factually and, where appropriate, mathematically correct (BestMaVB-HKR, no. 6.1.3.2). After verifying that they are factually and, where appropriate, mathematically correct, it must be ensured that no subsequent alteration of the records is possible."

### **6.2.4 Data protection aspects**

Invoices to be received by the public administration do not contain any personal data – such as might be relevant for the purposes of the project concerned – but solely function-related data. As such, they do not fall within the purview of the Federal Data Protection Act.

## **6.3 Consideration of security-related exceptions**

In certain cases, different assessment criteria (or a different weighting of assessment criteria) require to be applied to electronic invoicing to those defined as a basis for utility assessment in the preceding chapters. In some cases, integrity and authenticity require to be ensured with the very highest level of security, for example – corresponding to registered post.

This applies when the administration is the sender of the invoice and wishes to send out a large number of invoices by electronic means (for example when a municipal authority sends out water bills or other notifications of charges to the public – this entails a risk of the field "account number" being manipulated by a third party prior to dispatch, for example). While this case is not to be considered and analysed within the scope of the present study, DE-Mail offers the ideal alternative to conventional postal delivery here.

Another area which does not fall within the scope of the present study is the receipt of invoices by certain authorities which are subject to a different security level to "standard" authorities. Here again, DE-Mail is recommendable as an alternative to postal delivery. Where the information in the invoice is of such a confidential nature that it is to be treated as classified material, the Federation's regulations on the safeguarding of classified information (VSA) or the corresponding guidelines in the "Handbuch für den Geheimschutz in der Wirtschaft"<sup>16</sup> (*"Manual on security in the business community"*) must be complied with.

These exceptions are outweighed by the majority of "normal" invoices which are of relevance to the present study. In these cases it is sufficient when a conventional verification process downstream of the invoicing stage ensures integrity and authenticity (cf. chapter 6.2). This also applies in particular to invoices in PDF format without any additional data. From a security standpoint, all the modes of transfer considered in this study (e-mail, web portal, https, DE-Mail, EDI) are applicable.

The stringent budgetary stipulations are also to be observed (see 6.2.2 above). This also guarantees a minimum standard of security when handling electronically transmitted invoices.

## 6.4 Implementation

The introduction of electronic invoicing will lead to an increased incidence of enterprises of all sizes exchanging electronic invoices with the public administration. Small and medium-sized enterprises (SMEs) should have a particular interest in sending invoices primarily by e-mail.

The standard described here is intended to facilitate the simplified processing of invoices between private enterprises and the public administration, without the two sides necessarily having to conclude individual agreements beforehand. Notwithstanding this intention, special provisions in framework agreements should be possible at any time in the context of public procurement law.

The form of implementation aims to ensure that the standard is equally applicable by users who do not intend to carry out automatic further processing and by users who wish to exploit the potential offered by electronic processing.

This recommended course of action for the impending implementation thus centres on the following principles:

- As much flexibility as possible – as much security as necessary: With regard to the mode of transmission in particular, a simple and flexible solution (e.g., sending of invoices by e-mail) must be available to all parties participating in implementation.

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<sup>16</sup> <https://bmwi-sicherheitsforum.de/start/>

- **Scaling of requirements:** The larger the order and turnover volume forming the basis for the invoicing process, the stricter the requirements to be met in the pilot project phase. These requirements should not be stipulated unilaterally by the administration. In the context of public procurement law, however, it must be permissible in future to include provisions in framework agreements and individual contracts which stipulate electronic invoicing as a mandatory condition pertaining to the award of contracts. Exemptions for specific areas are to prevent SMEs from being placed at a disadvantage.
- **Principle of voluntary participation:** Participation in the implementation process is initially to be voluntary. However, provisions in framework agreements must always be permissible under public procurement law.

#### **6.4.1 General requirements pertaining to implementation**

As a general principle, electronic invoices should be suitable for further processing by the invoice recipient without entailing any additional effort and expenditure and without the use of any special tools. The issuer should send a PDF document incl. image file and invoice data to the public administration, irrespective of whether the latter has yet implemented electronic processing.

The data model should be limited to contents which are either compulsory for all invoices (for example, on account of legal requirements) or which are in common use, irrespective of any specific area of administration, industry or type of enterprise, and which can be used effectively in standardised form (customary details such as order number, period for payment, etc.). In view of the high degree of complexity involved, industry-specific invoice items should be excluded from the basic data model. Such content can be specified where appropriate as part of a bilateral supplement to the standard.

#### **6.4.2 Recourse to standards**

Various standards have become established for business documents. In some instances such standards have already been in use in the private sector for some years, and in the public sectors as well in some EU countries (Koch, 2012). With regard to the data formats to be used, existing public standards or established industrial standards are to be applied wherever possible. The provisions of regulation 1025/2012 of the European Parliament and the Council on European standardisation of 25 October 2012 are to be observed (Official Journal L316 of the European Union, p. 12 ff., of 14 November 2012).

The standard must only require a minimum scope of technical measures for integration into the systems employed by solution providers which generate, receive and/or process invoices. In particular, no technologies must be necessary which are either protected or available solely from individual manufacturers.

Following only minimal adaptation, the standard should also be applicable for "similar" types of document, such as offers, order confirmations and delivery notes.

With due regard to the above-described requirements, various partners from the private and administrative sectors have collaborated within FeRD to develop a standard which should also be taken into account by public administration in the course of a pilot project.

#### 6.4.3 Underlying framework for implementation

The following levels are to be considered in defining a uniform and secure infrastructure for the exchange of electronic invoices between the business sector and the administration:

Levels of a uniform standard	
Contents / Semantics	<ul style="list-style-type: none"> <li>▪ What content has to be included in an invoice?</li> <li>▪ Which additional information may be added?</li> </ul>
Transmission	<ul style="list-style-type: none"> <li>▪ Which structure should be used for transmission?</li> <li>▪ Which channels of transmission should be supported?</li> </ul>
Governance	<ul style="list-style-type: none"> <li>▪ Who is responsible for the rules?</li> <li>▪ How are stakeholder incorporated?</li> <li>▪ Who is responsible for development and maintenance of the standard?</li> </ul>

Figure 10: Levels of a uniform standard for implementation

FeRD will answer these questions in a separate specification document which is also to receive due consideration in the pilot phase. Publication of the draft specification is planned for January 2013. The recommendation submitted in this study is intended to help standardize the processes between the business sector and the administration. This also accommodates the wishes for uniform arrangements which have been voiced repeatedly by the private sector in the past. In the context of tax legislation it is to be noted that the recommendation made here for a specific format does not have any bearing on recognition under tax law of an electronic invoice in this format or of invoices made out in a different format. The responsibility for complying with the requirements stipulated by the fiscal authorities lies solely with the taxable party. This applies in particular to the continuing uncertainty on the matter of correct archiving.

#### 6.4.4 Selection of tools/solutions

Numerous secondary and primary data were collected in the course of the analyses. Various aspects and strategies relating to optimisation measures for incoming invoices were identified in interviews with responsible experts at various authorities and ministries. In line with developments in the private sector, the establishment of shared service centres is under consideration, along with centralisation and the introduction of new software solutions. With regard to the introduction of software solutions, these considerations follow different paths according to whether the software solutions (e.g. workflow) are to be implemented within the

existing commercial software solution (e.g., MACH AG or SAP AG) or as an additional solution for handling clearance workflows (e.g., ReadSoft AG or Lucom GmbH). Experience from the private sector clearly shows that separate solutions generally enjoy a higher level of acceptance among end users. These findings are also backed up by surveys of users. A key factor here is always a solution tailored to the end user with regard to utility value and frequency of use.

It is important that the suppliers be involved in the processes. There is a common fear among suppliers that providing invoices in read-only and data format is a complex, time-consuming and expensive matter (e.g., EDI). The example of the Austrian Federal Economic Chamber clearly shows that simple solutions (e.g., the Word plug-in, <http://portal.wko.at>) are also available on the market. Simple solutions intended specifically for small and medium-sized enterprises are being developed in the E-Docs project sponsored by the German government. A solution is currently under development, for example, which lends itself to intuitive operation by the supplier and avoids the need for user actions in the course of daily business operations. The "small-scale" supplier continues to print its invoices – as with the present-day process – and a read-only and data format are produced according to the applied variant (e.g. in FeRD format). Detailed information on these services is to be found at [www.e-docs-standards.de](http://www.e-docs-standards.de).

#### **6.4.5 Internal process setup and application in pilot projects**

The solutions centring on the transfer of invoices via e-mail or https with and without data have emerged as recommendable options in the course of the cost utility analysis undertaken in this project; these solutions should subsequently form the basis of implementation in systems of public administration. Such implementation is planned for 2013 in the area of the federal administration at authorities belonging to the Federal Ministry of the Interior's sphere of responsibility.

The findings from the detailed analyses have furthermore shown that that additional potential for optimisation remains to be exploited in existing processes within public administration systems. The degree of centralisation is limited, for example, and requires to be stepped up. Requirements such as early scanning or an electronic workflow have also yet to be realised to an adequate extent. These matters are to be taken up in the course of a pilot project.

These findings result in the following essential areas of action for the introduction of electronic invoicing:

- Firstly, necessary adaptations and improvements in the clearing and booking processes currently in place in the public administration. The appropriate action in this area will suffice to enable the successful and purposeful introduction of electronic invoicing – in whichever of the fourteen variants presented.
- After this step, solutions for electronic invoicing are to be integrated in accordance with the cost utility analysis presented above. In addition to an electronic invoicing process, where possible data should also be exchanged in the FeRD standard.
- In selecting the partners for the pilot project, various background situations should be considered with regard to the possible invoicing processes (e.g. incoming/outgoing

invoices, central or decentralised processing of invoices). As a general principle, all developed solutions should be compatible with any ERP system.

The current processes and system support were evaluated at various meetings focusing on the analyses of case studies to assess the current situation regarding electronic invoicing at federal authorities. The findings of this evaluation process are outlined in Figure 11.

## Actual Process

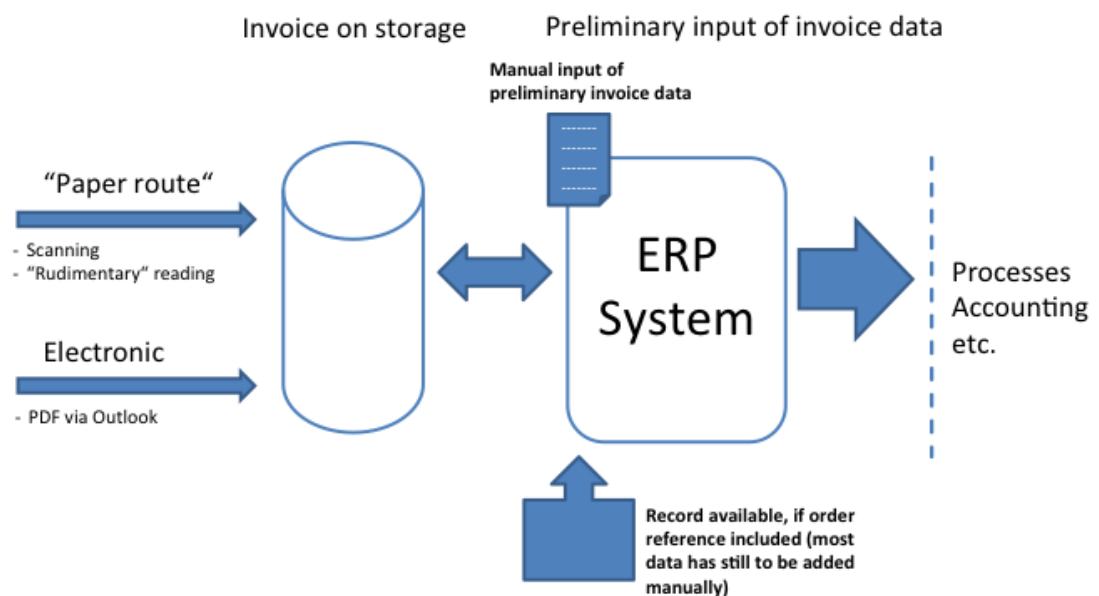


Figure 11: Diagram showing the current processes for incoming invoices

This assessment of the current situation gives rise to two required areas of action for successful implementation of an electronic process for handling incoming invoices. The first area concerns the necessary adaptation of the transfer process from the disk drive to the ERP system and the preliminary booking of invoices, while the second area relates to the electronic receipt of invoices. The focus of the pilot scheme as part of the project conducted with the University of Frankfurt will be on the front end – i.e. the electronic receipt of invoices. Identified improvement measures for the preliminary booking of invoices will be discussed directly with the relevant parties at the authorities participating in the pilot project and the Federal Ministry of the Interior. With regard to the receipt of invoices, it is to be noted that invoices are already received in electronic form by public administration authorities today in isolated instances – in formats of the respective supplier's choice. This situation is also to receive due consideration in the course of the pilot project. Further details are to be agreed in consultation with the participating authorities by way of specific project planning.

It is important that the pilot project should yield initial results as swiftly as possible. In this context, the short-term aim is to avoid paper in the area of incoming invoices, while the medium-term objective is to improve the preliminary booking of invoices through the integration of data.

The FeRD standard is to be applied to this end. Figure 12 highlights these primary aims of the pilot project in graphic form.

## Pilot Project: Objectives

Objectives of the pilot project:

- a) Replacement of the paper route (no scanning costs, save paper)
- b) Simplification of preliminary data input process, reduction of certain process elements (identification of necessary data for further handling)

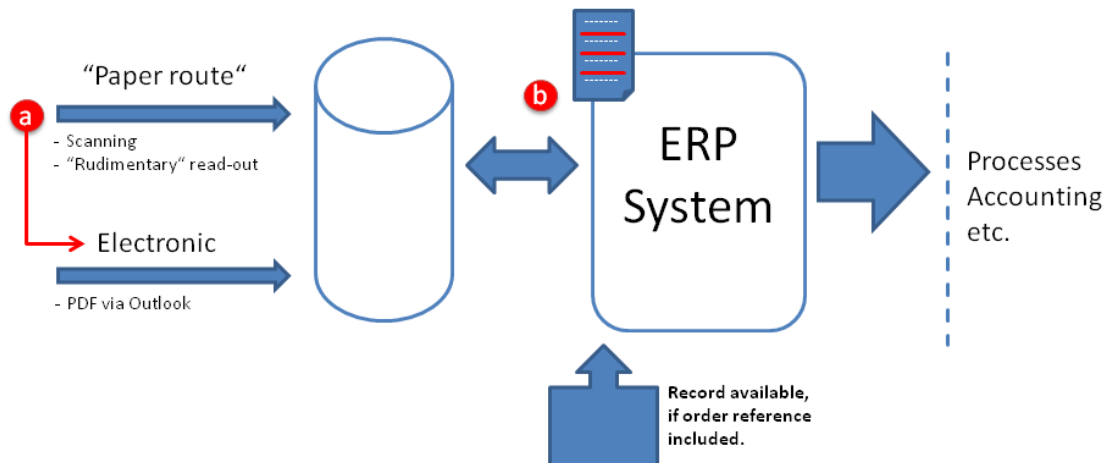


Figure 12: Aims of the pilot project in the context of the current process

The current situation and the time schedule result in four variants to be implemented. These are presented in Figure 13. The short-term **variant 1** is aimed at swift implementation (e.g., with suppliers of the 'Kaufhaus des Bundes' ('Federal procurement store')) in the form of a standard invoice in PDF form. Any scanning costs can be reduced in this way.

Possible solutions for the design of internal processes to handle electronic invoices are subsequently to be presented, but these are not necessarily to be regarded as alternative solutions. Some solutions may also function as a means of transition on the way to a more extensive restructuring of the system for handling incoming invoices. In the medium-term, it is crucial to successful implementation that potential also be exploited in the preliminary booking of invoices. This requires the exchange and read-out of data. Different variants are available here – summarised in variants 2 to 4:

- Experience in the market shows that for suppliers the simplest form of sending invoices is by e-mail with a corresponding PDF. With this **variant 2** the data then requires to be read out using a "parser service" and duly integrated in the ERP software.
- On the basis of a specified standard, **variant 3** allows the direct integration of a data record. Tools are available for this purpose which can generate a target format directly on the supplier's premises and subsequently send data in this format with a PDF.
- For invoices which are already received with a data record today, transformation into the "right" format for further processing is to be implemented for the receiving administrative body (e.g., ZuGFERD). This transformation process is to be found in **variant 4**.

## Pilot Process: Variants

Objectives of the pilot project:

- a) Replacement of paper route (no scanning costs, save paper)
- b) Simplification of preliminary data input process, reduction of certain process elements (identification of necessary data for further handling)

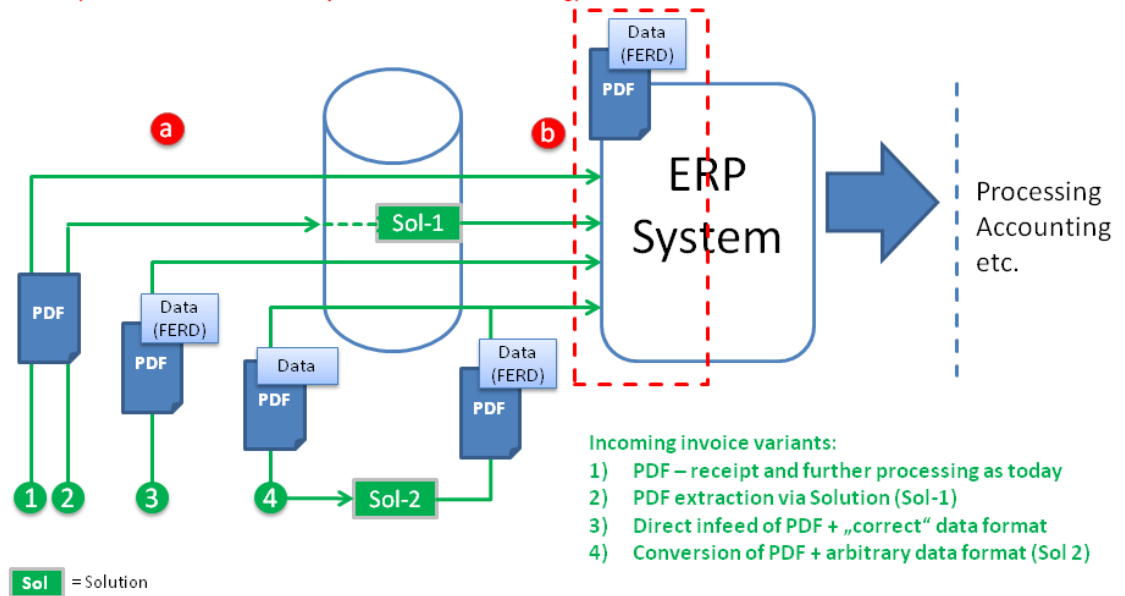


Figure 13: Variants of the pilot project



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