Study on the practical application and implementation of the European e-Invoicing standard

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Key Definitions

For the purposes of this document, the following terms and definitions apply, and are mainly based on the definitions of the European Committee for Standardization (CEN).

Term	Definition
CEN Member	CEN National Standardization Body (NSB) and CENELEC National Committee (NC)
CEN WS/BII	The CEN Workshop on Business Interoperability Interfaces for public procurement in Europe was an initiative that aimed to address interoperability issues in European public procurement, by developing technical specifications to implement e-Procurement processes in a compatible manner across the EU.
Compliant	Some or all features of the core invoice model are used and all rules of the core invoice model are respected. [1]
Conformant	All rules of the core invoice model are respected and some additional features not defined in the core invoice model are also used.
Core elements of an electronic invoice	Set of essential information elements that an electronic invoice may contain in order to enable cross-border interoperability, including the necessary information to ensure legal compliance.
Core invoice model	Semantic data model of the core elements of an electronic invoice.
Core Invoice Usage Specification (CIUS)	The CIUS is a specification that provides a seller with detailed guidance, explanations and examples, relating to the actual implementation and use of the information elements in the core invoice model in a specific trading situation.
Electronic invoice	An invoice that has been issued, transmitted and received in a structured electronic format which allows for its automatic and electronic processing. [2]
End user	An end user is a public administration or one of its suppliers.
ERP vendor	Enterprise Resource Planning (ERP) vendors sell ERP systems. An ERP system is a business process management software that allows an organization to use a system of integrated applications to manage the business and automate many back office functions such as procurement and accounting. [3]

European Standard (EN)	A normative document adopted and made available by CEN-CENELEC in the three official languages and disseminated by the Management Centre (CCMC) to the Members for implementation as an identical national standard, as referred to in the CEN-CENELEC Internal Regulations Part 2 Clause 1.2.
Information element	An information element is a semantic concept that can be defined independent of any particular representation in a syntax.
MUG	MUG (Message User Guidelines) is the CEN project that developed the implementation guidelines for the UN/CEFACT CII syntax.
Public e-Procurement	e-Procurement refers to the use of electronic communications and transaction processing by government institutions and other public sector organisations when buying supplies and services or tendering public works.
Semantic data model	A structured set of logically interrelated information elements.
Service provider	An e-invoicing service provider is an organization that provides its customers with services for the creation, delivery and processing of e-invoices and other related e-business transactions as well as supporting software, and analytics. Such organizations are typically based on the provision of network, business outsourcing, financial services, technology [4]
Structured information element	An information element that can be processed automatically.
Syntax	A machine-readable language or dialect used to represent the information elements contained in an electronic document (e.g. an electronic invoice).
Validation artefacts	Tools that help parties and service providers to comply with standards or specifications.

Purpose of the Study

The objective of the present study is to assess the European standard on electronic invoicing, that has been designed by the CEN (Comité Européen de Normalisation) Technical Committee 434 (CEN/TC 434) with respect to the criteria listed in the Directive 2014/55/EU on electronic invoicing in public procurement.

In particular, Directive 2014/55/EU states that prior to the introduction of the European standard on electronic invoicing in the Member States, the practical application of the standard should be sufficiently tested. This assessment should be done in conjunction with the drawing up of the standard and should involve end users. It should address, in particular, aspects of practicality and user-friendliness, and should demonstrate that the standard can be implemented in a cost efficient and proportionate manner.

The present study aims to consolidate the results of tests performed by CEN during the draw-up of the European standard, and to complement this with the more detailed assessment with regard to practicality, user-friendliness and possible implementation costs.

Scope of the Study

In this context an end user is a public administration or one of its suppliers, bearing in mind that the Directive does not place any obligation on the suppliers. The obligation to receive e-invoices lies on the contracting entities/authorities. However, their suppliers will be called sooner or later to use e-invoicing. Therefore, this study looks into several user cases.

Two different B2G (business to government) architectures for e-invoicing in public procurement are already in place in most of the Member States, namely:

- a central hub (or a combination of several hubs) that receives all e-invoices from suppliers and dispatches them to the relevant contracting entity/authority (centralized system); or
- a distributed system where the e-invoices have to be sent by the suppliers directly to the relevant contracting entity/authority (distributed system).

Bearing in mind the above architectures and the two syntaxes (OASIS UBL 2.1, UN/CEFACT CII) that have been selected by CEN/TC 434 to support the European standard, a number of scenarios have been defined taking into account the diversity of the e-invoicing policies in the Member States and the national, regional and local levels of the contracting entities/authorities. The scenarios include the following cases:

- Contracting entities/authorities that use national solutions (in centralized or distributed systems);
- Contracting entities/authorities that have no system for e-invoicing;
- Contracting entities/authorities that already have e-invoicing solutions in place that are (to a great extent) aligned with the standard;
- Contracting entities/authorities that have e-invoicing systems that do not include any of the 2 above mentioned syntaxes;
- Other relevant cases.

The following **activities** were performed to ensure that the requirements to assess the potential impact of the European e-invoicing standard on end-users were fully addressed:

1) Consolidating the technical results of the test that has been carried out by CEN/TC 434 to validate the proper functioning of the European standard.

> The results of the CEN/TC 434 Working Group on Test methodology and test results have been analysed and views exchanged with the representative of the Working Group to ensure correctness and completeness of the information provided (see Chapter 2 of this study).

2) Assessing the practical application for an end user of the European standard on e-Invoicing against the following criteria:

> **(a) Practicality**
>
> This criterion refers to elements such as being effective, useful and suitable for a particular purpose or situation.
>
> The suitability of the standard, in terms of its fitness for purpose, has been assessed in relation to specific scenarios including: contracting entities/authorities that have already in place an e-invoicing solution and need to update it; contracting entities/authorities that need to acquire a new solution and to integrate it with their Enterprise Resource Planning (ERP) systems; and contracting entities/authorities which have no system currently in place. For each scenario a specific European country has been selected and the criteria has been assessed.
>
> In addition, the key stakeholders have been interviewed including the OpenPEPPOL community, regional and local authorities and GS1 in Europe (see Chapter 3).
>
> **(b) User-friendliness**
>
> This criteria involves an assessment of the easiness to use and to implement the standard. In particular, the impact of the standard when implemented into the existing solution of a given contracting entity/authority.
>
> In general, the organisations that will be implementing the European standard on e-invoicing are: solution and service providers, and in-house developers.
>
> This criteria has been assessed in selected e-invoicing scenarios and by interviewing the key stakeholders. In particular, ERP vendors and e-invoicing service providers have been interviewed to assess their views on the standard and their willingness to implement it, making it available in their solutions (see 'EESPA' and 'ERP vendors' in the Stakeholder section, in Chapter 3).
>
> **(c) Possible implementation costs**
>
> This criteria refers to the implementation costs to be borne by end-users (contracting authorities and suppliers) for supporting the standard, covering the full set of identified scenarios.
>
> The costs to support the European e-invoicing standard were described for each national implementation, and where available also the maintenance costs. These costs are based on on-going projects in the Member States. The costs for a regional contracting authority have also been presented. An

analysis of how the implementation costs will vary in the selected e-invoicing scenarios has been included in the Key findings (in Chapter 4).

The potential CEN costs related to the use of the standard have been assessed (see Annex 1). In addition, the existing e-invoicing solutions on the market were scrutinized, e.g. the number of service providers, the capabilities offered by these providers, and pricing models (see Annex 2).

3) Assessing the **additional costs or burden** placed on smaller contracting entities/authorities or micro, small and medium-sized enterprises by the Directive 2014/55/EU.

Regional and local authorities, and a European SMEs association were interviewed to assess this aspect. In addition, the availability of e-invoicing solutions and services targeting these end-users were identified in the various countries analysed, and at a European level.

Structure of the study

The table below briefly presents the content of this study.

	Topic Chapter	Objective
	Purpose, scope and methodology	This Section describes the purpose and scope of the study, highlighting the criteria for the assessment requested by the European Commission, including the methodology.
1.	The European e-Invoicing standard (EN)	This Chapter describes the requirements for developing the European e-invoicing standard and its main features.
2.	CEN Testing of the EN	This Chapter describes the testing activities carried out by the CEN Technical Committee 434 and their results.
3.	Impact Assessment	This Chapter first includes and in-depth analysis of the impact of the EN in six Member States based on specific scenarios; and secondly it describes the impact of the EN for the key stakeholders.
4.	Key findings	This Chapter provides a summary of the key findings from the technical testing activities described in Chapter 2, and from the Impact Assessment in Chapter 3.
5.	Conclusions	In this Chapter the conclusions of the study are provided.
	Annex 1	This Annex provides a summary of the CEN policy on dissemination, sales and copyright; and cost of the EN.
	Annex 2	This Annex provides a high level overview of the e-invoicing solutions and services in Europe.

Methodology

This e-invoicing study has been divided into three phases as illustrated in the figure below. Each phase is further detailed in the following sections.

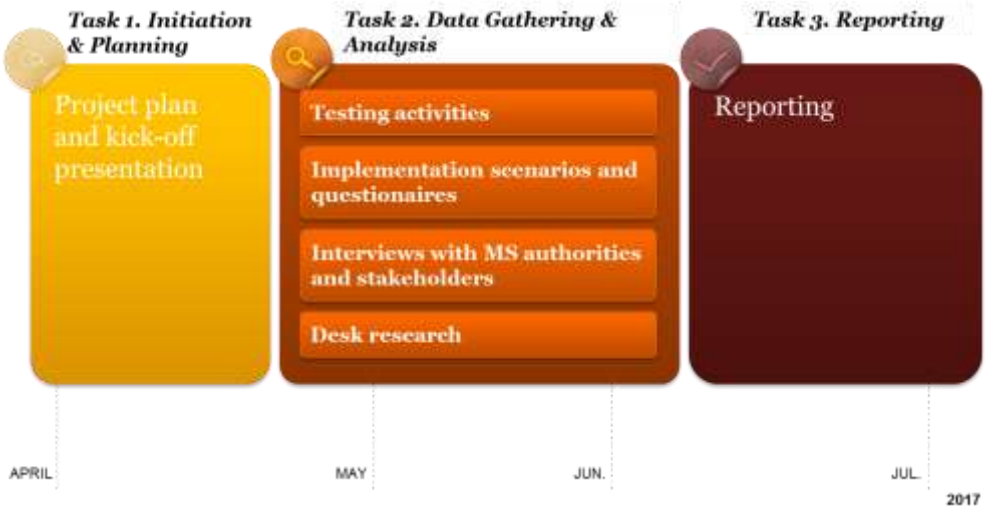

Figure 1: Project phases

Task 1: Initiation & Planning

The first phase of the project consisted of preparatory work such as setting up a project plan, evaluating and selecting the Member States and stakeholders for in-depth analysis (scenarios), agreed upon with DG Grow.

Definition of scenarios

The final set of selected scenarios consisted of 6 countries:

- France
- Ireland
- Italy
- The Netherlands
- Norway
- Poland

These scenarios were selected for in-depth analysis based on their representativeness in the following areas:

- Area 1: Level of (de)centralisation for e-invoicing at the national level
- Area 2: E-invoicing maturity level
- Area 3: Use of e-invoicing standards

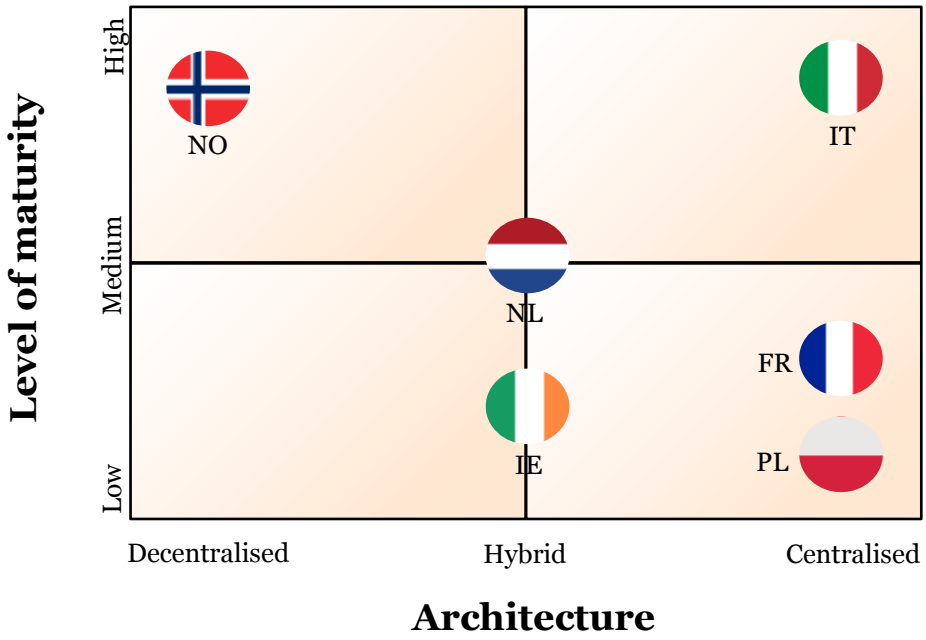

Figure 2: Countries selected for the assessment

Task 2: Data gathering & Analysis

The second phase of this project was focused on gathering and consolidating data that was required for assessing the European e-Invoicing standard and analysing the data.

We built upon the test results of the Working Group 6 of CEN/TC 434, which looked at the practical application (fitness for purpose) of the EN from a technical perspective.

Furthermore data was gathered by means of **desk research**. This research was held to clarify the e-invoicing models that are in place, their capabilities offered and pricing models.

The selected **implementation scenarios** described in Task 1 were analysed in this task.

Finally, targeted **interviews** were held with Member State, regional authorities and industry representatives, service providers and software vendors. During these interviews, a predefined set of questions was presented to the representatives. These meetings were recorded, documented in meeting minutes and approved by the corresponding representatives.

In particular, we interviewed representatives from the Member States and public administrations that were selected during task 1.

- France – Ministry of Finance
- Ireland – Office of Government procurement (Department of Public Expenditure and Reform)
- Italy – Ministry of Finance, Agency for Digital Italy (AgID), Revenue Agency, Region of Emilia-Romagna, Unioncamere, UNINFO
- The Netherlands – Ministry of Economic Affairs
- The Swedish Association of Local Authorities and Regions
- Norway – Agency for Public Management and eGovernment (Difi)
- Poland – Ministry of Economy, Institute of Logistics and Warehousing

In addition to the above, we also contacted representatives from the industry:

- OpenPEPPOL
- EESPA
- GS1 in Europe
- ERP vendors
- European DIGITAL SME Alliance

Task 3: Reporting

In the final phase of this study, the findings that were collected during task 2 were reviewed, consolidated and formulated into conclusions.

In order to, as much as possible, avoid subjectivity and to identify European trends, findings were assessed comparatively for all scenarios. In this exercise, we used the results of the desk research to validate the input given by Public Administrations, e-invoicing Service Providers and software vendors.

The conclusions were drawn following the same process.

The European e-Invoicing Standard

1

This Chapter describes the background and legal requirements for developing the European e-invoicing standard on e-invoicing and its main features.

Introduction

The mass adoption of e-invoicing within the EU would lead to significant economic benefits. It is estimated that moving from paper to electronic invoicing could generate savings of around EUR 240 billion over a six-year period. [5]

Key e-invoicing benefits include:

- cost reduction and optimisation due to reduction of manual data keying and associated error margin, missing invoices, reduced archive space and postal charges;
- efficiencies through the use of structured data for internal system integration and automated business data reconciliation; increased accuracy of data and processing speed; easier dispute handling and discrepancy resolution
- enhanced working capital due to the reduction of the average number of days that a company takes to collect revenue after a sale has been made ('Days Sales Outstanding').

Notwithstanding the recognised benefits, electronic invoicing is currently not the predominant method of invoicing in Europe. Previous studies and market consultations [6] highlight that one of the main barriers to the adoption of e-invoicing by European firms is the multiplicity of technical standards and related requirements. Even for large corporates the cost of using several e-invoicing standards can be significant:

"*We currently support many different standards, versions of standards and formats and this is not sustainable anymore. If you look at the cost benefits of automation, supporting 4 different standards represents a break-even point for us, dealing with 2 or 3 standards would put us in a very good position, but having to support one single standard would result in huge savings, as we would realise the real benefits of business automation with minimal setup and maintenance costs.*" [7]

The European Parliament, in its resolution of 20 April 2012, underlined the substantial benefits offered by electronic invoicing, stressing the importance of open and interoperable electronic invoicing solutions, based on common legal requirements, business processes and technical standards. For these reasons, the European Parliament called for making electronic invoicing in public procurement mandatory by 2016.

In October 2013, the European Multi-Stakeholder Forum on Electronic Invoicing (EMSFeI), set up by the Commission Decision of 2 November 2010, unanimously adopted a Recommendation on the use of a common European standard (a semantic data model) to support interoperability for electronic invoicing.

The goal of interoperability is to allow for the presentation and processing of information in a consistent manner between business systems, regardless of their technology, application or platform. Full interoperability includes the ability to interoperate on three distinct levels: in terms of the content of the invoice (**semantics**), the format or language used (**syntax**), and the method of transmission.

Key fact

Directive 2014/55/EU foresees the adoption of a European standard for e-Invoicing.

On the 16th of April 2014, the European Parliament and Council voted Directive 2014/55/EU on electronic invoicing in public procurement (the Directive). The Directive aims at facilitating the use of electronic invoices by economic operators when supplying goods, works and services to the public sector. In particular, it sets out the legal framework for the establishment of a European standard (EN) for the semantic data model of the core elements of an electronic invoice.

Key fact

The Directive obliges contracting authorities to receive and process electronic invoices sent by suppliers and respecting the European standard.

The Directive only requires recipients of an invoice, i.e. contracting authorities, central purchasing bodies and contracting entities, to accept and process electronic invoices in accordance with the European standard on e-invoicing, if the e-invoice is implemented in one of the two mandatory syntaxes selected by the CEN Technical Committee 434 (see Syntax testing in Chapter 2 for more information).

There is no obligation on suppliers to send electronic invoices, since this is dependent on the national legislation and implementation of Directive 2014/55/EU.

The Directive should apply to electronic invoices issued as a result of the performance of contracts to which Directive 2009/81/EC, Directive 2014/23/EU, Directive 2014/24/EU or Directive 2014/25/EU applies. Only contracts signed as a result of a tendering process, which was above the EU threshold for inclusion in the Official Journal, are covered by Directive 2014/55/EU.

While the adoption of a common standard will reduce some of the complexity of the migration to e-invoicing, the operations, in technical terms, would imply certain costs. One of the concerns of the legislator was to make sure that the compliance with the Directive does not impose unnecessary burdens on public administrations, as well as SMEs.

In general, the Commission is expected to make every effort to minimize the eventual implementation cost of the standard for its users.

The Standardisation Request

In order to comply with the provisions of the Directive, the Commission requested on December 10th, 2014, the relevant European standardisation organisations: [8]

1. to develop a European standard (EN) for the semantic data model of the core elements of an electronic invoice;
2. to identify a limited number of invoice syntaxes which fully comply with the European standard;
3. to develop syntax bindings, i.e. information specifying how the semantic data model could be represented in the listed syntaxes, and their automatic validation artefacts;
4. to develop guidelines on interoperability of electronic invoices at the transmission level; taking into account the need of ensuring the authenticity of the origin and the integrity of the electronic invoices' content;
5. to develop guidelines on the optional use of sector or country extensions in conjunction with the European standard, including a methodology to be applied in the real environment;
6. to carry out the test of the European standard with respect to its practical application for an end user.

The Directive requires that prior to the introduction of the European standard on electronic invoicing in the Member States, the practical application of the standard should be sufficiently tested. This assessment should involve end users. It should address aspects of practicality and user-friendliness, and should demonstrate that the standard can be implemented in a cost efficient and proportionate manner.

Requirements to the EN

Both Directive 2014/55/EU and the Standardisation Request explicitly pose several requirements to the EN and its deliverables.

Specific requirements

Article 3 of Directive 2014/55/EU states that: "The Commission shall request that the relevant European standardisation organisation draft a European standard for the semantic data model of the core elements of an electronic invoice (the 'European standard on electronic invoicing').

The Commission shall require that the European standard on electronic invoicing complies at least with the following criteria:

- it is technologically neutral;
- it is compatible with relevant international standards on electronic invoicing;
- it has regard to the need for personal data protection in accordance with Directive 95/46/EC [9], to a 'data protection by design' approach and to the principles of proportionality, data minimization and purpose limitation;
- it is consistent with the relevant provisions of Directive 2006/112/EC [10];
- it allows for the establishment of practical, user-friendly, flexible and cost-efficient electronic invoicing systems;
- it considers the special needs of small and medium-sized enterprises as well as of sub-central contracting authorities and contracting entities;
- it is suitable for use in commercial transactions between enterprises."

Further on in article 3 the Directive explicitly describes the task of **testing**:

- the standard shall be tested as to its practical application for an end user; and
- during the performance of the test, special account be taken of the respect for the criteria of practicality, user-friendliness and possible implementation costs.

CEN Technical Committee 434 – Electronic Invoicing

In response to the standardisation request, the European Committee for Standardization (CEN) set up in September 2014, the Technical Committee 434 (CEN/TC 434) [11] with the task of developing the requested deliverables. The structure of CEN/TC 434 reflects the respective deliverables and related activities carried out by each Working Group (WG).

CEN/TC 434 Working Groups

Working group	Title
CEN/TC 434/WG 1	Core semantic data model
CEN/TC 434/WG 2	List of syntaxes
CEN/TC 434/WG 3	Syntax bindings
CEN/TC 434/WG 4	Guidelines at transmission level
CEN/TC 434/WG 5	Extension methodology
CEN/TC 434/WG 6	Test methodology and test results

Key fact

CEN/TC 434 Members approved unanimously all the documents developed.

CEN/TC 434 Deliverables

CEN/TC 434 Working Groups prepared the following Deliverables, including the European semantic data model and the ancillary documents. All the documents have been recently approved unanimously by the Members of CEN/TC 434 with few abstentions and without any negative vote.

Reference		Title	Status
EN	16931-1	Electronic invoicing - Part 1: Semantic data model of the core elements of an electronic invoice	Published 2017-06-28
TS	16931-2	Electronic invoicing - Part 2: List of syntaxes that comply with the EN 16931-1	Published 2017-06-28
TS	16931-3-1	Electronic invoicing - Part 3-1: Methodology for syntax bindings of the core elements of an electronic invoice	Published 2017-06-28
TS	16931-3-2	Electronic invoicing - Part 3-2: Syntax binding for ISO/IEC 19845 (UBL 2.1) invoice and credit note	Formal vote 2017-06-29
TS	16931-3-3	Electronic invoicing - Part 3-3: Syntax binding for UN/CEFACT XML Industry Invoice D16B* **Should be UN/CEFACT XML Cross Industry Invoice*	Formal vote 2017-06-29
TS	16931-3-4	Electronic invoicing - Part 3-4: Syntax binding for UN/EDIFACT INVOIC D16B	Formal vote 2017-06-29
TS	16931-3-5	Electronic invoicing - Part 3-5: Syntax binding for the Financial Invoice based on ISO 20022	Withdrawn
TR	16931-4	Electronic invoicing - Part 4: Guidelines on interoperability of electronic invoices at the transmission level	Published 2017-06-28
TR	16931-5	Electronic invoicing - Part 5: Guidelines on the use of sector or country extensions in conjunction with EN 16931-1, methodology to be applied in the real environment	Published 2017-06-28
TR	16931-6	Electronic invoicing - Part 6: Result of the test of EN 16931-1 with respect to its practical application for an end user	Final vote 2017-09-14

Note: EN= European Norm; TS= Technical Specification; TR= Technical Report.

The Members of CEN are the National Standardization Bodies of 34 European countries – including all the Member States of the European Union (EU) and other countries that are part of the European Single Market.

Each National Standardization Body that is part of the CEN system is obliged to adopt each European Standard as a national standard and make it available in their country. They also have to withdraw any existing national standard that conflicts with the new European Standard. Therefore, one European Standard (EN) becomes the national standard in all 34 countries covered by CEN Members.

In line with Directive 2014/55/EU, and after publication of the reference to the European standard for e-invoicing in the Official Journal of the European Union, all public contracting authorities and contracting entities in the EU will be obliged to receive and process an e-invoice when it relates to procurement in the scope of the EU Directives as long as:

1. it is in conformance with the semantic content as described in EN 16931-1;
2. it is represented in any of the two mandatory syntaxes identified in CEN/TS 16931-2 (see *List of syntaxes* in the following section).

The European e-Invoicing standard

The European standard for e-invoicing establishes a semantic data model of the core elements of an electronic invoice. The semantic model includes only the essential information elements that an electronic invoice needs to ensure legal (including fiscal) compliance and to enable interoperability for cross-border, cross sector and for domestic trade.

The semantic model may be used by organizations in the private and the public sector for public procurement invoicing. It may also be used for invoicing between private sector enterprises. It has not been specifically designed for invoicing consumers.

Key fact

The core invoice model 's functionalities include invoice issuance and delivery, validation, accounting, VAT reporting, payment and auditing.

The core invoice model is based on the proposition that a quite limited, but sufficient set of information elements which can be defined and support generally applicable invoice-related functionalities. These functionalities include invoice issuance and delivery, invoice validation, accounting, VAT reporting, payment and auditing.

The set of information elements that are contained in the core invoice model consists of two parts, a legal part and a common part:

- the legal part of the core invoice model supports the observance of both tax and commercial legal and regulatory requirements pertaining to electronic invoicing commonly in force throughout the EU;
- the common part contains commonly used and accepted information elements that are not sector or country specific.

For the legal part, the selection has been made regarding the information elements required on a mandatory basis by EU Directives and individual state law, whether local VAT regulations, or any other local legal provision.

The information elements included in the common part represent a justifiable selection of requirements in use in commercial practice. An important criterion for inclusion is that the buyer's information system can process such an element.

The core invoice model defines a set of business terms that are used to identify an individual information element, or group of information elements, contained in the semantic model, and that may be exchanged in an invoice. The semantic data model has a wide variety of both '**mandatory**' and '**optional**' information elements.

How to use and extend the core invoice model

The core invoice model is intended to be used for all generally applicable invoicing processes. In most situations, business partners would use the core invoice model exclusively and the invoices they send or receive would contain only structured information elements defined in the model.

There are however circumstances where the trading partners may wish to:

1. Mandate optional elements to be used in an e-invoice, by restricting the use of information elements present in the core invoice model; or
2. Provide additional information elements that are not part of the core invoice model.

The first requirement is satisfied using a **Core Invoice Usage Specification (CIUS)**. The second requirement is satisfied using an extension specified in an **Extension Specification**.

A CIUS is a set of usage guidelines (or restrictions) for the core invoice model that will facilitate the creation of an invoice that is compliant with the core invoice model. A CIUS may be used to specify ways in which the core semantic model is to be applied (for example, use of payment methods, credit notes/negative invoices, code lists and identifiers). If an optional element is made mandatory, it must be defined in a CIUS.

Alternatively, extensions based on the CEN/TC 434 Extension Methodology [TR 16931-5] can be developed to add information elements not included in the core invoice model. Any such extension shall not infringe or contradict the semantic definitions in the core invoice model, nor the legal provisions of the Directive.

The development of sector specific or cross-sector extensions should be based on justified business requirements. The semantic model of these additional information elements will need to be defined and registered as an extension with the appropriate organization. Whilst always optional, the use of an Extension may be subject to contractual conditions between the parties.

In some sectors or situations where there are specific additional information requirements, the required information may be conveyed in the form of unstructured text. Unstructured text has the drawback in that it cannot be processed automatically and therefore requires human intervention.

All these tools should ensure that the use of the EN can be flexibly applied to the needs of buyers and sellers.

The semantic data model of the core elements of an electronic invoice and credit note

The information elements, and groups of information elements, that constitutes the semantic data model of the core elements of an e-invoice, as well as their relationship and the business rules required to ensure the integrity and consistency in the data provided in a conformant instance document (an individual invoice) are described in Clause 6 of the European Norm (16931-1) "*Electronic invoicing - Part 1: Semantic data model of the core elements of an electronic invoice*".

An overview of the **groups of information elements** contained in the semantic model is provided in the figure below. Each of these groups and their detailed content are explained in the EN 16931-1.

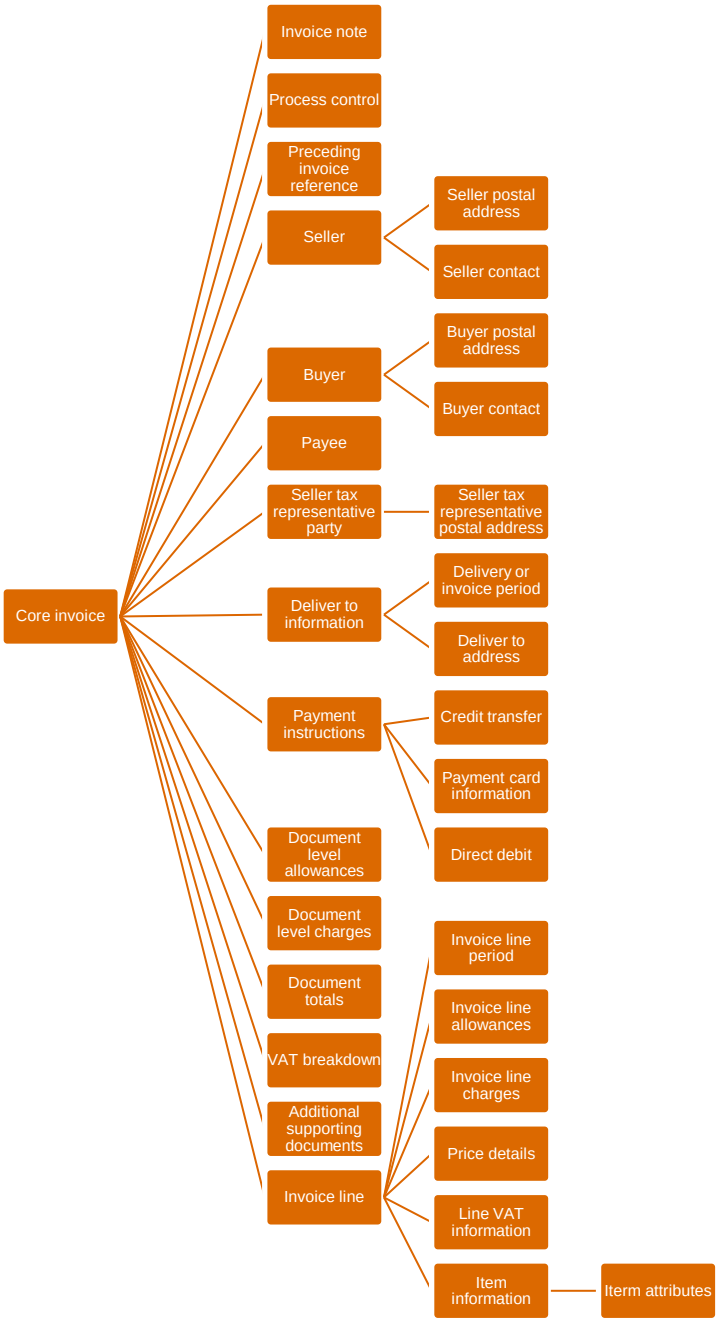

Figure 3: Overview of the semantic model

List of syntaxes

The purpose of the core semantic invoice model is to facilitate computer applications to generate e-invoices and for other applications to receive and process those invoices automatically, without the need for prior bilateral agreement on the content, or elements of the invoice.

However, in order to exchange electronic invoices, the model elements need to be represented in a syntax (or format), allowing the computer systems to identify the content.

The CEN/TC 434 identified a short list of syntaxes based on those mentioned in the Standardization Request: UN/CEFACT XML, UN/EDIFACT, OASIS UBL, and Financial Invoice (based on ISO 20022).

The Standardization Request provides a set of criteria that establishes the basis for the assessment of the syntaxes.

Based on the assessment carried out by CEN/TC 434, the list of **mandatory syntaxes** which comply with the EN on e-invoicing include:

- UN/CEFACT Cross Industry Invoice XML message as specified in XML Schemas 16B (SCRDM - CII)

- UBL invoice and credit note messages as defined in ISO/IEC 19845:2015

Electronic invoices compliant to the EN on e-invoicing and represented in either of the two syntaxes mentioned above must be received and processed by contracting authorities and contracting entities in the EU.

The capabilities of authorities, particularly small local authorities, to comply with the requirements of Directive 2014/55/EU, was a key concern in the selection of the syntaxes included in the list.

It is expected that the list above will lead to simplification and facilitate the practical application of electronic invoicing in procurement.

The list of syntaxes selected by CEN/TC 434 and the related assessment is included in the CEN Deliverable "*Electronic invoicing – Part 2: List of syntaxes that comply with EN 16931-1*" – [CEN/TS 16931-2].

CEN Testing of the EN

This Chapter describes the technical test carried out by CEN/TC 434 during the drawing of the European e-invoicing standard and the results of the related activities.

Results of CEN Testing Activities

The Standardisation Request requires the standard to be tested as to its practical application for an end user and that during the performance of the test, special account should be taken of the respect for the criteria of practicality, user-friendliness and possible implementation costs. An end-user is a person who ultimately uses or is intended to ultimately use a product.

The CEN TC/434 Working Group 6 (WG6) on Test Methodology and Test Results was tasked with testing the EN as to its fitness for purpose. WG6 produced a technical report to document the testing requirements, methodology and results: "*Result of the test of EN 16931-1 with respect of its practical application for an end user"* (TR 16931-6).

CEN/TC 434 WG6 decided that testing the EN meant to check if it fulfilled the specific requirements as set out in the Standardisation Request.

Key fact

The standard was tested by CEN/TC 434 as to its fitness for purpose, focusing on the technical tests at a semantic and syntax level.

Scope

The Technical Report describes the testing of the EN at a semantic and syntax level. It also includes the methodology and testing of the validation artefacts. These represent mandatory elements and rules of the EN 16931 in an open source code and ensure that conformance of an invoice with the EN can be checked automatically.

The report includes three main sections. The first one concerns the semantic testing where an overview of the methodology, the testing and the results are described. Similarly, the second section covers the syntax methodology, testing and results. The final section has two sub-chapters describing the tests performed to ensure the EN is suitable for payments and automatic processing respectively.

Out of scope

It was agreed at earlier meetings that piloting was out of scope i.e. perform live transactions, because resources were unavailable to undertake this in the time allowed. Instead scenarios were simulated by leveraging on the experience of the experts involved.

Working Group 6 requested specific legal expertise to assess VAT compliance. The Commission had taken this up and shared the draft EN with their VAT experts. The result was that no issues were discovered. Due to limited resources the simplified invoice requirements were not checked and are being considered as an extension to be developed at a future stage.

Testing against ISO 20022 Financial Invoice was deemed out of scope. Instead the mapping between the core invoice model and ISO 20022 SEPA payment files has been analysed.

Semantic Testing

Test Methodology

The methodology consists in validating the semantic data model against the specific requirements of the Standardisation Request, with a special focus on the criteria of practicality and user-friendliness, as explicitly stated in Directive 2014/55/EU.

The testing of the semantic data model included checks against **real invoices** that are in current use. The invoice instances were initially checked to verify they did not contain any sectoral specific information.

All specific requirements have been assessed against the core invoice data model to ensure the model is fit for purpose semantically. This process was completed during various meetings. The notes from these meetings were gathered, analyzed and used as input for the Technical Report 16931-6.

Working Group 6 gathered feedback as to the use and content of the EN from standards organizations and a limited number of implementers such as GS1, service providers, ERP vendors, public bodies, other end users, and the Commission regarding VAT rules.

It was agreed with the Commission and approved by CEN to provide an extract of the EN to the EU Multi-stakeholder Forum on e-Invoicing (EMSFeI). This resulted in ten experts from public bodies volunteering to provide feedback that was incorporated in the Technical Report. It was furthermore agreed to investigate how the invoice could map to a SEPA-based payment process, and this is documented further in the section 'Payment'.

WG6 held regular meetings from August 2015 through to March 2017. The focus was to test the data model and provide feedback to the Working Group developing the model. Several experts were invited to attend the meeting and representatives of the European Commission who would discuss progress and facilitate the developments.

Assessment of compliance with specific requirements

WG6 has done assessments on each of the specific requirements to ensure they are met as a means to demonstrate that EN 16931 and its related specification is fit for purpose. The results of assessment of the EN against the specific requirements are summarized in the table below:

Id	Standardisation Request Specific Requirement	WG6 Assessments
1.1a	Technologically neutral	The EN is a semantic model documented in human readable form. As such, it is technically neutral. The EN states that the model must be expressible in UBL and CII syntaxes, which are based on open standards. The EN defines mappings to these syntaxes in a technologically neutral way. The business rules are documented in a technologically neutral way. Several tool vendors have participated in WG6. The vendors use a range of different technologies, and have established that they can each work with the EN.
1.1b	Commercially neutral	No particular accounting system or commercial tool is required to be able to work with the EN.
1.2	Compatible with relevant international standards on e-invoicing	WG4 worked on selection of the List of Syntaxes. This process included a ballot by CEN Members and the result was a 100% positive vote.

1.3	Have regard to the need for personal data protection in accordance with Directive 95/46/EC, to a 'data protection by design' approach and to the principles of proportionality, data minimisation and purpose limitation	The Commission provided the draft EN to data protection experts for review. No issues were discovered.
1.4	Compatible with Directive 2006/112/EC, and suitable for use with non-VAT invoices	The Commission provided the draft EN to VAT experts for review. No issues were discovered. In addition, WG6 tested invoice instances based on real invoices which included simple VAT elements. No problems were encountered.
1.5	Allow the establishment of practical, user-friendly, flexible and cost-efficient electronic invoicing systems	The definition of a semantic model is of major value for this requirement. The model must be expressible in the UBL and CII formats, two very common syntaxes. It is noted that in order to ensure that the EN continues to be practical and user-friendly, it is important to align with new technologies and syntaxes as they gain widespread adoption in the market. WG6 tested invoice instances based on real invoices, and reviewed visualisations of the invoices. The EN was deemed to be effective. Easy availability of information on the EN is important to satisfy this requirement.
1.6	Take into account the special needs of small and medium-sized enterprises as well as of sub-central contracting authorities and contracting entities	SMEs need cost effective, easy-to-use e-invoicing solutions, and so the EN must be simple and easy to use. This is already assessed under 1.5 above. SMEs, sub-central contracting authorities and contracting entities are likely to adopt automated processing, perhaps using shared services. The EN is deemed to work effectively for these scenarios.
1.7	Not require, and not impede, the use of electronic signatures or seals	The electronic signature process is not part of the EN. Nothing in the EN requires or impedes the use of electronic signatures or seals.
1.8	Contain an informative annex which provides a clear, transparent and precise indication of the relationship between the elements of the EN and the corresponding EU legal requirements	EN 16931-1 has included this as Annex B - Assessment of the compliance of the European Standard with the requirements of the Standardization Request of the European Commission.

	specified in this standardisation request	
1.9	Preserve investments already made at national level	National priorities have been accommodated by: • basing the EN on previous work, primarily by MUG and BII; • involving CEN members. CEN has members in every state and each member can be involved, and vote. • liaising with the European Multi-Stakeholder Forum on e-Invoicing (EMSFeI). In addition, CEF Telecom has funded national implementations that align with national practices, for example in Italy.
1.10	Include the physical and financial supply chain perspective, i.e. not treat the invoice in isolation but consider related trade and finance documents and processes, and reflect both private and public sector requirements, with a view to allowing the full straight-through processing (STP) of an electronic invoice	This requirement is met by the EN containing a sufficient range of references to stages and datasets upstream and downstream of the invoice in the physical and financial supply chain. WG6 has also done assessments as to payments and automatic processing. The EN is deemed to support this requirement.
1.11	Suitable for voluntary use in commercial transactions between enterprises and have the capacity to reflect specific needs and requirements of the business-to-business (B2B) ecosystem	WG6 has tested using real world examples which largely came from the B2B ecosystem (e.g. GS1). B2B liaison groups such as GS1 and Odette (automotive industry) have been involved in the standardisation effort. Invoicing processes for B2B and B2G are the same, and are generally supported by the same vendors.
1.12	Re-usable in other standardisation initiatives	TC 434 is working closely with TC 440 [12] so that messages are in alignment. In future activities TC 434 will start to use the architecture being developed by TC 440.
1.13	The EN should contain, inter alia, the elements mentioned in Article 6 of the Directive 2014/55/EU.	WG6 has reviewed this, and all elements are found in the semantic model in EN 16931-1.

Legal requirements were assessed by CEN/TC 434 and the result of this assessment can be found in Annex C of EN 16931 - *How the semantic model meets*

legal requirements from relevant directives. WG6 has reviewed this annex and concluded that no further testing was needed to assess these requirements.

Semantic testing of real instances

Various organisations and individuals with expertise in e-invoicing provided examples of real invoices that were used to simulate the creation of invoice instances based on the semantic data model. Working Group 6 and other external liaison groups checked whether existing invoice systems could handle an invoice based on the EN.
WG6 also reviewed the EN, specifically usage notes and definitions. The results of this exercise resulted in an updated document that would be easier to understand and simpler to use.

Findings and recommendations

The basic concepts of the data model were also discussed. This included the concept of an invoice only referencing one Order and one Delivery. In addition, it was discovered that an invoice instance conformant to EN 16931 and represented in one of the syntaxes may not be interoperable with SEPA because of limitations in the character sets that can be used within SEPA payments files.

Discussions were held with the European Central Bank (ECB) EMSFeI Liaison, and usage notes were added to EN 16931 outlining how to maintain interoperability with SEPA.

Conclusion of semantic testing

The purpose of the semantic testing was to make sure that each element had a justified core requirement. Any issues discovered were fed back to the appropriate workgroups. Many of the comments were either sent directly to Working Group 1 responsible for developing EN 16931, or Working Group 3 responsible for the syntax. Most of the issues were editorial or suggestions to provide better text in the definitions or usage scenarios.

Key fact

The semantic testing concluded that the EN meets the preset requirements.

Based on the assessments, it is concluded that the EN meets the requirements of the Standardisation Request in relation to the semantic data model.

Syntax Testing

In accordance with the Directive and the standardisation request of the European Commission, CEN/TC 434 selected a limited number of syntaxes to implement the core invoice model.

The CEN/TS 16931-2:2017 *Electronic invoicing - List of syntaxes that comply with EN 16931* lists the following **mandatory syntaxes**:

- UN/CEFACT Cross Industry Invoice XML message, as specified in XML Schemas 16B (SCRDM - CII)
- UBL invoice and credit note messages, as defined in ISO/IEC 19845:2015

In addition, it was decided to also perform syntax testing for UN/EDIFACT INVOIC message directory version D.16B.

The group concluded, based on their research that the ISO 20022 Financial Invoice was not in sufficient use to justify being included.

WG6 decided to test the major events in the “lifecycle” of an invoice:

- Creation

- Validation
- Transmission
- Visualisation

The tests executed and the results for each of these steps are described below.

Test Methodology

The methodology for testing each of these syntaxes is to use the validation artefacts as developed by Working Group 3 (WG3) and ensure that they are representative of the semantics of the core model. They can therefore be used to automatically check for conformance with the core model.

The validation artefacts were uploaded to the test system provided by the Commission (GITB Test Bed). The test scenarios included creating instances that use EN 16931 in specific test cases and checking that the validation artefacts correctly allow valid instances, while rejecting invalid ones.

Various existing validation systems were used as part of the testing process. These included freely available conformance test systems, as well as commercial systems.

As one of the syntaxes was not XML based, a solution had to be agreed in order to process an EDIFACT invoice as XML. EDIFACT has an ISO equivalent (ISO/TS 20625:2002) that was used for that purpose. The Workgroup created a Java application that transformed EDIFACT to its ISO XML equivalent. The validation artefact would then be used to check for conformance, in a similar way to the others.

The CEN/TC 434 Working Group 3 developed the validation artefacts for testing the syntaxes. These artefacts are essentially open source code that checks that specific invoice instances contain the **mandatory elements** of the EN. As these artefacts were seen as critical to ease the implementation of the EN, most of the work of the syntax testing was to ensure that the validation artefacts worked and were without bugs.

Creation

Generating invoice instances

Invoice instances were generated based on three concepts:

- Error-free instance
- Forcing syntax errors
- Forcing content errors

Sources of invoice instances

The source of the invoice instances came from the following:

1. Instances as provided by CEN/TC 434 WG3
2. Some “real-world” anonymised examples e.g. from the Norwegian market, Automotive Industry and Retail.
3. The above instances being manually manipulated provoking errors.

Validation

Test Tools used

Different testing tools were used to eliminate inconsistencies which might be dependent from a specific tool or test system. For testing the xml instances the GITB document validator[1] and Difi's VEFA validator[2] among others were used. The following software tools were used: offline JAVA validator; and GEFEG.FX software.

Test results

Key fact

Test scenarios for the selected syntaxes could run through the validation engines and delivered the expected results.

Test scenarios for invoice instances based on the selected syntaxes (UBL, UN/CEFACT CII and EDIFACT) were created and run through iteratively until:

1. All files could run through the validation engines
2. All methods delivered the expected results

Transmission

The testing scenarios involved testing using various transmission protocols including email, AS2 (PEPPOL Specification [13]) and OFTP2 (Odette).

WG6 concluded that the invoice instances could be used by most common protocols. This was expected as most protocols are agnostic to the message type exchanged (e.g. invoice).

Visualisation

WG6 tested the invoice instances using the following representation or visualization methods:

- Simple readers and viewers, such as a web browser
- Text editors with interpretation of the syntax
- Complex editors with additional visualization options and transformation options.

The group found that, when necessary, they could transform simple instances using the XSLT standard. XSLT (eXtensible Stylesheet Language Transformation) allows the transformation of XML instances into other XML documents, or other formats such as HTML or PDF. This was particularly useful for html or pdf output, which could then be printed as a paper version.

Payment

Requirements

The core requirements used relating to payments are the following:

- the invoice should identify the means of payment;
- the invoice should identify the payment amount;
- the invoice should include necessary details to support payments and invoice to payment reconciliation.

In addition, Directive 2014/55/EU states that: "The European standard on electronic invoicing should also be compatible with the existing standards for payments to allow for the automatic processing of payments."

A range of payment methods can be used including cash, check, credit transfers, direct debits, account transfer over the books of the same payment service provider, and card payments.

The focus of the testing was on the following payment types:

- SEPA Credit Transfer for Euro payments;

[1] http://13.80.11.48/cenws8/standalone/validator.jar
[2] https://test-vefa.difi.no/validator

- SEPA Direct Debits for Euro payments;
- Card payments.

Test Methodology

The methodology applied is as follows:

- Analyse the core invoice semantic model to ensure that it covers the payments-related areas that are in scope;
- Analyse the core invoice semantic model to ensure that it is aligned with the CEN BII Workshop Agreement, Guideline on Payment Initiation and Reconciliation;
- Analyse example instances of the semantic model, and show how the payments information can be mapped to SEPA payments files; moreover, evaluate whether traceability between the invoice, the payment initiation files, and the payment notification and account statements is clear, and automated reconciliation feasible.

National payment practices for non-Euro currencies were also checked, as well as non-SEPA international credit transfer.

Test Execution

Specific testing scenarios were created to test instances in regard to payment processing. Detailed comments for each payment-related area that has been assessed are provided in section 9.4 of the Technical Report (TR 16931-6:2017).

Test Results

Semantic Model

The core invoice semantic model covers the payments-related areas that are in scope and is aligned with the CEN Workshop Agreement, Guideline on Payment Initiation and Reconciliation. Based on example invoice instances of the core invoice semantic model, it was possible to construct SEPA payments files.

The core invoice model does allow for the identification of account identifiers for national payment. However, it is suggested that national representatives should check alignment with national payments for non-Euro currencies.

Traceability and Automated Reconciliation

Remittance information in the invoice can be included in SEPA payment initiation messages and in payment status, payment notification and account status messages. This information can be used for automated invoice to payment reconciliation. A usage note is included in EN 16931-1 for the remittance information field outlining how to ensure interoperability between the core invoice and SEPA payments and account files.

The UTF-8 character encoding is mandated for the ISO 20022 messages that are used in SEPA payments. If a different character encoding is used for the invoice, there is a potential for characters in the remittance information to be mapped incorrectly on different systems. EN 16931-1 does not define the character encoding to be used in the invoice syntaxes. This will be defined in the syntax representation of the invoice. The test team recommend that the UTF-8 character encoding be mandated for all supported syntaxes.

Traceability for SEPA Direct Debits

For SEPA direct debits, the main traceability is via the seller name, remittance information and the unique mandate reference. If the mandate is taken over by a new seller, then traceability is compromised since the seller name and unique mandate reference can change. It is assumed that traceability from the old

mandate to the new mandate, and old seller to new seller is not in scope for the core invoice model.

Automated Processing

Requirements

The Standardization Request states that EN 16931 should support for automatic processes:

"include the physical and financial supply chain perspective, i.e. not treat the invoice in isolation but consider related trade and finance documents and processes (e.g. reconciliation, supply chain finance, credit notes, etc.), and reflect both private and public sector requirements, with a view to allowing the full straight-through processing (STP) of an electronic invoice; "

Straight-through processing (STP) enables the entire trade process to be conducted electronically without the need for re-keying or manual intervention.

Test Execution

To ensure all the requirements are covered by the semantic model, a review was performed to compare the requirements listed in the semantic model with those listed in the section on invoicing functionalities supported by the EN (16931-1).

The core invoice model shall support the following functions: Accounting; Invoice verification against the contract, the purchase order and the goods and service delivered; VAT reporting; Auditing; Payment.

The following functions were considered out of scope: Inventory management; Delivery processes; Customs clearance; Marketing; Reporting.

Test Results

Some requirements were not listed in the semantic data model explicitly for invoice verification and for VAT reporting. This issue was raised to WG1 to take into account for corrections in the EN 16931-1 before its publication.
WG6 has through its assessment not found any additional requirements needed for the functions defined for automated processing of an EN conformant invoice.

Conclusions of the CEN Testing Activities

Key fact

No major issues were identified during the testing process of the EN for e-Invoicing by CEN/TC 434.

No major issues were raised during the testing process. This was probably because Working Group 3 had already undertaken its own quality assurance testing. Also, testing ran alongside EN 16931 development so that issues could be raised in parallel without building to significant numbers.

The process did improve the EN 16931 since the resulting updated definitions and usage notes will help implementers and end users to understand it more easily. The Working Group 6 discovered some issues between e-invoicing and SEPA payments and this has been referred to ISO.

A key result of the testing process was the testing of validation artefacts and their use in the Commission hosted Global e-Business Interoperability Test Bed (GITB) system [14] developed under EU support and guidance. This Test system can now be used for syntax testing and could be made available to further assist implementers. However, currently the validation artefacts only check for compliance with the mandatory elements of the core semantic data model.

Therefore it will be necessary for organisations that create extensions and CIUS to develop their own validation artefacts to check the additional mandatory elements. For instance, it is expected that OpenPEPPOL would develop their own CIUS and include validation artefacts.

The testing methodologies were developed so that they are agile and could adapt to changing resources and timelines. The overall testing process was geared so that various aspects of the testing would be independent and could run in parallel. For instance, semantic and syntax testing was separated.

Syntax testing was primarily focused on ensuring the validation artefacts were suitable for checking conformance, while facilitating the updates required as bugs are discovered or more efficient algorithms are developed. This was also based on lessons learned from the CEN WS/BII project. The availability of validation artefacts is key to facilitate the practical use of the EN for implementers.

Impact Assessment

This Chapter presents an overview of the collected information for each of the countries and stakeholders analysed. As previously explained, the selected countries are covering various e-invoicing implementation scenarios. The content complements the technical testing activities carried out by CEN/TC 434, by focusing on the implementation of the EN and its impact on the end-users. In particular, assessing whether the EN is fit for purpose, it is easy to implement and cost-efficient for end-users.

Country Profiles

This section details the status towards implementation of the EN and the position with regard to the EN from a representative subset of countries.

Italy

National Context

Italy mandated the use of electronic invoicing to the public sector since March 31st, 2015, for all levels of public administrations (Legislative Decree n. 66/2014).

The Ministry of Economy and Finance (MEF) is the main governance body for e-invoicing and is responsible for preparing regulations and norms. The Revenue Agency (AgE) is responsible for the operations of the centralised e-invoicing Interchange System (SDI), while Sogei provides the technical support to manage the SDI. The General Accounting Department monitors public spending.

The Revenue Agency maintains and updates the technical specifications in cooperation with the Agency for Digital Italy (AgID) and the competent entities within MEF. AgID coordinates the activities with all public administrations and institutional stakeholders and operates the public administration registry (IPA).

A national XML format, FatturaPA, has been mandated, for e-invoicing in the B2G context to all level of public administrations. The national format could also be used for B2B e-invoices, as an option.

Electronic invoices must be signed electronically using a qualified electronic signature before being sent to the SDI. Technical specifications for format and transmission have been published. Since January 2017, the process also supports the exchange of e-invoices in the B2B context.

An overview of the existing **centralised** national e-invoicing system and its actors is presented below:

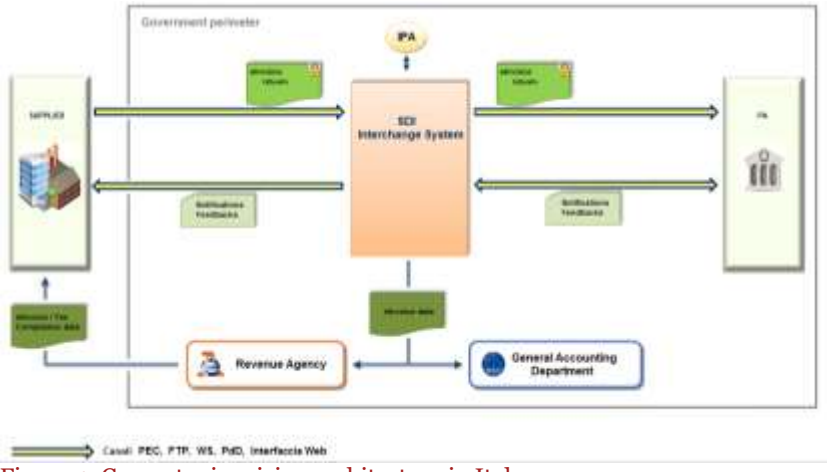

Figure 4: Current e-invoicing architecture in Italy

e-Invoicing Maturity

The following figure represents the electronic invoices exchanged by the national system, SDI, on a yearly basis:

Period	Invoices received	Invoices sent	Invoices rejected	Rejection rate
2014	1,930,213	1,577,676	352,537	18.26%
2015	23,450,832	21,593,221	1,857,611	7.92%
2016	30,126,006	28,310,992	1,815,014	6.02%
Jan to April 2017	7,421,380	7,069,328	352,052	4.74%
Total number of invoices managed	62,928,431	58,551,217	4,377,214	6.96%

Key fact

Italy considers the EN for e-Invoicing to be fit for purpose and to cover most of the national business requirements.

Implementation of the EN

Italy considers the EN for e-invoicing to be fit for purpose and to cover most of the national business requirements. Through its national technical committee within the national standardization body, Italy participated in the activities of CEN/TC 434 contributing to the development of the EN.

Italy will develop Core Invoice Usage Specifications (CIUS) at a national level and related technical rules for use of the EN in a domestic context.

Italy will maintain the national e-invoicing format and support the EN. During the current initial phase, which started in January 2017, the national e-invoicing system (SDI) will be upgraded to handle e-invoices based on UBL and UN/CEFACT, while supporting the national format.

In the long term, likely within 5 years, the objective is to migrate to a single global standard, UBL, still supporting the other mandatory syntax with translations, and phasing out the national format.

In the short run, the objectives are to:

1. Preserve the investments made in the national e-invoicing infrastructure; and
2. Reduce the impact to the lowest possible for contracting authorities and suppliers, by upgrading the central SDI system, without requiring the end users to upgrade their systems.

In the longer run, the objectives are to:

1. Ensure a smooth transition through coordinated national support activities; and
2. Facilitate the correct implementation of the national Technical Rules for Interoperability between e-Procurement platforms (Circolare 3 AgID) and the automation of the end-to-end procurement process, based on PEPPOL or, where a PEPPOL specification is not available, by implementing a CEN BII profile using the OASIS UBL 2.1 syntax.

Electronic invoices in the B2G context will continue to be exchanged through the SDI system that will be upgraded in order to:

- Handle electronic invoices conformant to the EN in both mandatory syntaxes: UBL 2.1 and UN/CEFACT CII, through a centralised translation engine; and
- Manage the communications between the parties involved in the transmission with the introduction of a new channel, the PEPPOL infrastructure and its network of Access Points.

An overview of the future national e-invoicing architecture is shown below:

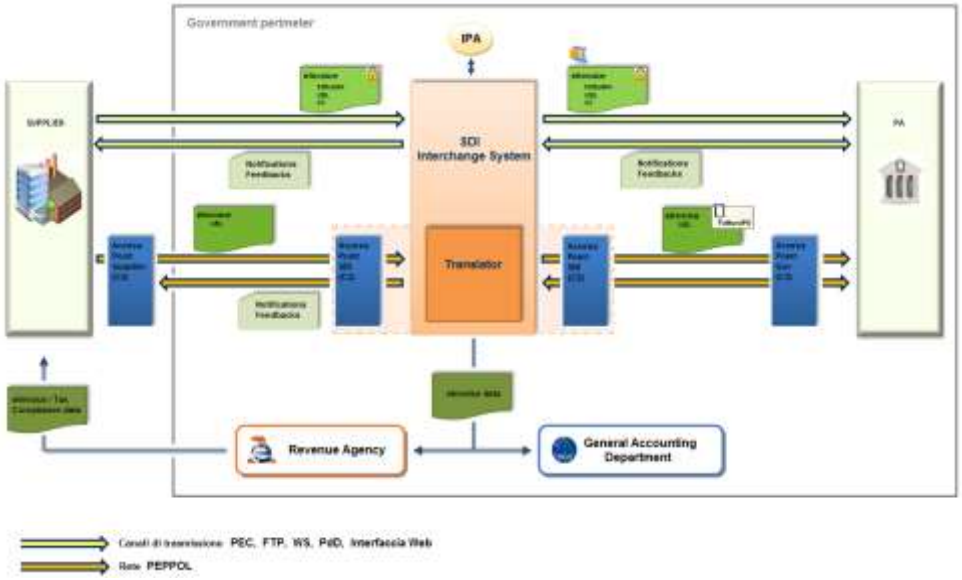

Figure 5: Future e-invoicing architecture in Italy

In the first implementation phase the main costs will cover the upgrade of the SDI system and the development of a centralised national translation engine. Contracting authorities and suppliers will not be obliged to upgrade their systems.

These costs will be covered through the eIGOR project that was awarded funding under the 2015 CEF Telecom e-Invoicing Call. The total cost for the national eIGOR project is of 1.252,500 euro.

After this initial phase, additional investments will be required to ensure that the service will be able to cater for high volumes of transactions, before the Directive 2014/55/EU will be transposed into national law.

In particular, the main cost factors will be for hardware and software to further upgrade the SDI system, the development of a PEPPOL Access Point, provision of technical support, evolution of the Business Intelligence system and updates to the technical specifications.

Impact of the EN

The implementation of the EN is considered to be cost-efficient for handling of national and cross-border transactions. Italy will preserve the investments made for e-invoicing in the B2G by upgrading centralised national infrastructure, without any impact on contracting authorities and their suppliers.

No costs are foreseen to implement the EN for SMEs and small contracting authorities. They are free to decide whether to invest in new solutions. Their decision will also depend on the availability of e-invoicing solutions conformant to the EN and their related cost.

In general, e-invoicing has already provided benefits to the Italian economy, such as a significant reduction of Days Sales Outstanding, thus improving cash flows for companies (Source: Farmindustria, 2017).

Norway

National Context

All central government entities are under the obligation to require and process invoices electronically with their suppliers. There are no similar requirements for regional or local authorities, but if they engage in electronic invoicing, they have to use specific formats. The Reference Catalogue for IT standard in the public sector requires all public sector entities to be capable to receive e-invoices in certain formats.

The EHF and PEPPOL BIS standard are mandated for central, regional and local contracting authorities and entities. UBL is the technical format (syntax) that is widely used by trading parties in Norway. EHF - Electronic trade format – is a national format based on PEPPOL BIS (and UBL) that is used in public procurement. The only difference is that two information fields are optional in PEPPOL BIS but mandatory in EHF.

The Ministry of Government Administration and Modernisation is the formal legislative power for e-invoicing. The transposition process of the Directive 2014/55/EU has been held back until the publication of the EN, but Norway might decide to mandate the use of the EN for e-invoicing in B2G, B2B and B2C.

To implement its policies and decisions, the Ministry of Government Administration and Modernisation is assisted by Difi, the Agency for Public Management and eGovernment. Difi supports standardisation and interoperability.

The e-invoicing architecture in Norway is **decentralised** but for certain areas of the government there are sector specific centralised solutions in place. The 4-Corner model (4-party exchange model) is the most used operating model by trading parties for e-invoicing in public procurement.

Norway also used a hybrid approach where a group of contracting authorities (for example with common functional characteristics such as a regional hospital group) or a collection of smaller or regionally-based municipal authorities, or a number of central government departments, may choose to join forces and establish a shared reception point for e-invoices.

Figure 6: The Four Corner Model

The reception channel for e-invoices from suppliers is operated by the Norwegian Government Agency for Financial Management [15]. They receive invoices on behalf of nearly 200 central government entities on a dedicated platform.

Norway carried out activities for use of e-invoicing in the public sector since 2009, involving contracting authorities, economic operators and ICT service/software providers.

e-Invoicing Maturity

All public sector entities, except five municipalities (out of 426), are registered with capability to receive EHF and PEPPOL BIS invoices in the Norwegian centralised PEPPOL Service Metadata Publisher, ELMA. In addition, more than 75.000 private sector entities are registered with the same type of receipt capability in ELMA [16].

More than 40 million invoices have been sent over the Norwegian part of the PEPPOL eDelivery Network the last 12 months. It is estimated that 70-75% of all invoices in the public sector are EHF invoices (no exact figures for all municipalities are available).

Implementation of the EN

Norway will adopt the new PEPPOL BIS specifications for invoicing and credit notes but in parallel it will develop CIUS for the PEPPOL community and implement a new version of EHF.

In particular, Difi will roll out the PEPPOL BIS v3 that will be linked to UBL. A centralised translation service will probably be established for the CII syntax, together with a new legal requirement for contracting authorities to receive and process an invoice in this format for contracts above the EU threshold. Only minimum investments will be made for the support of CII.

Difi will prepare the EHF 3.0 with all its documentation and validation artefacts and already initiated that change process. Difi's objective is to provide all public sector entities and the whole Norwegian market with EN enabled invoice format. This will not be a cost for the contracting authorities and it will be a minimal cost for the service providers, as it will fit within the normal upgrade process.

Difi has already sent out the first notice about the EN enabled EHF v3 entering into force in October 2018 according to already established change management procedures. In parallel, Difi will start the BIS and EHF project in June 2017 based on the CEN deliverables. It will be ready in April 2018.

Moreover, Difi coordinates a CEF e-invoicing project funded by INEA [17] (CEF-Telecom Call-2016-3) which supports the implementation of the EN in existing e-invoicing solutions and the uptake of EN enabled solutions by more than 300 local and regional authorities and some 25.000 private sector entities. This project enables Difi to upgrade the current mandatory national e-invoicing format EHF 2.0 to an EN compliant version 3.0, and support additional service providers not part of the project in making their existing solutions EN compliant.

Impact of the EN

There are more than 60 different products/services that are EHF enabled and will therefore be EN enabled in the future. All types of functionalities and value-added services are available on the market and a healthy competition is driving prices down, making the simpler services/solutions very affordable for SMEs and local authorities.

Difi considers the role of ERP and accounting software vendors to be crucial and has already requested this community to support the EN. Prices range from €0 to tens of thousands of euros as part of an integrated system. In the latter case, it is difficult to see what part of that price is exactly related to e-invoicing.

Online banking functionalities are supported by all the ERP systems/financial systems used in the public sector so that the payment process is automated. The biggest bank group in Norway implemented support in their online banking system, which made it possible for SMEs to have access to it without any additional cost.

Key fact

Because e-invoicing is already widely used in Norway, implementing the EN will only be a matter of update.

Therefore Difi does not foresee any changes in the pricing levels or any costs for parties involved as a consequence of the EN. This is because e-invoicing is already used and implementing the EN is only a matter of upgrade.

France

National Context

The e-invoicing Directive has already been largely transposed by the Electronic Invoicing Development Executive Order no. 2014-697 of June 2014 which applies to 95% of the public administrations, including national, regional and local administrations. This legislation will need to be amended to include also some other types of public bodies, such as ‘groupements publics’.

The Ministry of Finance is responsible for the transposition of the Directive and the technical application. The electronic invoicing program aims to mandate the submission and receipt of electronic invoices for the public sector and its suppliers. This program falls within the ambit of the French Economy Modernization Law (LME) of 4 August 2008, the Inter-ministerial Committee for Modernization of Publix Action of 17 July 2013 and the Business Simplification and Security Enabling Act of 3 January 2014.

The Electronic Invoicing Development Executive Order no. 2014-697 of June 2014 goes beyond the requirements of Directive 2014/55/EU by making e-invoicing mandatory for suppliers in the B2G. However, it considers PDF invoices as a form of electronic invoices.

The Executive Order entered into force on the 1st of January 2017 for large companies and public suppliers, and it will gradually extend to other companies until 1st January 2020, as follows: large companies and public entities by the 1st of January 2017, intermediate-sized companies by the 1st of January 2018, small and medium-sized enterprises by the 1st of January 2019, micro-enterprises by the 1st of January 2020.

The AIFE (Agence pour l'Informatique Financière de l'Etat), which is part of the Ministry of Finance, is providing the **centralised** e-invoicing platform, Chorus Pro, to all public entities. The use of Chorus Pro is mandatory.

e-Invoicing Maturity

There are a total of 100 million B2G invoices per year of which currently 10% are sent electronically. It is expected that by 2020 100% of the invoices will be sent electronically as e-invoicing becomes mandatory for all suppliers.

Implementation of the EN

UN/CEFACT CII and UBL are already supported by Chorus Pro and have proven to cover all business needs. The EN is thus considered to be fit for purpose.

The guiding principles for the operation of Chorus Pro revolve around: the implementation of a shared solution for all of the suppliers (both private and public) of the public sphere; the implementation of a 'pivot' feed allowing the direct integration of billing data in the information system of the public recipients and enabling data collection for processing; and the availability of the features of Chorus Pro through APIs.

Chorus Pro supports all suppliers of the public sector to submit their invoices, to check on their current status of the invoice and the payments. There are 3 main channels for suppliers to connect: direct integration (EDI), web portal and services. Chorus Pro also accepts invoices that are coming from PEPPOL Access Points.

France is developing a Core Invoice Usage Specifications (CIUS) and implementation guidelines for the EN which will make only the following two optional fields of the core semantic model mandatory in the national CIUS:

- the code of the administration which receives the invoice (i.e. the identifier of the contracting authority); and
- a sub-code of the Purchase Order number, which is an extra code used by very large organisations like the State.

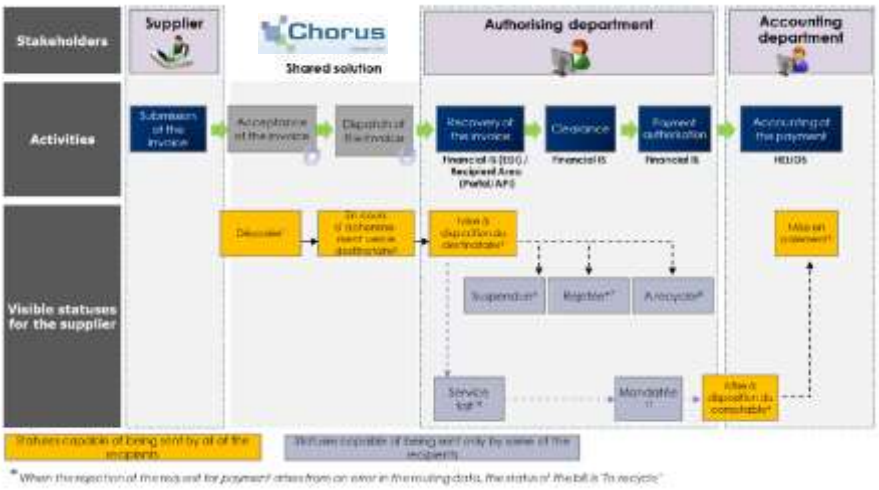

Figure 7: E-invoicing and e-payment processes

Contracting authorities are mandated to receive electronic invoices through Chorus Pro, which handles the reception and transmission. It is up to the contracting authorities to decide whether they want to process the invoice electronically or manually. In addition, the Ministry of Finance is providing a mandatory payment system, which makes the payment decision the only part of the process not automated. There are many contracting authorities (approximately 80.000) and some of them are very small, without any IT system in place.

Impact of the EN

As Chorus Pro already supports UN/CEFACT CII and UBL, the **EN will have no real technical impact**. All Chorus Pro transmission channels are offered free of charge to suppliers and public administrations. These include API, and the ChorusPRO webportal for structured and PDF invoices. By the end of 2017, it will also support a hybrid invoice, Facture X, which is developed in collaboration with Germany.

Key fact

The EN will have no impact on small public administrations in France. The EN does not disrupt SMEs either.

The development of Chorus Pro had a total cost of €18 million, and maintenance is costing between €3 and 4 million per year. However, the EN specifically will not add any cost. Furthermore, the EN will have no impact on (small) public administration as Chorus Pro is provided at no cost for administrations or suppliers. The EN does not disrupt SMEs either as they remain free to send PDF invoices to public administrations.

In order to maximise the benefits of a common standard, France leaves suppliers free to decide which electronic format and channel they will use.

Poland

National Context

The Polish Act on e-invoicing in Public Procurement, which transposes Directive 2014/55/EU into national law, will be published by mid-2018. This Act will mandate the use of the EN and its two syntaxes. PDF invoices are not considered to be electronic invoices.

The Ministry of Economic Development is the PEPPOL Authority in Poland. It is supported by the Institute of Logistics and Warehousing. A national e-invoicing forum (including representatives from the Ministry of Finance) also exists.

The Act of e-invoicing in Public Procurement will be accompanied by the roll-out of a central e-invoicing platform. Use of this future e-invoicing infrastructure will be mandatory for all level of the public administrations and for state owned companies. The solution, which will comply with European and national requirements, will make adoption smoother for contracting authorities and economic operators and will be offered free of charge.

In 2020, national authorities will assess whether to also mandate e-invoicing for suppliers of the public sector, and in a B2B context.

e-Invoicing Maturity

There is no e-invoicing infrastructure or regulation currently. Adoption of e-invoicing in the Business-to-Government context is therefore close to zero.
In a B2B context, electronic transactions account from 16% to 20% of the total, depending on the sector. e-Invoicing is very popular in the B2C context, in particular for Telecoms.

Implementation of the EN

Poland is currently developing a **centralised** e-Invoicing platform (PeF) as the national hub for receiving e-invoices for the public sector (B2G), based on the PEPPOL Interoperability Framework.

A competitive dialogue has been launched by the Ministry of Economic Development to select two e-invoicing service providers that will develop the required infrastructure, including but not limited to a PEPPOL Access Point and a Service Metadata Publisher. The contract will be awarded by September 2017.

Poland will implement the PEPPOL Invoice specifications that will be aligned to the EN. UBL 2.1 will be the preferred syntax, and UN/CEFACT CII e-invoices will be translated into UBL 2.1.

Private solution providers will also be allowed to connect to the central gateway and provide services to suppliers, while contracting authorities will be supported by the two service providers that will be awarded the contract.

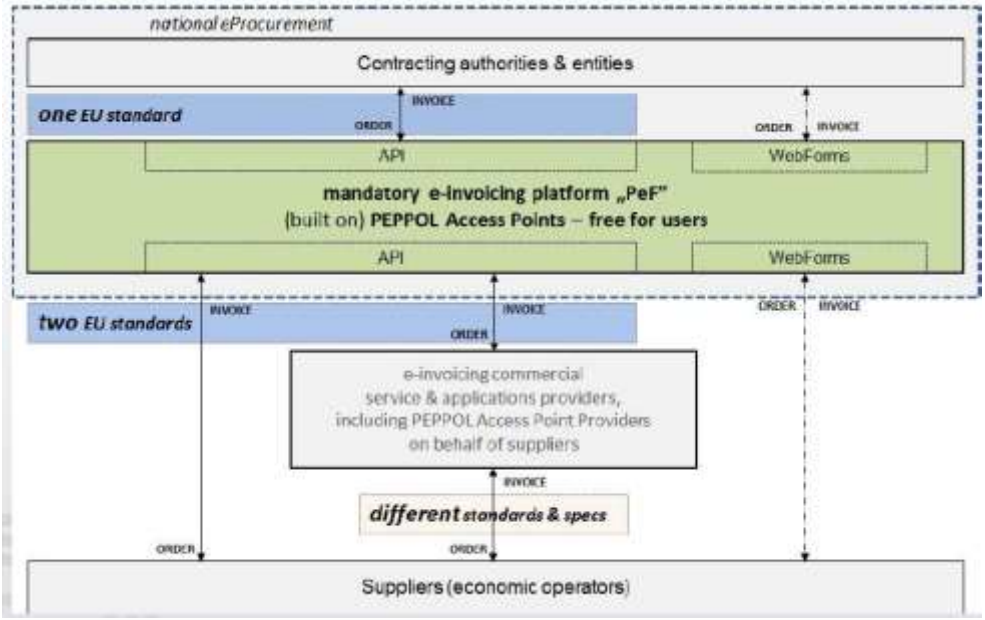

Figure 8: E-procurement and e-invoicing hub high-level architecture

The two Access Point providers managing the central hub, on behalf of the Polish government, will handle the communications message exchange with the Access Points of suppliers, implementing a 4-corner model, ensuring competition among service providers and avoiding lock-in solutions.

Change management is the most complex aspect of the implementation. To simplify the process, contracting authorities will adopt only one standard and one syntax (UBL 2.1). However, suppliers will be free to send also UN/CEFACT CII invoices that will be converted into UBL 2.1. The two Access Point providers will translate these invoices.

Poland will exchange invoices conformant to the European e-invoicing standard, electronic orders and dispatch advices based on the PEPPOL specifications through the network of Access Points. To ensure authenticity and integrity, business controls will be performed through automated matching of purchase order, contract information, and despatch advice with invoice data. It is envisioned that the source of structured data for the ordering process will be the national contract register including public procurement data, when available from a separate pre-award system (beyond 2020).

Based on the implementation plans, the EN is considered fit for purpose. A CIUS will be developed at a national level. The Ministry of Finance will be consulted to carry out a gap analysis from a legal perspective. The development of extensions is not being considered.

The budget for the providers of the centralised e-invoicing platform (PeF) is funded through the European Regional Development Fund. The CEF Telecom e-Invoicing 2016-3 programme will be the source of financing of a project "European cross-border e-invoice in local public procurement in Poland", involving local public authorities in Poznan and Warsaw.

Implementing the EN is not considered as a main cost factor, with standardisation activities (domestic and European) estimated at €330,000. The total budget for the development of the centralised e-invoicing platform (PeF), which includes the standardisation activities, is estimated at €5 million.

Impact of the EN

The central platform on e-invoicing in public procurement will be the main tool supporting the EN implementation process. It will allow for simplification of the standard implementation as well as the change management process. It will avoid public entities to take individual actions to implement the Directive, which would be very costly for tax payers.

The impact of the EN on public administrations will be limited as the centralised e-invoicing platform (PeF) will be provided free of charge.

The impact of the EN on suppliers will also be limited. Suppliers will be allowed to connect to the centralised e-invoicing platform (PeF) at no cost through three channels: direct integration, web-portal, or PEPPOL service providers. Suppliers will be free to select any PEPPOL Access Point provider to send e-invoices compliant with the EN to Polish contracting authorities.

The 2014/55/EU Directive is accelerating the automation of the invoicing process. Without the Directive the process would have taken longer.

Key fact

Implementing e-invoicing in Poland will require a significant effort from public administrations.

However, the implementation of e-invoicing in Poland will require a significant effort from public administrations to be prepared, especially to integrate it with their accounting software and to realise organisational changes. If contracting authorities (CAs) receive only a few invoices, then they are likely to manually process the invoices and not invest in advanced IT solutions. It will be up to each CA to decide the level of automation and IT sophistication, based on their business case and invoice volumes.

In this regard, the CEF funding is a very useful instrument, which helps funding the implementation of OpenPEPPOL access points for local authorities.

The Netherlands

National Context

The Netherlands intend to transpose Directive 2014/55/EU as is (without any delay for non-central government agencies) in the Procurement Law. The implementation is now under public consultation.

The Ministry of Interior and Kingdom Relations is responsible for the implementation of e-invoicing in central government agencies. The Ministry of Economic Affairs is responsible for e-invoicing policy and legislation. The Netherlands has a Multi-Stakeholder e-Invoicing Forum with an advisory role with respect to the Dutch input to the European Multi-Stakeholder Forum on e-Invoicing (EMSFeI).

Since 1 January 2011, it is mandatory for central government agencies to receive e-invoices via a central hub called 'Digipoort'. From the 1st of January 2017, suppliers to central government agencies have to submit electronic invoices for new contracts.

PIANOo, the national competence centre for e-Procurement, has set up a dedicated e- invoicing unit to support local authorities, which can act independently but they are advised to follow the example of the central government entities.

Currently, a **hybrid** e-invoicing architecture is in place. Digipoort is a central hub that supports government communications in many other areas, with high security requirements. Non-central organisations generally do not use Digipoort, even if they are allowed, because it is complex and expensive to use.

The central government advised local government agencies to get a connection to SimplerInvoicing (national PEPPOL community) using their existing software providers.

The problem with the Digipoort web-portal is that the suppliers have to manually key in their invoices. Furthermore, it does not support the upload of XML structured messages. The government advice is for SMEs to use commercial parties from SimplerInvoicing as they provide more user-friendly solutions, sometimes free of charge for a limited number of e-invoices.

e-Invoicing Maturity

At the end of 2016 the central government received 48% of a total of approximately 2 million invoices in a structured electronic form. 22% was PDF and 30% paper invoices. This will increase as from 1 January 2017, it is mandatory for all new public procurement contracts to request e-invoices.

In addition, there have been standardisation efforts carried at the national level:

- The UBL-OHNL is a standard format used in Digipoort for the central government. Digipoort also supports natively the HR-XML format. Service providers may send invoices in other formats and these are converted to the UBL-OHNL standard.
- Non-central public administration must be able to receive and process e-invoice in the HR-XML format ('comply-or-explain' principle). The UBL-SimplerInvoicing format is recommended.

Key fact

The EN is considered to be fit for purpose for general B2G invoices. The use of certain elements will be restricted, such as code lists. A national CIUS and sectoral extensions will be developed.

Implementation of the EN

The EN is considered to be fit for purpose for general B2G invoices but the Netherlands envision to restrict the use of certain elements. In particular, the code lists referenced seem to be too extensive. Therefore, a selection will be made in a national CIUS that will be shared with other countries, aiming to achieve consensus about their use so that economic operators will not have to change their systems for sending e-invoices.

The Netherlands is developing a **national CIUS for use in the B2G and B2B** that is expected to be ready by the end of 2017. The government will try to co-ordinate CIUS development with other Member States, especially Germany.

UBL is the preferred syntax for B2G in the Netherlands. Migrating from the presently used format to EN 16931 needs relatively little effort. UBL 2.1 will natively be supported by ERP systems for government agencies to receive e-invoices. UN/CEFACT CII will be supported by the use of translators. However, there are currently no suppliers that plan to send UN/CEFACT CII invoices to government agencies.

For two industry sectors (Energy and Temporary Staffing) extensions are being prepared so that sector specific information may be processed automatically. The Netherlands prefer these extensions to be co-ordinated at the European level.

National formats will be phased out as soon as the EN meets the requirements of suppliers and is operational for everyone.

Impact of the EN

The costs related to the development of the NL CIUS and setting up format conversion to support UN/CEFACT CII amount only to a fraction of the annual maintenance budget for central government systems. No specific estimates were given for local authorities and SMEs, as costs would be largely dependent on ICT maturity. The implementation of the EN is considered to be cost-efficient so long as standard architecture and infrastructure are used.

There are only 5 or 6 big software vendors for municipalities' software and the largest are already part of SimplerInvoicing. As soon as the EN is published, SimplerInvoicing will roll out a plan to upgrade to the EN. Therefore the largest suppliers of municipality software will follow, making it easier for **municipalities** (for approximately 250 of the total 380) to instantly embrace the EN.

More than 80% of commercial providers of administrative and accounting software in the **SME market** have agreed to build in a native UBL interface for e-invoices free of charge.

It should be noted that implementation costs are greatly alleviated by the availability of CEF funds. PIANOo formed a consortium and invited all relevant service and solution providers that work for non-central government agencies, which agreed to implement the EN..

Ireland

National Context

The transposition of 2010/45/EU Directive into Irish Law is set out in the Statutory Instrument 354 published in 2012 and which came into effect from 1 January, 2013. This established electronic invoices on an equal footing with paper invoices and incorporates the definition of an electronic invoice's processing, such as the appropriate application of business control to ensure authenticity, integrity and a reliable audit trail of the electronic document.

There is no other existing national legislation or policy specifically relating to e-invoicing with the exception of policy currently being developed in response to the 2014/55/EU e-Invoicing Directive.

The Office of Government Procurement (OGP), which operates within the Department of Public Expenditure and Reform in Ireland, is responsible for the transposition of the Directive. The OGP also has responsibility in general for public procurement policy and in particular for the e-invoicing programme.

There are a number of e-invoicing initiatives across the Irish public sector which are aimed at addressing the business needs of the lead contracting authority or of a specific group of contracting authorities within specific sectors shared services but there is currently no national e-invoicing architecture for B2G transactions per se.

Financial **Shared Services** initiatives are underway across all areas of Government (including Health, Education, Central and Local) and it is expected that these will be the main implementation points for establishing the e-invoicing capability required to deliver compliance with the Directive.

In 2012, a Government pilot established a selection of seven Public Sector Bodies (PSBs) that could receive invoices electronically using PEPPOL functionality. Each PSB engaged a different service provider to provide PEPPOL Access Point e-invoicing capabilities to a small number of suppliers assisted in demonstrating the exchange of messages using the 4-corner model.

e-Invoicing Maturity

Presently, although there are a number of e-invoicing initiatives across the Irish public sector using various formats and syntaxes (such as PDF, EDIFACT, UBL XML, PEPPOL), the Irish Government has not mandated nor recommended the use of any specific standards for e-invoicing in the B2G.

Key fact

The adoption of the EN would not pose any challenge for service providers in Ireland.

EDIFACT is the dominant e-invoicing standard for private businesses in Ireland but market research has indicated that service providers have existing capabilities in respect of XML based syntaxes and the adoption of the European standard mandated syntaxes, UBL and CEFACT XML, would not pose any significant challenge for them. XML based syntaxes are also already in use in a number of e-invoicing solutions already in place within the Irish Public Sector.

According to a study carried out in 2016, it was estimated that approximately 90% of all invoices were on paper, with the remainder being sent via email and to a lesser degree being in more recognised e-invoicing formats.

Implementation of the EN

The National e-Invoicing Programme is still in the process of formulating the detail of the implementation model but it is expected that Core Invoice Usage Specifications (CIUS) will be developed at a national, and possibly sectoral level, primarily to request that certain conditional elements are flagged as being required to facilitate compliance with national or sectoral invoicing business rules within the public sector. The use of purchase order reference, party and item identifiers and information are the most likely elements that will be referred to in any CIUSs developed.

In the event that the decision is taken to develop and apply Core Invoice Usage Specifications (CIUS), it is not expected to have any implications on cross-border trade nor should it impact Irish suppliers as it is expected that the CIUSs that may be developed will only mandate the use of elements that are commonly found in invoice documents and an invoice document created in conformance with any CIUSs developed will still be compliant with the EN.

The primary objective of the National e-Invoicing Programme is to facilitate the enablement of all public bodies to deliver the minimum capabilities to accept and process e-invoices by the compliance deadlines. Its secondary objective is to facilitate the enablement of straight through processing in high-volume public sector bodies and shared service centres, to enable public administrations to reap the full benefits of e-invoicing.

The e-Invoicing Programme will establish a multi-supplier procurement framework. The specifications of the framework will be developed based on the invoice processing environments, capabilities and requirements of the contracting authorities.

It is expected that the framework will facilitate contracting authorities in protecting and maximising the investments already made in existing e-invoicing solutions by allowing for a range of levels of services to be accessed through the framework - from basic PEPPOL Access Point services and translation services through to systems integration and business validation and workflow services.

Both UBL 2.1 and UN/CEFACT CII will be supported, driven by a combination of translation services and ERP systems that can natively support them through adaptors for these standards overtime. UBL is expected to have more traction due to its current use within the established PEPPOL network.

Impact of the EN

The overall budget of the National e-Invoicing Programme is not available, however, the main cost category is subject matter expertise in the areas of e-invoicing, project management, communications and public procurement.

For small public administrations, the implementation of the EN may weight on their budgets if they are not currently part of the shared services initiatives. However, as there is a large number of shared services available, the implementation of e-invoicing should be cost efficient on a broad scale. CEF funds may play a role in alleviating the weight on budgets of small public administrations. For instance, the Department of Education has established a consortium which received CEF funding for promoting the uptake of e-invoicing in Ireland.

For small suppliers, the impact of the EN is expected to be low.

Key Stakeholders

This section details the position with regard to the EN from key stakeholders of the B2G e-invoicing market.

OpenPEPPOL

OpenPEPPOL is a non-profit international association under Belgian law and consists of both public sector and private members. The association has assumed full responsibility for the development and maintenance of the PEPPOL [18] specifications, building blocks, services and implementation across Europe. PEPPOL is designed to create interoperability in electronic public procurement in Europe.

Views on the EN

OpenPEPPOL considers the EN to be fit for purpose as it covers the main legal and business requirements. The EN includes even more information and flexibility than what is required by PEPPOL.

Key fact

OpenPEPPOL considers the EN for e-invoicing to be fit for purpose and to cover the main legal and business requirements.

Implementation of the EN

OpenPEPPOL will develop restrictions to the EN that will be reflected in a CIUS. The ambition is that the PEPPOL CIUS can be used by all contracting authorities and economic operators in Europe, becoming the "lingua franca" for e-invoicing. The PEPPOL CIUS will also meet the requirements for Business-to-Business transactions, since the PEPPOL network is already used in the B2B context.

The minimum requirement from OpenPEPPOL will be the base for the implementation of the European model and for the development of the new PEPPOL specifications (PEPPOL BIS version 3). Even if there could be countries that will publish national CIUSs, all PEPPOL users will have to support the common PEPPOL CIUS to ensure cross-border interoperability.

There will be two main requirements that OpenPEPPOL is putting in order to register national extensions and the specifications: the documentation of the specification, as well as validation artefacts must be made available. The two requirements are also valid for additional CIUS. OpenPEPPOL is establishing this as strict policy in order for the PEPPOL network to be used in new domains.

OpenPEPPOL will mandate the support for the UBL syntax, while the use of the UN/CEFACT CII syntax will be optional. Using one or two syntaxes is something for each contracting authority to decide. OpenPEPPOL is thus a one-stop-shop for compliance with the EN: both UBL and CII will be supported by the PEPPOL eDelivery Network.

The migration to the EN will be coordinated in three phases: an initial optional period where both the PEPPOL BIS v2 and the new BIS v3 will be allowed; a semi mandatory period where newcomers will only support the EN; and finally the third period when the BIS v3 conformant to the EN will be mandatory for all participants in the network.

Impact of the EN

The EN is really what PEPPOL was meant for, so the EN is definitely a positive driver for the expansion of OpenPEPPOL, i.e. countries like Poland are coming on board to use PEPPOL as their primary strategy to implement the directive and the EN. OpenPEPPOL is in a very good position to cater for the implementation of the EN in Europe.

By delivering an EN enabled PEPPOL specification that will be mandatory, OpenPEPPOL expects to become the common denominator for implementing the EN across Europe, in cases where a national CIUS is not directly compatible with other national CIUS.

However, too much flexibility in the EN might result in not being able to cater for directly implementing conversions. Decisions must be made regarding the optional elements.

EESPA

EESPA is the European E-invoicing Service Providers Association [19]. It develops influence, information and intelligence, industry promotion, standards and best practices.

EESPA provides a robust governance framework and a strong team to gather and represent views of its members, keeping abreast of the regulatory framework, making timely decisions on common positions, creating consensus, building coalitions, and always behaving ethically and transparently.

Key fact

EESPA considers the EN for e-invoicing to be fit for purpose and is pleased with the 2 selected syntaxes.

Views on the EN

The semantic model is fit for purpose as it includes a wide range of the generally required information elements, which can be selected for use by means of a core invoice usage specification (CIUS). EESPA is very pleased to see that it is mandatory only to support the two XML syntaxes, having worked with OpenPEPPOL to present the arguments [20] for this approach.

While fully supporting the EN, EESPA raised two main concerns: a risk that communities might believe that numerous extensions are needed to address sector and country based requirements that are not provided for within the Core; and the need for a governance model to maintain the EN as it is adopted.

Implementation of the EN

The practical issues for implementation are not yet clear. Provided that the syntax bindings are well executed and easy to use, implementation should be relatively straightforward. There is a need for implementation guidelines.

There is a concern about implementation in Member States and whether extensions will be over-used. Extensions should be avoided, and their proliferation could represent a threat to the EN.

EESPA members will find it difficult to operate in an environment where extensions are just created at will and not made publicly available according to agreed quality standards. The related invoices run the risk of failing during the processing and becoming manual items.

The EN implementation timetable for EESPA members will be driven by the market, especially by public administrations adopting the EN.

Decision-makers and implementers should be invited to read the *Guidance Paper for EU Public Administrations* [21] and think about a national or sectoral policy framework to be put in place for their Member State.

Impact of the EN

The objective should be to make sure that implementation of the EN is as easy as possible and no different from other common standards. The syntax aspect is not considered to be a major concern and should not generate a significant incremental cost to EESPA users and end-users.

If the implementation of the EN requires additional effort to support format conversion, validations, CIUS or extensions, then these costs will require management as part of the product mix in a competitive market. Costs will arise for set-up, customer tools, buyer integration, processing, mapping, validation and compliance checks, and quality assurance.

There are some concerns that, because the adoption of the EN is purely voluntary on the supplier side, critical mass may be slow to develop reducing potential returns on the required up-front investment.

Since EESPA members work as intermediaries for their customers, they will provide all the necessary capabilities to manage the mandated syntaxes and conversion into and out of other required syntaxes, such as EDIFACT and the other technical languages present in ERP and other software.

ERP vendors

The ERP vendors and sector representatives that participated in this study account together for the majority of the European market and a significant part of the global market in B2B and B2C e-invoicing. Our sample included ERP vendors working with over 330,000 European SMEs and local authorities, as well as ERP vendors working with large-scale administrations and multinationals. The ERP vendors and sector representatives contacted wished to remain anonymous.

All 6 organisations contacted indicated that they currently processed (issuing and/or receiving) structured electronic invoices in multiple formats including UBL. CII is currently natively supported by only one of the 6 contacted organisations.

Views on the EN

While 5 of 6 organisations contacted were already aware of the development of the EN, only 3 had reviewed the draft EN.

Key fact

ERP vendors expect the EN to facilitate the adoption of e-Invoicing.

In general, the EN is welcomed and considered fit for purpose. It would facilitate the adoption of e-invoicing and builds upon the specifications supported by OpenPEPPOL, to the extent that Member States implement the EN as is or with only a CIUS.

Implementation of the EN

Three organisations stated that the EN will be implemented using a national CIUS or following PEPPOL. Two organisations stated the EN would be implemented as is, and the last one had not defined yet how the EN would be implemented, even if its implementation was foreseen.

In addition, industry specific extensions would only be developed if there is sufficient commercial interest.

All the contacted organisations will provide their customers with the capability to both send and receive e-invoices in conformance to the EN. Four out of six organisations will provide these capabilities through connection to the OpenPEPPOL network.

Impact of the EN

In terms of software offering to their customers, the contacted organisations are divided as to how the new features will be offered:

- Two organisations intend to integrate the issuing and receiving of e-invoices following the EN in their e-invoicing module. It will thus be offered by default to all their e-invoicing customers.
- Two organisations intend to offer support to the EN separately.

The last two organisations contacted were still undecided.

In terms of costs, the ERP vendors that will include support of the EN natively in their solutions will do it at no extra charge for their customers. For vendors which offer PEPPOL Access Points and support of the EN separately, costs range up to €500 per customer, similar to other modules provided by these companies.

GS1 in Europe

GS1 is a neutral, not-for-profit organisation that develops the most widely used supply chain standards system in the world. GS1 in Europe is a not-for-profit organisation with 47 European Member Organisations which engage everyday with governments, trading partners, industry organisations and technology providers to respond to business needs through the adoption of global standards.

GS1 manage the production, collection and sharing of data on products and product lives, among stakeholders, businesses but also consumers and public authorities. GS1 standards improve the efficiency, safety and visibility of supply chains.

Views on the EN

Key fact

A key concern is that the EN is a step back compared to what is in place because of its great flexibility.

The EN will allow to achieve a higher degree of interoperability across the European countries and industries but also for cross-border trade. Therefore, Directive 2014/55/EU fits the objective that GS1 in Europe has, but unfortunately the final outcome did not take into account the reality of the European market, especially in the type of format that is going to be used and the SMEs. This is not GS1 XML but UN/EDIFACT, which is widely deployed in Europe.

A key concern is that the EN is a step back compared to what is in place already because of its great flexibility. The more flexibility in a standard, the worst it is for the industry. For the majority of the GS1 members this standard is not considered as a step ahead because of many free text elements which would block automation, lack of use of code lists, risk of many bilateral subsets (simple invoice) / superset (national or sectoral extensions) formats.

The core has already many optional elements. Future XML syntaxes are not clear for industries that will start using EDI. It is unclear how the core format will be maintained and how there will be a clear overview of all sub and supersets.

The standard was developed to be used only within the EU (e.g VAT information is mandatory), which makes it very difficult for companies in the EU to conduct business in the market outside the EU or globally by using the EN. Nevertheless, one positive aspect is that the standard could be helpful for intra sectorial cross border harmonization within GS1 industries.

GS1 was involved in the development of the standard within CEN/TC 434 since the very beginning: working groups, development of the documents.

Implementation of the EN

In general terms, companies are ready and willing to comply with the European digital agenda but the EN will have a strong impact, with a return on investment at a later stage. GS1 in Europe is ready to use its network to help companies implementing European ambitious goals.

According to comments received from GS1 member companies, the question of implementation ease for the EN is hard to answer before analysis has been made of existing business systems, including existing implementation and use of EDI invoices. In most cases there will be a number of different systems in an IT environment which have to be updated at each company.

The level of 'easiness' also depends on the in-house systems that are used. The lack of coded information and extensive use of free text fields will result in much necessary bilateral communication upfront that can create different implementations for the same purpose.

The main implementation cost factors include: system analysis and system development; mapping specifications; system test; change of setup to allow the new XML format; cost per each customer specific system adjustment according to a specific Core Invoice Usage Specification (CIUS).

Impact of the EN

There will be a big impact on companies to comply with the Directive: new technology, new syntax, and a new semantic model. It will force SMEs to invest in new tool, software, consulting to comply. The more languages you add, the more complex it becomes, especially for SMEs. It will not be cost-neutral but most of GS1 are convinced that realising the digital agenda is going to be positive for everyone on the long term.

There is a need to clarify the consequences of using Core Invoice Usage Specification (CIUS). The concept of CIUS, specified in the EN is considered a huge risk which can complicate implementation and the following roll-out. In the worst case there will be a CIUS for the supplier to relate to (implement) for each contracting entity.

Each CIUS will entail a cost for each supplier. The concept of CIUS described in the EN should be considered carefully as it may counteract the implementation and use of the EN. There will be challenges for UN/EDIFACT users to convert to UBL.

GS1 in Europe is user driven will support their members to implement the EN standard. GS1 goal is to help companies to work together on the adoption, to reduce costs and accelerate the implementation.

Emilia-Romagna region

Emilia-Romagna is an administrative Region of Northern Italy. Emilia-Romagna is one of the wealthiest and most developed regions in Europe, with the third highest GDP per capita in Italy.. There are 387,000 enterprises located in the region. Like in the rest of the country, the majority of enterprises count less than ten employees.

The regional Government has developed a public PEPPOL Access Point that allows all local authorities to receive, send and archive all the procurement documents electronically.

Views on the EN

The Emilia-Romagna region, through the national technical committee within the national standardization body, participated in the activities of CEN TC 434 contributing to the development of the EN and considers the EN to be fit-for-purpose.

Implementation of the EN

A CIUS will be defined at a national level and will not represent an obstacle for national and cross-border trade. Therefore, the Emilia-Romagna region will implement the national Core Invoice Usage Specifications (CIUS) and technical national rules for domestic usage in parallel.

In particular, the ERPs of the regional public administrations have implemented the UBL-PEPPOL format for invoice order and dispatch advice. The regional goal is to stop managing the format conversion to the national format FatturaPA and to move to the actual implementation of the EN standard (UBL specification) with the national CIUS.

Therefore, the implementation of the EN will be achieved through the upgrade of ERP systems natively supporting the standard and the use of translators.

Impact of the EN

The region expects to start receiving invoices from other country using the UBL syntax through the PEPPOL network. On the other hand, the cost of upgrading the current e-invoicing infrastructure to implement the EN is detailed as follows:

1. Gap analysis and design of the new interfaces: 30.000€
2. ERP software update (considering an ERP supporting UBL is already in place): 5.000€/ERP implementation
3. Update of the OpenPEPPOL access point: 60.000€
4. Coordination and dissemination activities: 60.000€

Key fact

Emilia-Romagna Region considers that the benefits of the EN outweigh its implementation costs.

The benefits are considered to outweigh these implementation costs.

Swedish Association of Local Authorities and Regions

The Swedish Association of Local Authorities and Regions, SALAR, is both an employers' organisation and an organisation that represents and advocates for local government in Sweden. All of Sweden's municipalities, county councils and regions are members of the SALAR, which acts on their behalf.

The SALAR participates in the Single Face To Industry (SFTI) joint initiative of the Swedish public sector, which promotes and facilitates e-procurement for both central, regional and local level. SFTI also provides recommendations for B2G e-invoicing.

While e-invoicing is only mandatory for the central government, 87 % of the municipalities and 95 % of the regions are using e-invoicing in Sweden.

Views on the EN

Key fact

The EN is very close to the Swedish national standard that is recommended for usage in B2G and widely adopted in B2B.

The EN covers most of the requirements. There is another national standard that will cater for additional requirements if necessary. The content of the EN is very close to Svefaktura which is recommended for usage in B2G, but is also widely used in B2B. The EN/PEPPOL invoice is expected to be used in a B2B context similarly.

Usage of standard is crucial for local authorities in order to reduce the costs. Svefaktura made it possible for Sweden to have a broad implementation of e-invoicing. The EN will be recommended and will give the same benefits as with the usage of existing e-invoicing standards, Svefaktura and SFTI Fulltextfaktura.

Additional benefits are also expected in Sweden as a result of the EN implementation, as it will ensure that one standard can be used also for cross-border e-invoicing.

Implementation of the EN

SFTI will recommend the EN/CIUS that will be developed within OpenPEPPOL. No extensions are foreseen. This EN/PEPPOL CIUS will be used by all level of public administrations: central, regional and local.

Currently, suppliers can send e-invoices using their ERP or accounting system; or through web portals, or by keying in the data. The most common to implementing the EN is expected to be through the upgrade of ERP systems natively supporting the standard as there are already many ERP systems, e-Procurement systems or e-invoicing solutions supporting the national standard. Supporting the EN for those systems is therefore expected to be only a matter of update.

In Sweden, in many public procurement contracts, solution providers have to implement the recommendations of SFTI, namely:

- To implement the Core without using extensions and avoiding bilateral agreements
- To use the new PEPPOL CIUS for the EN and the PEPPOL infrastructure to increase usage and speed up supplier adoption, since this makes it easier to get e-invoices from many suppliers.

Impact of the EN

The current solution providers will be able to support the EN without any difficulty. They already handle e-invoices in XML format and with a content that is very close to the content of the EN. A minor upgrade to the current solutions is expected to handle e-invoices conformant to the EN. Several of the solution providers also offer this e-invoicing service in other Member States.

Inexpensive e-invoicing solutions are already in use by many public administrations, which enable them to receive e-invoices directly in their e-procurement or e-invoicing systems. As long as extensions can be avoided, implementing the EN is expected to be inexpensive for all public administrations.

Key Findings

Based on the preceding analysis, the following key findings can be drawn.

Impact of the EN for Member States

The impact of the EN in Member States will be largely determined by the following factors:

1. E-invoicing Maturity

E-invoicing maturity at a national level is determined by the adoption rates in the public and the private sector, a competitive market for e-invoicing services and solutions, and the level of organisational and IT readiness.

The impact of the EN, in terms of costs and complexity, will be lower in Member States with high maturity levels having the experience and solutions to manage the required changes; while it will be higher in Member States where e-invoicing adoption is low, where the number of solution and service providers is limited, and the national IT infrastructure is not very advanced.

The impact of the EN will also depend on the national legislation, policy and related requirements. Governments will have to define a strategy to implement Directive 2014/55/EU (from minimal compliance with the Directive to full invoice process automation), policies, and plan a national roll-out. The use of e-invoicing for suppliers to the public sector may be mandated, including the use of specific formats.

2. E-invoicing Architecture

In Member States where a *centralised* e-invoicing architecture is in place, the impact of the EN on end-users will be generally low. Any change required to support the EN and the related cost will be borne mainly by the entities managing the central e-invoicing system.

In Member States with a *de-centralised (or hybrid)* e-invoicing architecture, contracting authorities and suppliers will rely mainly on a competitive market for e-invoicing solutions and services offered to support the EN.

Impact of the EN in the selected scenarios

The impact of the EN in four high-level scenarios, based on the level of maturity and e-invoicing architecture in use at a national level, is described below.

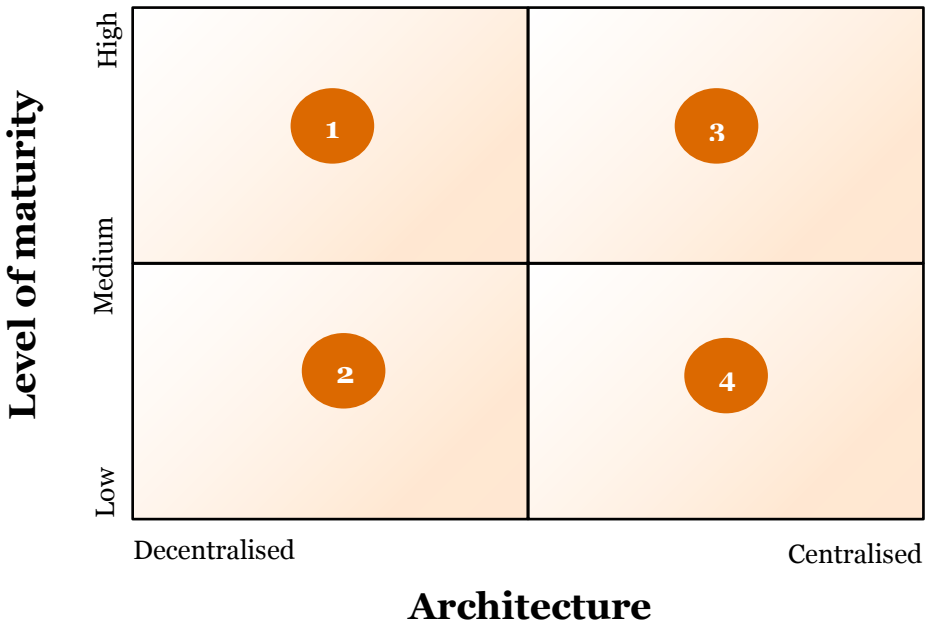

Figure 9: Impact of the EN in selected scenarios

Scenario 1

High Maturity – Decentralised architecture

Member States with a high level of e-invoicing maturity are characterised by high adoption rates in the public and the private sector, a competitive environment for e-invoicing service and solution providers, and an advanced organisational and IT readiness.

Countries using a decentralised e-invoicing architecture, will leverage on e-invoicing service and solution providers to upgrade their systems to support the EN, offering competitive solutions to public and private entities of all sizes.

In this scenario, the impact of the implementation of the EN is expected to be low. The cost for upgrading the systems will be borne by the service providers and consequently by end-users (contracting authorities and their suppliers). It will be marginal if the service providers are supporting standards already aligned to the EN, while it will be relatively higher in the opposite case.

Scenario 2

Low Maturity – Decentralised architecture

Member States with a low level of e-invoicing maturity are characterised by low adoption rates in the public and private sector, a limited number of e-invoicing service and solution providers and a low level of readiness. In this context, countries adopting a de-centralised architecture will face challenges for ensuring e-invoicing take up and implement the EN.

However, this may be mitigated by the government providing very clear guidance and rules, such as the use of standards.. In addition, awareness, advocacy, senior sponsorship, training, competence centres and shared services will play a significant role in supporting adoption of the EN.

In this scenario, the impact of the EN and the related costs are expected to be high, especially for contracting authorities that will have to be prepared to receive e-invoices in accordance with the EN, for domestic and cross-border transactions.

Scenario 3

High Maturity – Centralised architecture

In Member States with high e-invoicing maturity which have established a centralised public architecture, providing a central hub for contracting authorities to receive e-invoices, the implementation of the EN will have a low impact, in general.

National requirements will influence the level of impact. If the use of standards aligned to the EN is already supported, the impact of the EN will be extremely low, while if national or proprietary formats not aligned to the EN are in use, or have been mandated, then the impact will be higher.

In this scenario, the cost for supporting the EN will be borne mainly by the entities managing the centralised e-invoicing system. Any cost for suppliers should be reduced since they are dealing with a central system.

Scenario 4

Low Maturity – Centralised architecture

In Member States with a low e-invoicing maturity, which have implemented a centralised e-invoicing system, the impact of the EN will depend on the national requirements and the level of readiness in the public and the private sector.

Countries with a centralised e-invoicing system that have mandated the use of standards already aligned to EN will not face any major technical challenge. If the level of readiness is high, e-invoicing adoption would increase accordingly.

Countries with an immature central e-invoicing infrastructure for the public sector, and with low level of readiness will have to make significant investments to implement the EN. Contracting authorities will be supported and enabled through the centralised system; while suppliers will rely on commercial operators, and in some cases, free of charge services will be offered for a limited number of invoices.

Impact of the EN for small contracting authorities

Key findings from our interviews with regional and local authorities show that:

- Usage of standard is crucial for local authorities in order to reduce the costs.
- The most common way to implementing the EN is expected to be through the upgrade of ERP systems natively supporting the standard.
- As long as extensions can be avoided, implementing the EN is expected to be inexpensive for all public administrations.
- The benefits are considered to outweigh the implementation costs.

In line with Directive 2014/55/EU, contracting authorities and contracting entities will be obliged to receive and process electronic invoices which comply with the European standard (EN) on electronic invoicing and represented in any of the two mandatory syntaxes (UBL 2.1 and UN/CEFACT CII). The Directive does not pose any obligation on suppliers.

The decision to process compliant e-invoices electronically is left to the contracting authority. In general, it will be up to each contracting authority to decide the level of automation and IT sophistication of their systems and the investment they are willing to make. This will be based on their business case and on national requirements.

CEF Telecom funding is considered to be a useful instrument to support the implementation of the EN.

Impact of the EN for SMEs

The EN will have a positive effect on SMEs, by preventing public administrations in different countries, and even regions within the same country, to require different e-invoicing specifications.

In some Members States, e-invoicing services are offered free of charge to SMEs for a limited number of e-invoices. In Italy, the Chamber of Commerce provides such a service, also including e-archiving[3].

Finally, the EN is agnostic to the use of e-signatures. Any cost related to the use of e-signatures for e-invoicing to the public sector, in Member States where their use is mandatory, should be taken into account.

Impact of the EN for Stakeholders

OpenPEPPOL considers the EN to be a positive driver for the expansion of the Association, since an increasing number of countries, like Poland, are adopting the PEPPOL Interoperability Framework. OpenPEPPOL will update its current e-invoicing specifications and will mandate the use of the UBL 2.1 syntax, while supporting UN/CEFACT CII as an optional syntax. The Association will deliver a CIUS for its members and has the objective to become the “lingua franca” for e-invoicing in Europe.

[3] https://fattura-pa.infocamere.it/fpmi/service

The adoption of a common CIUS ensuring cross-border interoperability should provide further harmonisation and result in costs reduction for implementers.

EESPA, the European Association of e-Invoicing Service Providers, fully supports the EN. EESPA members will provide all the necessary capabilities to manage the mandated syntaxes and conversion into and out of other required syntaxes, such as EDIFACT and the other technical languages present in ERP and other software. The availability of e-invoicing services supporting the EN will be an important driver for the adoption of the EN by end-users. In addition, EESPA stresses the importance to limit the proliferation of extensions as they represent a threat to the EN; and the need to establish a governance model to maintain the EN.

ERP vendors interviewed fully support the development of the EN and will implement it in their solutions. Both mandatory syntaxes will be supported, with clear priority to UBL 2.1. Country specific extensions should be avoided to reduce implementation costs. The higher the availability of ERP systems natively supporting the EN, the lower the costs will be for end-users, particularly for small contracting authorities and SMEs.

GS1 in Europe is concerned about the cost to implement the EN for its members using EDIFACT, and by the flexibility of the standard. This is caused by the possible overuse of free text fields; and the underuse of code lists. Each CIUS will entail a cost for each supplier and is considered to be a risk that can complicate the implementation and roll-out of the EN.

Adequacy of the EN for public administrations

Based on our analysis and test results from CEN/TC 434, the EN can be considered fit for purpose for public administrations. The test carried out by CEN covered the semantic model and the syntaxes in scope (including the creation, validation, transmission and the visualisation of e-invoices). As the CEN test ran together with the development of the EN, the EN has been adapted accordingly so that there is no issue with any of the afore-mentioned aspects.

The present study completes the tests of CEN/TC 434 by looking at the implementation of the EN and its fitness for purpose with regard to the requirements of a variety of public administrations, including local and regional ones. In all implemented scenarios, the EN meets business requirements and can be implemented as is or with a CIUS.

A CIUS will manage the flexibility of the EN by mandating some of the optional elements including the use of restricted code lists. Extensions are only being considered in The Netherlands to cater for sector-specific needs.

Adequacy of the EN for suppliers and actors of the e-invoicing market

Based on our analysis and test results from CEN/TC 434, the EN can be considered fully fit for purpose for suppliers and e-invoicing service and solution providers. The test carried out by CEN also covered automated processing and payment of e-invoices, proving the suitability of the EN in the B2G and B2B context. Industry stakeholders were represented in CEN/TC 434 and involved in the tests. This ensured that the EN meets the market requirements and does not represent a challenge to businesses.

During our analysis, all e-invoicing service and software providers welcomed unanimously the EN. Directive 2014/55/EU is expected to have a positive impact on their businesses and as the EN builds upon existing widespread syntaxes, it will not have any disruptive effect on the market. However, a high number of extensions will represent an additional cost for solution and service providers to support them in their systems and will reduce the benefits of a common standard.

Implementation costs

While the level of costs for implementing e-invoicing is largely dependent on the maturity and the architecture of the public sector in each country, the costs directly linked to the EN are marginal at most and should represent only a small fraction of the costs for implementing e-invoicing.

The costs for implementing the EN will vary based on the national context. In general, for **implementers** (such as solution and service providers, or in-house developers) the costs would include: analysis to define requirements, mapping the EN to the internal format, ERP software integration, testing and communication activities.

Several of the software providers interviewed for this study will implement the EN in their core solution through their regular updates, free of charge for their customers. However, the cost for implementing the EN will increase if a high number of extensions will be used at a national and sectoral level, significantly reducing the benefits of a common standard.

For **end-users** (contracting authorities and SMEs) the costs for supporting the EN will depend on the level of internal readiness, and on the solutions and services available in the market. For example, if they are currently using an ERP system or a e-invoicing service that will be upgraded by the provider to support the EN (as a regular update), than the cost will be relatively low. Whereas, if a project is required for customisation, such as for extensions, then the cost will be relatively high. The pricing models will vary, ranging from basic free of charge solutions or services to more advance services and capabilities (see Annex 2 for more information). Therefore, for end-users without any organisational and IT skills, the adoption of the EN will still be manageable

For an end-user that has a pre-existing capability for XML based e-invoicing, the implementation costs are generally low. This is the case for 5 of the 6 countries analysed. For end-users that have e-invoicing capabilities but not XML based, e.g. EDIFACT, the cost to support the EN will be relatively higher. (However, EDIFACT is mainly used in the B2B context and its use is not common in the public sector).

In the case where there is no pre-existing e-invoicing capability, especially for small contracting authorities and SMEs, the cost for implementing e-invoicing using a common standard will outweigh the investment.

The CEN/TC 434 decision to limit the number of syntaxes to be supported to two XML formats (UBL 2.1 and UN/CEFACT CII) will result in costs reduction in many cases for contracting authorities. Suppliers instead will be free to decide which of the two syntaxes they will use to send e-invoices, helping to further reduce their costs.

The EN can thus be considered to be very cost-efficient to implement.

Lessons from implementers

A key success factor for the roll-out of the EN is its adoption in a B2B context, making standardisation market driven. In order for this to take place, a common B2B CIUS should be created to facilitate the use of the EN in B2B at national and cross-border levels. Uptake of the EN for B2B invoices would be further facilitated if an open infrastructure were to be available, such as OpenPEPPOL.

The more solution and service providers with native support for the EN through the enabled PEPPOL BIS version, the more costs will be driven downwards. This is because the conversion services are not needed. Also, the bigger the players that provide native support, the bigger the benefits and the ease for implementation on national and European level. When contracting authorities procure IT systems, there should be a requirement in the contract specifications to support the EN for e-Invoicing.

In addition, the contacted organisations put forward a number of measures to support the roll-out of the EN and maximise the benefits. These are listed below in order of recurrence:

- a test environment, freely accessible (no authentication required), with meaningful explanations for errors, validation artefacts and examples of complex and simple invoices;
- a central European registry listing all service and solution providers which are supporting the EN;
- clear documentation about the EN and its implementation;
- a technical Service Desk to provide support through the implementation of the EN;
- validation artefacts for the EN available through an application programming interface (API);
- financial support for the implementers; and
- promotion of OpenPEPPOL.

Finally, a **governance body** should be set up for evaluating the quality of extensions at both the semantic and syntactical level and to look for commonalities between countries and sectors, based on a controlled process. This role could be covered by CEN/TC 434.

It should be mandatory to publish extensions in a **central registry**. This body could help coordinate the development of CIUS at national level, to maximise convergence and formalise the collaboration already taking place between some Member States.

Public buyers should be encouraged to adopt a 'maximal strategy' based on full process automation, and not just implement the minimal requirements to receive e-invoices, which will yield modest benefits.

Conclusions

Practicality of the EN

The practicality of the European standard for e-invoicing, in terms of its fitness for purpose has been confirmed by the Member State authorities and stakeholders interviewed. In addition, the EN has been unanimously approved by all CEN/TC 434 Members.

The EN for e-invoicing is based on existing international standards widely adopted in Europe. The decision to limit the number of formats for implementing the data model to UBL 2.1 and CII will result in further simplification, since these are two very common syntaxes already in use in the market. Most of the contracting authorities interviewed for this study will prioritise the support for only one syntax, UBL 2.1.

The results of the testing activities show that no major issues were encountered. Testing of the semantic data model and the selected syntaxes contributed to the improvement of usage notes and definitions to facilitate the implementation and a better understanding of the EN. The validation artefacts used to automatically check for conformance of an invoice with the EN have been made available to the open source community and will significantly benefit implementers.

User-friendliness of the EN

By identifying a common set of information elements of an invoice that cover the majority of business and legal requirements, the core invoice semantic data model is of great value for the establishment of user-friendly and cost-efficient e-invoicing systems.

The role of ERP and software vendors is considered to be crucial by central, regional and local authorities. In particular, the implementation of the EN natively in their solutions will reduce the need for format conversion, thus significantly decreasing complexity and costs to end-users.

The EN is considered to be flexible due to the possible use of optional elements, free text fields and code lists included. However, this advantage may result in excessive proliferation of CIUSs and extensions that should be limited, possibly through a coordinated European initiative.

National CIUS should only apply to domestic use, not preventing cross-border exchange of electronic invoices. According to CEN/TC 434: “Extensions are not intended to be used to specify legally required information elements and expected to be mandatory by law and do not form an integral part of the European Standard”.

Implementation costs of the EN

While the costs of implementing e-invoicing are largely dependent on the level of maturity, the architecture of the public sector and the standards in use in each country, the costs linked specifically to the EN are marginal and represent only a small fraction of the costs for implementing e-invoicing.

In particular, where centralised systems are in place at a national level, the overall costs are minimal and will be absorbed by the entities managing the central system. In Member States with a distributed or a hybrid model, the availability of solutions that support the EN will be necessary for end-users.

All the ERP vendors and e-invoicing service providers interviewed for this study will offer solutions conformant to the EN based on market demand. However, the cost for implementing the EN will increase if a high number of extensions will be used at a national and sectoral level, significantly reducing the benefits of a common standard.

Small contracting authorities and SMEs will decide the level of investment and process automation of the e-invoicing services and solutions they will use, based on the national requirements and their business case.

CEF Telecom funds are being used to implement the EN. This is considered a fundamental factor for the uptake of the European standard. The cost to purchase the EN from CEN is not a major issue but the availability of information free of charge is considered to be important.

The roll-out of the EN will require maintenance and governance. A central registry including the "certified" CIUS and/or extensions, following a formal approval process will ease implementation. Common CIUS should be made available in relatively short time to the market. In this respect, the role of CEN/TC 434 and the European Commission will be critical to provide the necessary support.

Contacts




Our sincere thanks go to all the e-invoicing platform owners and experts who shared their knowledge and thinking with us. Their active and candid participation is the single greatest factor in the success of this study. We greatly appreciate the participants' willingness to free up their valuable time to help make this study as comprehensive as possible, and we're delighted that their input is integrated into this report.

The e-invoicing study team

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Annex 1 - CEN Policy on Dissemination, Sales and Copyright

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The CEN policy on dissemination of standards and their copyrights is aligned with the ISO policy which is based on the principle of the protection of the Copyrights and non-free availability of standards. This is important considering the European and International standardization systems are aligned and coordinate at all levels. All CEN members are also ISO members. Many of the standards adopted by CEN as European standards have been developed at the international level by ISO.

Key principles

One of the main objectives of CEN and its Members is the widest possible dissemination and use of their Publications throughout Europe and the rest of the world. Publications, including their entire content and their associated metadata, together with their national implementations, are works constituting individuality and originality and are therefore copyright-protected under the laws of Belgium, which is the country of origin of the works.

Whilst Members' activities can be funded in accordance with their local statutes and rules, the commercial exploitation of the Publications is fundamental to the maintenance and sustainability of CEN, CENELEC and their Members' activities. CEN and CENELEC are funded primarily by the subscriptions of the Members.

CEN and CENELEC distribution policy of Publications, including their copyright protection, is set under CEN-CENELEC Guide 10 on "Policy on dissemination, sales and copyright of CEN-CENELEC Publications" [22]. Furthermore, CEN and CENELEC assign respectively the right to exploit Publications to each individual national Member by means of a specific bilateral Exploitation Agreement.

A fundamental principle incorporated in Guide 10 and stressed in the bilateral Exploitation Agreement is that Members shall not make European standards and other Publications freely available.

Members have the exclusive right within their own territories (and the non-exclusive right in the territories of third countries) to distribute, adjust, translate, rent, lend, derive revenue from duplication and loan, communicate to the public, transfer all exploitation licences and authorize all sub-licences and otherwise exploit the Publications and their national implementations.

All Members and other identified partners have an obligation to protect the value of the Publications and to ensure that they and their distributors and licensees are in full compliance with the terms and procedures set out in the CEN-CENELEC Guide 10.

[4] Article 17. Par. 2 of the EU Charter of Fundamental Rights protects Intellectual Property Rights, including Copyrights.

Distribution of definitive texts of European Standards

While access to CEN Publications is not free of charge, there are specific circumstances where this could be avoided, for a limited period of time. Members may distribute "definitive texts" of a European standard to end-users as an interim measure for a limited period of time, pending the publication of the national implementation of that European standard. In such cases, the "definitive text" distributed shall not be represented as national implementations, or as having the same authority as national implementations.

Cost of European Standards

CEN Members are themselves responsible for the distribution policy in their own territory, of CEN Publications. This includes fixing the price of each Publication in accordance with the local market conditions. Each CEN Member receives the amount paid by its customers for the purchase of the Publications and of other related services.

CEN Members fix the price on the basis of the number of pages of each document and origin. They use a price ladder for that purpose. Prices may vary for that reason from one country to another.

For example, the Dutch national standardisation body, NEN, would charge for a European Standard (a Publication) of 130 pages approximately 120 EUR.

Depending on the size of the users national Members may offer different purchase solutions. Thus, SMEs or micro enterprises can purchase a single Publication of a European Standard at a preferential rate, while multinationals may purchase more complete licensing solutions allowing them to use and implement the Publication (or set of different Publications) in several places within the same organisation with, possibly, other associated services. The remuneration of these licences may be agreed as a yearly annual fee.

Sponsored access through a Member

Members may make Publications publicly accessible to specified user groups on the basis of sponsorship by a Public Authority or private organization.

In these cases the Member shall always guarantee that the public accessibility to the Publications is granted with appropriate measures that safeguard copyright and in a way that the economic value of the Publications is recognized.

Official language versions

CEN and CENELEC hold the copyright in all Publications in the three official languages, English, French and German.

Members, Affiliates and PSBs may translate Publications into their national language(s) if it is not one of the three official languages, and certify the accuracy of the translation in accordance with the CEN-CENELEC Internal Regulations. This is then deemed to be the definitive language version of that Publication. There shall be only one definitive language version of any Publication.

Members that translate Publications into definitive language versions own the copyright in these language versions, but may not assign it to any third party.

In these cases, Members may reach an agreement to make available the Publications in their national language with the government, or other public or private organisations, against remuneration.

CEN and CENELEC Workshop Agreements: new pricing policy

Specifically with regard to CEN and CENELEC Workshop Agreements (CWAs), and only those in the ICT and R&D domains, a new policy has been approved by the CEN and CENELEC Boards according to which these CWAs can be made publicly available only in the CEN or CENELEC websites, and that the possible loss of revenue to the CEN and CENELEC members is compensated by a pre-payment made by the Workshop hosting the relevant development work through a specific extra charge. This is calculated as 8% of the total cost of the specific CWA to be developed.

It should be noted that the public availability of the CWAs is compliant with the CEN and CENELEC distribution rules, as a third party (i.e.: the Workshop) has already prepaid the access rights to these CWAs for the public. However, this new policy refers only to CWAs in the ICT and R&D domains, and the policy for the dissemination of other CEN and CENELEC Publications, notably European Standards, remains as described above.

Considerations on the EN for e-invoicing

1. In accordance with Regulation 1025/2012 on European standardization, European Standards (ENs), including "harmonized" European Standards, are voluntary.
2. For e-Invoicing, following Standardization Request M/528 given to CEN by the European Commission (and the European Free Trade Association), an EN has been developed and published to support the essential requirements of EU Directive 2014/55/EU.
3. EU Directive 2014/55/EU, Art 7 states that "Member States shall ensure that contracting authorities and contracting entities receive and process electronic invoices which comply with the European standard on electronic invoicing", which implies that CEN EN becomes -exceptionally and de facto- of mandatory use.
4. Stakeholders interviewed for this Study, which also participated in the standardisation activities of the CEN TC 434, expect the EN for e-Invoicing to be made available free of charge.
5. Core Invoice Usage Specifications (CIUS) and extensions of the EN 16931-1 will be developed by other entities (outside of the CEN environment) and published separately.
6. Schematron validation artifacts of the EN for e-invoicing have been made available on Github. [23]

The European Standard (EN) for e-Invoicing and the other ancillary deliverables on e-invoicing developed by the CEN TC 434 are Copyrighted publications and, in order to avoid infringement on the CEN Copyrights, the national authorities and stakeholders who wish to purchase these deliverables need to obtain a license for their use by the relevant National Standardization Bodies under conditions that will satisfy the purpose of their use.

Organisations interested in accessing the European Standard for e-invoicing and its set of documents should contact their CEN National Standardisation Body for more information. [24]

For example, the Cyprus Organisation For Standardisation[5] will make available the CEN/TC 434 Deliverables at the following prices:

Standard reference	**Description**	**Price (without VAT)**
CYS EN 16931-1:2017	Electronic invoicing - Part 1: Semantic data model of the core elements of an electronic invoice	122,00 EUR
CEN/TS 16931-2:2017	Electronic invoicing - Part 2: List of syntaxes that comply with EN 16931-1	31,00 EUR
CEN/TR 16931-4:2017	Electronic invoicing - Part 4: Guidelines on interoperability of electronic invoices at the transmission level	51,00 EUR
CEN/TR 16931-5:2017	Electronic invoicing - Part 5: Guidelines on the use of sector or country extensions	41,00 EUR
FprCEN/TR 16931-6	Electronic invoicing - Part 6: Result of the test of EN 16931-1 with respect to its practical application for an end user	41,00 EUR
CEN/TS 16931-3-1:2017	Electronic invoicing - Part 3-1: Methodology for syntax bindings of the core elements of an electronic invoice	41,00 EUR
FprCEN/TS 16931-3-2	Electronic invoicing - Part 3-2: Syntax binding for ISO/IEC 19845 (UBL 2.1) invoice and credit note	128,00 EUR
FprCEN/TS 16931-3-3	Electronic invoicing - Part 3-3: Syntax binding for UN/CEFACT XML Industry Invoice D16B	122,00 EUR
FprCEN/TS 16931-3-4	Electronic invoicing - Part 3-5: Syntax binding for the Financial Invoice based on ISO 20022	128,00 EUR

[5] http://www.cys.org.cy/en/search-standards

Annex 2 - e-Invoicing Market in Europe

This Annex includes high level information about e-invoicing operators in the European market, e-invoicing exchange models, pricing models and capabilities offered to end users.

e-Invoicing operators

There has been a rise in the number of service providers in Europe, including all categories of e-invoicing operators: from more than 300 operators in 2008 to an estimated 700 in 2016.

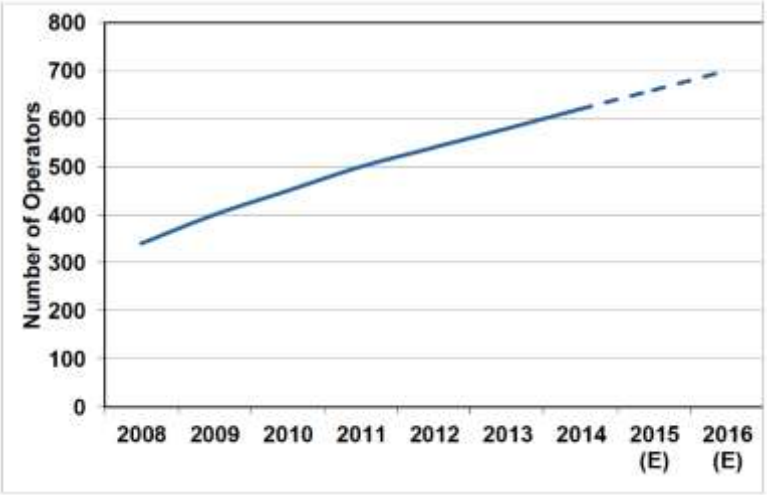


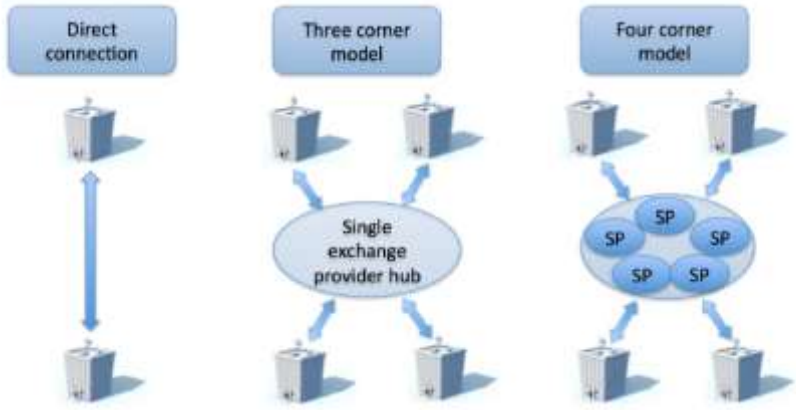
Figure 10: Number of e-invoicing operators in Europe (Source: Billentis)

In the majority of European countries, e-invoicing service and solution providers for any target group (SMEs, LSEs, etc.) are present. Most of them originate from Norway, Sweden, Netherlands, UK, Belgium and Italy [25]; fewer are from Austria, Ireland, Estonia, Greece and Spain. New operators established their business in countries with relevant public sector projects.

Furthermore, the quality of services is also rapidly improving [26]. This may be caused by the high competition between solution providers.

Exchange models

The e-invoicing models depicted below describe the different ways of exchanging e-invoices between the issuer and the recipient. [21]



- **Direct Connection**

A Direct connection is an exchange model consisting of a one-to-one connection between a buyer and a supplier. The key benefit of this model is the fact that it is relatively easy to implement. A drawback is that it will require new test procedures when a supplier changes its IT infrastructure and it can be complex and costly to manage. It becomes even more complex to handle when there is a need to start setting up different relationships with several trading partners.

A Direct connection model requires require a bilateral agreement between the parties.

- **Three Corner Model**

A Three-corner model is an exchange model where the sender and receiver of invoices are connected to a single service provider for sending and receiving e-invoices. The key benefit of this model is that the service provider can offer a customized service to both buyers and suppliers. A drawback is that suppliers might have to work with several service providers simultaneously when their customers are using different systems.

The agreements are settled between the trading parties and the service provider that ensures both ends to communicate through its infrastructure.

- **Four Corner Model**

A Four-corner model is an exchange model where both the sender and the receiver of an e-invoice are supported by a service provider, which makes that two service providers are involved: one for the sender and one for the receiver. The key benefit of this model is that both the buyer and the supplier can choose their own preferred service provider. In this case, service providers are interconnected and validate the exchange of e-invoices between the trading parties.

In this model every partner only connects to its own service provider, and therefore the complexity and the cost are drastically reduced compared with the models above.

The PEPPOL network is an example of a 4-corner model. PEPPOL [18] (Pan-European Public Procurement Online) provides a set of technical specifications that can be implemented in existing e-Procurement solutions and services to make them interoperable across Europe. PEPPOL enables trading partners to exchange standards based electronic documents, linking contracting authorities with their suppliers through a network of Access Point providers.

PEPPOL Access Points connect users to the PEPPOL network and exchange electronic documents based on the PEPPOL message specifications. Buyers and suppliers are free to choose their preferred single Access Point provider to connect to all PEPPOL participants already on the network. (‘Connect once, connect to all’). Roaming fees between PEPPOL Access Point providers are not allowed under the PEPPOL Interoperability Framework.

In particular, PEPPOL has achieved interoperability by:

- Defining a common electronic invoice format through the PEPPOL BIS specification, based on the OASIS UBL 2.1 standard.
- Connecting buyers and suppliers to the network through Access Points that implement the AS2 protocol to connect to each other.
- Implementing a central repository where the Access Points perform the lookup to discover the address of the recipient of the message.
- Establishing a legal interoperability framework (Transport Infrastructure Agreements) to govern the network of service providers and the relationships with their PEPPOL Authorities and OpenPEPPOL.

Pricing models

The list below describes the most used pricing models, even though there is a tendency for service providers to opt for hybrid business models. [27] [28]

- **Transaction or volume-based fee**

This business model has a pricing strategy depending on the volume/number of transactions that are made. The price per transaction is very variable from service provider to service provider, there is not a standard fee. A common way to define this type of fees is to setting up thresholds, defining ranges of transaction volumes and corresponding prices.

- **Subscription fee or time-based fee**

A subscription-based pricing model is a payment structure allowing to purchase or subscribe to a vendor's IT services for a specific period, usually on a monthly or yearly basis. The subscriptions are often bundled together with other services. These subscription plans may have some functional or volume limitations.

- **User-based fee**

The user-based pricing model is depending on the amount of users that will be using the solution. In this case, there are no constraints on the amount of transactions executed.

- **Pay per use**

This pricing model allows access to unlimited resources but the payment (usually a pre-payment) is made based on what is actually used. [29]

- **Functionality-based fee**

This pricing model is commonly used amid ERP vendors and service providers in which the level of fee depends on the required features. The more advanced the features, the higher the fee will be.

- **Buyer-centric fee**

In this model the buyer of the goods or services pays the service provider for the e-invoices received by its suppliers. In this case, the fee is calculated based on different parameters such as the number of suppliers, the number of transactions or even a lump sum.

- **Freemium model**

In this business model, a solution or a service is offered at no cost usually for a limited number of invoices or functionalities. The freemium business model is a combination of “free” and “premium” by which a basic product or service is offered free of charge, but money is charged for premium features or functionality. [30] Some providers monetize with the conversion from free to premium users while others monetize through advertising, data sharing or a combination. [31]

It is important to note the difference between a free trial and freemium. A trial is a limited-term offer that provides definite free access for the user to check the functionality of the service whereas freemium offers indefinite free access. [32]

Capabilities

This section includes a brief description of the most common e-invoicing capabilities offered by service and solution providers.

- **Customer setup**

On-boarding new customers may require a project to set them up. Depending on the type of service, the on-boarding can be self-made, typically for web portal users with no integration with back-end systems, or may require complex integration projects, with definition of communication between the customer back-end systems and the service provider. The customer setup capability refers generally to the latter, the ability to provide support for the setup and on-boarding of complex customers with integration to back-end systems.

- **e-Invoice creation, issuance, receipt and validation**

This includes the capability to create an e-invoice, as well as the functionality to send it out to the receiver and to perform the validation checks of the technical format and the content before sending it and after receiving it. e-invoices can be created implementing different technical syntaxes.

- **e-Invoice mapping, format conversion and transformation**

The capability of transforming from one format to another allows customers of the service providers to send and receive electronic invoices to multiple recipients, despite their method of reception or submission. This capability is important to ease the deployment of complete electronic invoicing projects for the customers, where the service provider will have to handle different situations and types of communications.

- **e-Invoice delivery and transmission**

This capability refers to the transmission of electronic invoices. Being able to connect to several networks allows to move to a four-corner model fostering interoperability.

- **Connection to the PEPPOL network (Access Point)**

As a specific case of the capability above, connecting to the PEPPOL transport infrastructure, based on a four-corner model, open standards and an open and interoperable network of Access Points.

- **Receipt of e-invoices (or invoice data capture)**

This capability is the means to collect invoice data in a structured format from suppliers.

- **Back-office integration**

Back-office integration allows for the complete automation of the invoice capture and reception process, so that the buyer does not need to perform any data entry since invoice information flows directly from the supplier to the buyer's back-office system, requiring no manual intervention.

- **Compliant e-archiving & audit trail**

These capabilities ensure that electronic invoices are stored over time. Service providers shall comply with the relevant legislation on these topics. [33]

- **Payment or (Remittance advice) processing**

Payment processing information refers to the capability to inform the suppliers on the payment status of their invoices, which will ease the process of matching invoices and payments in the supplier side.

- **Master data management**

This capability is based on the synchronization of master data between the back-end system and the service provider. Information about customers and suppliers or about products and prices can be handled by the service provider to ease the submission process of electronic invoices or even the validation of incoming invoices.

- **Support/helpdesk**

The capability to offer support service or a helpdesk is different depending on the size of the customers. It can be an automated service for larger volumes of customer or more customized with account managers for high volume users.

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