

EUROPEAN COMMISSION
Enterprise and Industry DG



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Internal Market and Services DG

European Multi-Stakeholder Forum on Electronic Invoicing

Recommendation on the use of a Semantic Data Model to support Interoperability for Electronic Invoicing

The Recommendation was unanimously adopted by the Forum
at the meeting of 1 October 2013

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Introduction

The replacement of paper based information exchange for business processes with information exchange in electronic form is a highly beneficial global trend. The competitiveness of European economic activity will benefit from this migration. Such electronic information exchange will play a prominent role in achieving the Single Digital Market, as set out in the Communication "A Digital Agenda for Europe"¹, one of the flagship initiatives of the Europe 2020 strategy². The uptake of electronic invoicing has for some time been an identified priority within the Digital Agenda.

The European Commission established the "Expert Group on e-Invoicing" on 7 November 2007³ which adopted its Final Report in November 2009⁴ and the recommendations made by the Expert Group, including those relating to the benefits of developing an e-Invoice semantic data model, were taken up by the European Commission in 2010 in its Communication entitled "Reaping the benefits of electronic invoicing for Europe"⁵. The latter Communication also stated that the European Commission would like to see electronic invoicing become 'the predominant method of invoicing in Europe by 2020'.

The Communication in 2010 also announced the formation of the "European Multi-Stakeholder Forum on Electronic Invoicing (e-Invoicing)", hereinafter referred to as 'the Forum'. One of its tasks was defined as: "Support and monitor work leading to the adoption of an e-Invoice standard data model", which was also described in the context of its work streams as "Activity 4: Migration towards a single e-Invoice standard data model".

Electronic invoicing has been achieving notable rates of adoption and is potentially capable of achieving critical mass in the short to medium term. This is owing to adoption by the public sector in a number of Member States and to private sector adoption through supply chain automation. An active e-Invoicing service provider and solutions industry is supporting this growth. It is recognized that further efforts are required in order for e-Invoicing to achieve its full potential. However, adoption rates in the public sector have lagged behind those within the private sector.

The Forum did at its meeting on 7 March 2013 envisage developing a Recommendation proposing convergence towards a single Semantic Data Model, as defined below, taking into account:

¹ [http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0245R\(01\):EN:NOT](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0245R(01):EN:NOT)

² http://ec.europa.eu/europe2020/index_en.htm

³ http://ec.europa.eu/internal_market/payments/einvoicing/index_en.htm

⁴ http://ec.europa.eu/internal_market/payments/einvoicing/index_en.htm

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0712:EN:NOT>

- The implications for the concerned stakeholders (industry sectors, SMEs, businesses, service providers, vendors, public sector, etc.).
- Recent developments in the Member States by both private and public sectors in the adoption of electronic invoicing.
- The limited capability of SMEs to provide or to integrate a large amount of data⁶.
- Articulated visions and strategies such as expressed in Commission Communications like the one referred to above, and that on "A strategy for e-procurement"⁷, and which stated that "the ultimate goal is straight through e-procurement" with all phases of the procedure from notification (e-notification) to payment (e-payment) being conducted electronically.
- The requirement to be aligned with international trade outside Europe.
- The European Parliament Report A7-0083/2012 on "a competitive digital single market – e-Government as a spearhead" which calls for electronic invoicing to be made mandatory for all public procurement by 2016 and the need for guidance its publication implies.

Recommendation

This Recommendation of the Forum is intended to meet the needs of both the public and private sector on a neutral basis and addresses three themes that need to be elaborated in unison for the further uptake of electronic invoicing:

1. The recognition of an over-arching **Interoperability Framework** as defined in conceptual terms below.
2. The proposed development of a **Semantic Data Model for the Core Section of an Electronic Invoice**, to include definitions, the identification of existing building blocks and practical user guidance.
3. The identification of a **methodology⁸ and implementation plan** for the carrying forward of the development of the Core Section including the identification of an organizational approach to the work required. This third component will be completed by the Forum no later than the end of 2014.

These three themes are described below in further detail:

Context: Interoperability Framework⁹

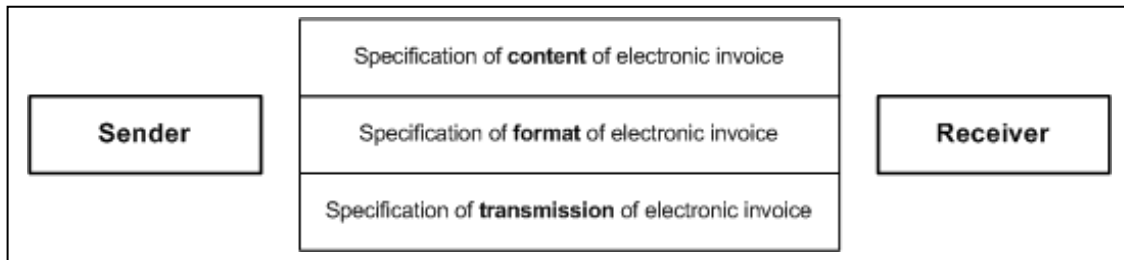
In the exchange of an (e-)invoice between a sender and a receiver, termed the trading parties, they (or their service providers) need to be able to agree on a number of key aspects, the most important being shown in the centre of the following diagram:

⁶ In the short term, SMEs (and larger companies) can provide or integrate only a minimum set of invoice data (5 to 10, concentrated on head and bottom invoice information) in addition to a non-structured human readable e-invoice (e.g. in pdf format) for a complete view of all invoice information.

⁷ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0179:FIN:EN:PDF>

⁸ A solid methodology/rulebook must be developed before a core/extension concept can be applied in a standard environment.

⁹ "Interoperability Framework" is used as 'shorthand' for the concept as described in this Recommendation and should not be confused with the EIF as drafted by the Commission.



At the first level (top), the data structure of the ‘**content**’ is described by a methodology or industry practice and is often expressed in a so-called ‘Semantic Data Model’, which can be defined here as a structured and logically interrelated set of terms and meanings required to meet the business requirements in a commercial context.

At the second level, the physical representation of this content in a structured electronic message is termed the ‘**format**’. Defining ‘data element’ here as: Smallest named item of data that conveys meaningful information or condenses lengthy description into a short code, a format is the representation of the content carried in data elements in a machine-readable form, which is structured and where the data elements are logically related to each other (and potentially to other data elements outside the invoice); it will usually be expressed in a syntax. Syntax is the machine readable ‘language’ or ‘dialect’ used to represent the data elements. Correct deployment of the ‘format’ allows for automated processing of the ‘content’.

At the third level (bottom), **transmission** refers to the aspects of delivery or making available the e-invoice from sender to receiver and includes the network modality, the transport protocol, addressing and routing and the means to support the proof of delivery of the e-invoice.

This Recommendation doesn’t address the presentation of an electronic invoice, which can be implemented in various ways.

The focus of this Recommendation is on **invoice content**, for which to date there is no universally accepted standard defining ‘terms’ and their ‘meanings’. This is a function of the heterogeneity of requirements and invoicing traditions among industries, geographies and jurisdictions, as well as the existence of legacy computer systems. These differing needs and historical circumstances have resulted in a huge variety of often incompatible content standards.

The convergence of electronic invoice content towards a common and comprehensive single semantic model (as recommended for the deployment of e-invoicing in the Communication COM(2010) 712 final) would be very complex, perhaps even difficult to justify due to the heterogeneity of requirements and would currently be unjustified by a business case. At best it remains a remote long term possibility.

A more promising avenue lies in fostering improved ‘**Interoperability**’ between the parties involved in an exchange of electronic invoices. The goal of interoperability is to

allow information to be presented and processed in a consistent manner between business systems, regardless of their technology, application or platform. Successful Interoperability includes the ability to interoperate at all the three levels identified above i.e. in terms of **content, format (or syntax), and transmission**. Additional considerations on the requirements for interoperability in the domains of format and transmission are provided in Annex.

This Recommendation focuses on '**Semantic Interoperability**'. This is defined¹⁰ as 'ensuring that the precise meaning of exchanged information is preserved and well understood in an unambiguous and context dependent manner, independently of the way in which it is physically represented or transmitted'.

In order to describe a way to achieve the semantic interoperability, an invoice is considered to be composed of a number of distinct sections¹¹:

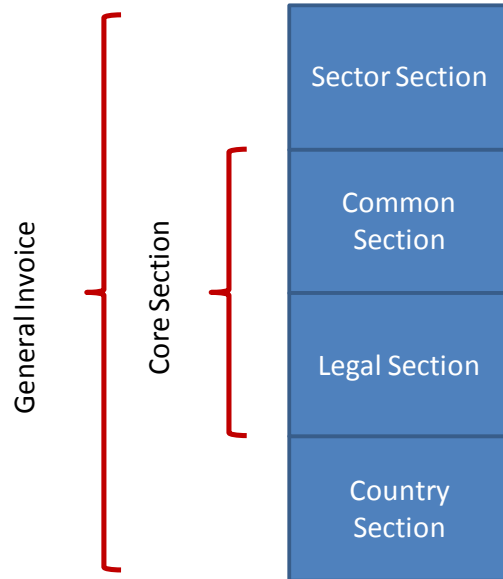
- The **Core Section** contains the Legal Section plus a Common Section. The Legal Section is concerned with both the observance of tax and commercial laws and regulations pertaining to electronic invoicing commonly in force throughout the EU. The Common Section contains commonly used and accepted data elements, which are not sector or country specific.
- The **Sector Section** contains those data elements which are only a concern of a specific industry sector, community, supply chain or buyers and sellers of a particular type of product. Such data elements may be incorporated in an invoice as an 'Extension' of the Core Section data elements.
- The **Country Section** contains those data elements which represent the specific requirements of a particular Member State above and beyond the Core Section data elements and which for local legal or other reasons are required in a compliant electronic invoice¹².

These Sections are illustrated in the diagram below:

¹⁰ From a clarification in the Final Report of the Expert Group on e-Invoicing

¹¹ A further elaboration of Recommendation 4.7 of the Expert Group on e-Invoicing

¹² For instance, the Country Section can contain a readable non structured format including all invoice data that are mandatory at domestic level in response to fiscal and legal requirements that are not covered in the Core Section.



The Core Section of an Electronic Invoice

Reverting to the concept of semantic interoperability, this Recommendation proposes the development of a single **Semantic Data Model for the Core Section of an Electronic Invoice** and guidance to add sector and/or country specific extensions to it, further in this Recommendation to be referred to as ‘Semantic Data Model’, to include definitions, the identification of existing building blocks and practical user guidance.

Such a Semantic Data Model for the Core Section creates the possibility of a ‘Core Invoice’ or ‘Minimum Core Dataset’, which will support basic cross-industry electronic invoicing business requirements. It will not include the business requirements specific to any one particular industry sector, but it will be applicable to a broad community of users under the following conditions:

1. Invoices between trading parties from differing industry sectors should only contain the Core Section and (where applicable) the required data elements from the applicable Country Section;
2. For a satisfactory level of cross-border¹³ interoperability to be possible, a cross-border invoice should ideally have no Country Section and few Sector Section data elements;
3. The Core Section should be simple, stable and designed to be easily implemented to ensure adoption.
4. The Core Section should be developed taking into account existing requirements and specifications and in particular those that are already in common usage.
5. The Core Section should support an agreed and limited set of business processes in which the invoice plays a role, such as validity checking, approval, accounting and payment initiation.

¹³ ‘Cross-border’ is intended to have the ‘Outside-of-Europe’ rather than the Intra-EU-Community perspective

6. The users and stakeholders in the EU environment should work with bodies having the appropriate remit, competence and credentials for the development and maintenance of the Core Section, so that the Core Invoice dataset is usable in practice and covers ‘off the shelf’ a reasonable proportion of the market.

If the trading parties ensure that they used the Semantic Data Model, cross sector interoperability will be enhanced. If Member States ensure that they do not create or perpetuate the mandatory use of Country Section data elements, a greater measure of interoperability would be achievable. The root cause of such Country Section data elements will often lie in country-level legislation and regulations. If these Country Section data elements are harmonized at EU level or dispensed with as appropriate, a considerable barrier to full semantic interoperability would be removed. If such Country Section data elements are retained then trading parties and their service providers will be required to continue to identify and carry such data elements in a compliant manner between the trading parties.

A ‘Core Invoice’ or ‘Minimum Core Dataset’ should be seen as a key enabler for business efficiency by acting as a basis to achieve interoperability with minimum cost and complexity. It would be left to the market to utilize the Core Invoice and express it in different syntaxes depending on specific business use cases. By adhering to one Semantic Data Model, interoperability will be facilitated because semantic data will be able to travel without supplement and/or transformation between formats as the data model is technology-neutral. Trading parties or their service providers could be encouraged to use the Semantic Data Model and the formats and syntaxes representing it, undertaking the necessary conversions, as they require to meet their customers’ needs. Standards bodies would begin to embed the single Semantic Data Model in the syntactical standards for which they are responsible.

Migration to a single Semantic Data Model is anticipated to happen over a period of time, recognizing there are many existing legacy investments and there will be a required period of time before new common solutions can be adopted.

The introduction of a single Semantic Data Model does not imply a ‘single standard’ immediately but more precisely convergence towards a single semantic reference data model to be used by existing solutions as they progress through development lifecycles.

The question then arises as to the availability of a semantic data model that could form the point of reference for the proposed development. Clearly such availability would ease the process.

UN/CEFACT and OASIS are two of the international organisations working on data models that cover the requirements of different industries and sectors; they are recognized and accepted globally and their standards are adopted by many actors within both the private and public sector. UN/CEFACT CII¹⁴ and OASIS UBL Invoice¹⁵

¹⁴ http://www.unece.org/press/pr2009/09trade_p08e.html

¹⁵ <http://ubl.xml.org/>

provide a connection between the various supply chain messages and integrated financial services requirements.

A European Norm (EN) on a “**Semantic Data Model for the Core Section of an Electronic Invoice**”, meeting European requirements, should be developed re-using existing material. Reference points should be the CEN CWA 16356 “MUG”¹⁶¹⁷ providing a European core invoice data model, the UN/CEFACT CII v. 2.0 (as recommended by the EU Expert Group on e-Invoicing), as well as the OASIS UBL Invoice, the CEN BII¹⁸¹⁹²⁰ core invoice for public procurement, the Financial Invoice based on the ISO 20022 methodology, and other activities in the public and private sectors.

Methodology and Implementation Plan

The Semantic Data Model should be delivered by an openly accessible international standards organization to ensure accessibility, and stability in terms of maintenance and quality. It will also ensure that the Core Invoice, based on the Semantic Data Model, is anchored in a global standard from an internationally recognized organization.

It will also be important that during the development process and thereafter appropriate mechanisms are put in place to ensure the proper input of stakeholders, both from the public and private sectors, and from the Forum itself or such successor bodies as are created over time.

This recommendation makes the following proposals in terms of methodology and implementation:

1. The **Semantic Data Model for the Core Section of an Electronic Invoice** should be formalized in a European Norm (EN), and should preferably be adopted not later than the end of 2016.
2. This EN development should be mandated / supported by the European Commission, based on advice by the Forum, as soon as possible, ideally by the end of 2013.
3. This EN development should include the physical and financial supply chain perspective, i.e. not treat the invoice in isolation but consider related documents, and reflect both private and public sector requirements.
4. A proposal for the Terms of Reference defining the scope, requirements and objectives for the EN development work should be provided by the Forum, at the latest by the end of 2013.

¹⁶ <http://www.cen.eu/cen/sectors/sectors/ISSS/Activity/pages/mug.aspx>

¹⁷ CWA 16356 resulted from a joint project of the CEN e-Invoicing 3, BII 2 and eBES Workshops. It represents a first consensus on a minimum set of data for a core semantic data model.

¹⁸ <http://www.cenbii.eu/>

¹⁹ http://www.cen.eu/cen/Sectors/Sectors/ISSS/Activity/Pages/Ws_BII.aspx

²⁰ Profiles developed by the CEN BII Workshop were the basis on which the Pan-European Public Procurement Online (PEPPOL)²⁰ project developed specifications and an interoperability model which have been implemented in 12 European countries. More information on PEPPOL at <http://www.peppol.eu>

European Multi-Stakeholder Forum on Electronic Invoicing

The European Multi-Stakeholder Forum on Electronic Invoicing, the National Fora and all stakeholders are invited to respond positively to this Recommendation and play their part in taking the proposals to the next stage of implementation and adoption.

Annex

In relation to the additional layers of Interoperability identified above, namely **Format** (or syntactical representation) and **Transmission**, a few considerations are relevant to this Recommendation in order to complete the picture represented by this Interoperability Framework. Owing to the vast diversity of trading party relationships, which may be conducted for e-business either directly on a one to one basis or through the intermediation of a service or solution provider, the feasibility of convergence on formats and modes of transmission would be very complex, perhaps even difficult to justify due to the heterogeneity of requirements and currently unjustified by a business case.

However, interoperability is increasingly being offered in the context of networks of users and their service providers and in the context of interoperability between networks. In the context of this network interoperability, it becomes feasible to agree on network standards for format (including syntax) and in the aspects of transmission based on the governance arrangements for the particular network environment. These standards can be used independently of those used in the user system and in the systems of their service providers, if the latter are utilized. The availability of mapping software allows the smooth functioning on an end to end basis. Such interoperability initiatives will benefit from the moves to create a stronger level of semantic interoperability, as they can increasingly adopt the Core Semantic Data Model, and at the same time propel interoperability at the other levels of the framework.

Such ‘network interoperability’ initiatives are common and growing in terms of adoption, both at Member State level and at a pan-European level. Examples of the latter include the PEPPOL project (now governed by OpenPEPPOL AISBL) and the Model Interoperability Agreement of the European E-Invoicing Service Providers Association (EESPA).