

1 **Recommendation on Interoperability for Electronic Invoicing** 2 **The use of a Semantic Data Model**

3 4 **Introduction**

5
6 The replacement of paper documents based information exchange for business processes
7 with information exchange in electronic form is a highly beneficial global trend. The
8 competitiveness of European economic activity will benefit from this migration. Such
9 electronic information exchange will play a prominent role in achieving the Single
10 Digital Market, as set out in the Communication "A Digital Agenda for Europe"¹, one of
11 the flagship initiatives of the Europe 2020 strategy. The uptake of electronic invoicing
12 has for some time been an identified priority within the Digital Agenda.

13
14 The European Commission established the "Expert Group on e-Invoicing" on 7
15 November 2007² which adopted its Final Report in November 2009³ and the
16 recommendations made by the Expert Group, including those relating to the benefits of
17 developing an e-Invoice semantic data model, were taken up by the European
18 Commission in 2010 in its Communication entitled "Reaping the benefits of electronic
19 invoicing for Europe"⁴. The latter Communication also stated that the European
20 Commission would like to see electronic invoicing become 'the predominant method of
21 invoicing in Europe by 2020'.

22
23 The Communication in 2010 also announced the formation of the "European Multi-
24 Stakeholder Forum on Electronic Invoicing (e-Invoicing)", hereinafter referred to as 'the
25 Forum'. One of its tasks was defined as: "Support and monitor work leading to the
26 adoption of an e-Invoice standard data model", which was also described in the context of
27 its work streams as "Activity 4: Migration towards a single e-Invoice standard data
28 model".

29
30 Electronic invoicing has been achieving notable rates of adoption and is potentially
31 capable of achieving critical mass in the short to medium term. This is owing to adoption
32 by the public sector in a number of Member States and to private sector adoption through
33 supply chain automation. An active e-Invoicing service provider and solutions industry is
34 supporting this growth. It is recognized that further efforts are required in order for e-
35 Invoicing to achieve its full potential. However, adoption rates in the public sector have
36 lagged behind those within the private sector.

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

40

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/internal_market/payments/einvoicing/index_en.htm

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

⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52010DC0712:EN:NOT>

- 41 • The implications for the concerned stakeholders (industry sectors, businesses,
42 service providers, vendors, public sector, etc.)
43 • Recent developments in the Member States by both private and public sectors in
44 the adoption of electronic invoicing.
45 • Articulated visions and strategies such as expressed in Commission
46 Communications like the one referred to above, and that on "A strategy for e-
47 procurement"⁵, and which stated that "the ultimate goal is "straight through e-
48 procurement" with all phases of the procedure from notification (e-notification) to
49 payment (e-payment) being conducted electronically;
50 • The European Parliament Report A7-0083/2012 on "a competitive digital single
51 market – e-Government as a spearhead" which calls for electronic invoicing to be
52 made mandatory for all public procurement by 2016 and the need for guidance its
53 publication implies.
54

55 **Recommendation**

56

57 This Recommendation of the Forum is intended to meet the needs of both the public and
58 private sector on a neutral basis and proposes three developments to assist in the further
59 uptake of electronic invoicing:

- 60 1. The proposal and recognition of an over-arching **Interoperability Framework** as
61 defined in conceptual terms below and spelt out in further detail (a.o. in sub-
62 Actions) in the Background Paper provided as a companion to this
63 Recommendation.
64 2. The proposed development of a **Semantic Data Model for the Core Section of**
65 **an Electronic Invoice**, to include definitions, the identification of existing
66 building blocks and practical user guidance.
67 3. The identification of a **methodology and implementation plan** for the carrying
68 forward of the development of the Core Section including the identification of an
69 organizational approach to the work required. This third component will be
70 completed by the Forum no later than the end of 2013.
71

72 These three components are described below:
73

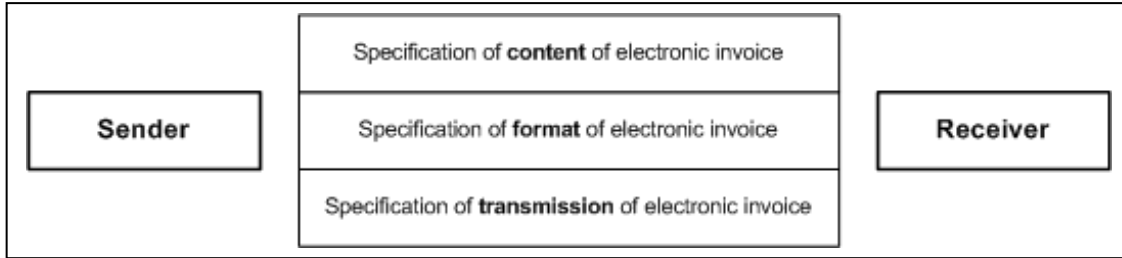
74 **Proposed Interoperability Framework⁶**

75

76 In the exchange of an (e-)invoice between a sender and a receiver, termed the trading
77 parties, they (or their service providers) need to be able to agree on a number of key
78 aspects, the most important being:
79

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0179:FIN:EN:PDF>

⁶ "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.



80
81

82 At the first level, the data structure of the ‘**content**’ is described by a methodology or
83 industry practice and is often expressed in a so-called ‘Semantic Data Model’, which can
84 be defined here as a structured and logically interrelated set of terms and meanings
85 required to meet the business requirements in a commercial context⁷.

86

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

96

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

101

102 The focus of this Recommendation is on **invoice content**, where it is clear that there is no
103 universally accepted standard defining terms and their meanings. This is a function of the
104 heterogeneity of requirements and invoicing traditions among industries, geographies and
105 jurisdictions, as well as the existence of legacy computer systems. These differing needs
106 and historical circumstances have resulted in a huge variety of often incompatible content
107 standards. However, the convergence of electronic invoice content towards a common
108 and comprehensive single semantic model would be very complex, perhaps even difficult
109 to justify due to the heterogeneity of requirements and currently unjustified by a business
110 case. At best it remains a remote long term possibility.

111

112 A more promising avenue lies in fostering improved ‘**Interoperability**’ between the
113 parties involved in an exchange of electronic invoices. The goal of interoperability is to
114 allow information to be presented and processed in a consistent manner between business
115 systems, regardless of their technology, application or platform. Successful
116 Interoperability includes the ability to interoperate at all the three levels identified above
117 i.e. in terms of **content, format (or syntax), and transmission**. A short discussion of the
118 requirements for interoperability in the domains of format and transmission is provided at

⁷ Ref: ‘Background Document’ as companion to this Recommendation

119 the end, but only as a means of defining all the elements of the proposed Interoperability
120 Framework and recognizing the prime focus herein on invoice content.

121

122 To be precise this Recommendation focuses on ‘**Semantic Interoperability**’ This is
123 defined⁸ as ‘ensuring that the precise meaning of exchanged information is preserved and
124 well understood in an unambiguous and context dependent manner, independently of the
125 way in which it is physically represented or transmitted’.

126

127 In order to describe a way to achieve the semantic interoperability, an invoice is
128 considered to be composed of a number of distinct sections⁹:

129

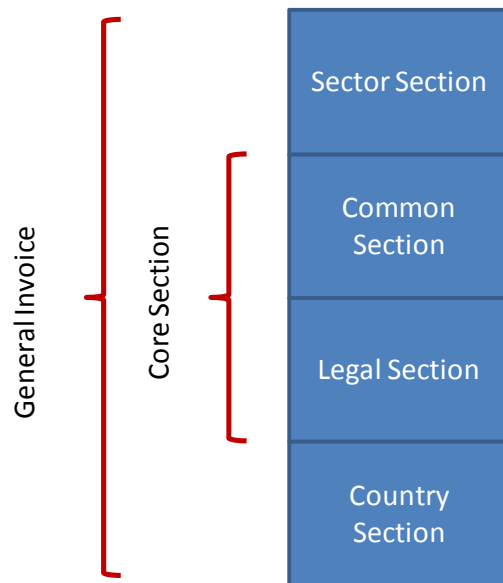
- 130 • The **Core section** contains the Legal Section plus a Common Section. The Legal
131 Section is concerned with both the observance of tax and commercial laws and
132 regulations pertaining to electronic invoicing commonly in force throughout the
133 EU. The Common Section contains commonly used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

143

144 These Sections are illustrated in the diagram below:

145

146



147

⁸ From a clarification in the Final Report of the Expert Group on e-Invoicing

⁹ A further elaboration of Recommendation 4.7 of the Expert Group on e-Invoicing

148 **The Core Section of an Electronic Invoice**

149

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

155

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

161

- 162 1. Invoices between trading parties from differing industry sectors should only
163 contain the Core Section and (where applicable) the required data elements from
164 the applicable Country Section;
- 165 2. For a satisfactory level of cross-border¹⁰ interoperability to be possible, a cross-
166 border invoice should ideally have no Country Section and few Sector Section
167 data elements;
- 168 3. The Core Section should be simple, stable and designed to be easily implemented
169 to ensure adoption.
- 170 4. The Core Section should be developed taking into account existing requirements
171 and specifications and in particular those that are already in common usage.
- 172 5. The Core Section should support an agreed and limited set of business processes
173 in which the invoice plays a role, such as validity checking, approval, accounting
174 and payment initiation.
- 175 6. The users and stakeholders in the EU environment should work with bodies
176 having the appropriate remit, competence and credentials for the development and
177 maintenance of the Core Section, so that the Core Invoice dataset is usable in
178 practice and covers ‘off the shelf’ a reasonable proportion of the market.

179

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

190

¹⁰ ‘cross-border’ is intended to have the ‘Outside-of-Europe’ rather than the Intra-EU-Community perspective

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

202
203 Migration to a single Semantic Data Model is anticipated to happen over a period of time,
204 recognizing there are many existing legacy investments and there will be a required
205 period of time before new common solutions can be adopted.

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

209
210 The question then arises as to the availability of a semantic data model that could form
211 the point of reference for the proposed development. Clearly such availability would ease
212 the process.

213
214 UN/CEFACT and OASIS are two of the international organisations working on data
215 models that cover the requirements of different industries and sectors; they are
216 recognized and accepted globally and adopted by many actors within both the private and
217 public sector.

218 UN/CEFACT CII¹¹ and OASIS UBL¹² work provides the required connection between
219 the various supply chain messages and is integrated with financial services requirements.
220 A European Norm (EN) on e-invoicing that meets European requirements should be
221 established, and due to their nature both UN/CEFACT CII and OASIS UBL may serve as
222 global common points of reference to which the EN on e-invoicing can relate in order to
223 achieve global interoperability.

224
225 There exist several ‘Core invoices’, for example as in MUG¹³, BII^{14,15}, ..., each
226 individually more or less based on the UN/CEFACT work and each with different states
227 of adoption.

228
229 In particular, the PEPPOL¹⁶ project has developed specifications and an interoperability
230 model (based on profiles that have been agreed in the CEN BII Workshops) which have

¹¹ http://www.unece.org/press/pr2009/09trade_p08e.html

¹² <http://ubl.xml.org/>

¹³ <http://www.cen.eu/cen/sectors/sectors/ISSS/Activity/pages/mug.aspx>

¹⁴ <http://www.cenbii.eu/>,

¹⁵ http://www.cen.eu/cen/Sectors/Sectors/ISSS/Activity/Pages/Ws_BII.aspx

¹⁶ Initiated in 2008, the Pan-European Public Procurement Online (PEPPOL) project has been developing and implementing the technology standards to align business processes for electronic procurement across

231 been implemented in 12 European countries, including Norway and Austria which have
232 made e-Invoicing mandatory for public sector suppliers, referencing the PEPPOL e-
233 invoicing specifications and network as an implementation method.

234
235

236 **Methodology and Implementation Plan**

237

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

242

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

247

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

250

- 251 1. The **Semantic Data Model for the Core Section of an Electronic Invoice**
252 should be formalized in a European Norm (EN), and should preferably be
253 adopted not later than the end of 2014
- 254 2. This EN development should be mandated / supported by the European
255 Commission, based on input by the Forum, as soon as possible, ideally by the
256 end of 2013.
- 257 3. This EN development should include the supply chain perspective i.e. not treat
258 the invoice in isolation but consider related documents, and reflect both
259 private and public sector requirements.
- 260 4. A proposal for the Terms of Reference defining the scope, requirements and
261 objectives for the EN development work will be provided by the Forum, at the
262 latest by the end of 2013.

263

264 The Forum, National Forums and all stakeholders are invited to respond positively to this
265 Recommendation and play their part in taking the proposals to the next stage of
266 implementation and adoption.

267

268 Note:

269 In relation to the additional layers of Interoperability identified above, namely **Format**
270 (or syntactical representation) and **Transmission**, a few remarks and suggestions are
271 relevant to this Recommendation in order to complete the picture represented by this
272 Interoperability Framework. Owing to the vast diversity of trading party relationships,
273 which may be conducted for e-business either directly on a one to one basis or through
274 the intermediation of a service or solution provider, the feasibility of convergence on

275 formats and modes of transmission would be very complex, perhaps even difficult to
276 justify due to the heterogeneity of requirements and currently unjustified by a business
277 case.

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

289 Such 'network interoperability' initiatives are common and growing in terms of adoption,
290 both at Member State level and at a pan-European level. Examples of the latter include
291 the PEPPOL initiative (Pan-European Public Procurement On-Line, originally funded by
292 the Commission and a number of public authorities whose activities are governed by
293 OpenPEPPOL AISBL¹⁷) and the Model Interoperability Agreement of the European E-
294 Invoicing Service Providers Association (EESPA).

295

296 ENDS

¹⁷ http://www.peppol.eu/about_peppol