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Recommendations and standards

Other deliverables for noting

Supply Chain Reference Data Model (SCRDM) Guideline

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I. About this document

1. This document describes and specifies the use, creation and maintenance of Reference Data Models (RDM).

II. Executive Summary

2. The advantage of the RDM approach is that an RDM draws on the overall available Aggregate Business Information Entities (ABIEs) within the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) United Nations Core Component Library (UN/CCL), creating a complete and focused subset specific to the needs of a segment, examples being the UN/CEFACT Supply Chain RDM (SCRDM) covering the contract for the supply of the goods, and the UN/CEFACT Multi Modal Transport RDM (MMT RDM¹) covering the contract for the supply of transport and related services.
3. Further, in this example, given both of these RDMs are drawn from (subsets of) the UN/CCL, interoperability between the RDMs is ensured.
4. The benefits of RDMs is that they provide business process modelers, business process analysts and software designers a base To-Be architecture to be achieved.
5. Starting from a base To-Be architecture, rather than attempting independently to understand and harmonize numerous disparate As-Is situations will commence to address the long and well-understood problem of lack of information interoperability between applications in the e-business arena (which have traditionally adversely impacted supply chains).
6. Company Boards and Government Agency heads should move to embrace To-Be RDMs as a means of increasing efficiencies, productivity and growth—simultaneously reducing the waste of technology applied to existing disparate non-interoperable and non-standardized information flows.
7. Work by the International Network of Customs Universities, the World Customs Organization (WCO), the European Union (EU) and the United Nations Economic Commission for Europe (UNECE) describes “seamless integrated data pipelines”. The concept of “seamless integrated data pipelines” enables the actors to build up data progressively, where all of the business and trade data required to progress trades is put in only once by the data originator.
8. The Union Customs Code (UCC) supporting legislation requires that global trade addresses transparency, and that accurate business and trade data precede the movement of physical trade goods. This legislation allows for a transition period until 2020.
9. UN/CEFACT standards based RDMs provide the base To-Be understanding to be delivered over seamless integrated data pipelines, servicing supply chain traders and service providers at the level of interoperability and flexibility required, and specifically by 2020. Due to the evolving nature of the UN/CEFACT RDM, the guideline includes material that focuses on the business community doing further discovery and analysis work. Some of the contents of this guideline are not typical of this type of technical document. However, they are critical for successful adoption and standardization in this area to move forward.

¹ Under development

A. Status of this document

10. This Guideline has been developed in accordance with the Revised Open Development Process ECE/TRADE/C/CEFACT/2016/17 for Guidelines, and approved for publication by the UN/CEFACT Bureau.

B. Revision history

| <i>Version</i> | <i>Release</i> | <i>Date</i> | <i>Comment</i> |
|----------------|----------------|------------------|----------------|
| 1.0.0.1 | Internal draft | 1 August 2016 | Initial |
| 1.0.0.2 | Draft | 15 December 2016 | Final |

C. Document context

11. The RDM artefacts are published as Reference Business Information Entities (BIEs) in the Context CCL. Each UN/CEFACT domain can publish an RDM including a Master Data Exchange Structure.

12. The Context Business Requirement Specifications (Context RDM-BRS) and Context Requirement Specification Mapping (Context RDM-RSM) are the high-level documents for the processes and requirement mappings for the individual processes and artefacts used for a particular RDM, such as for the context of the Supply Chain (SCRDM-BRS and SCRDM-RSM).

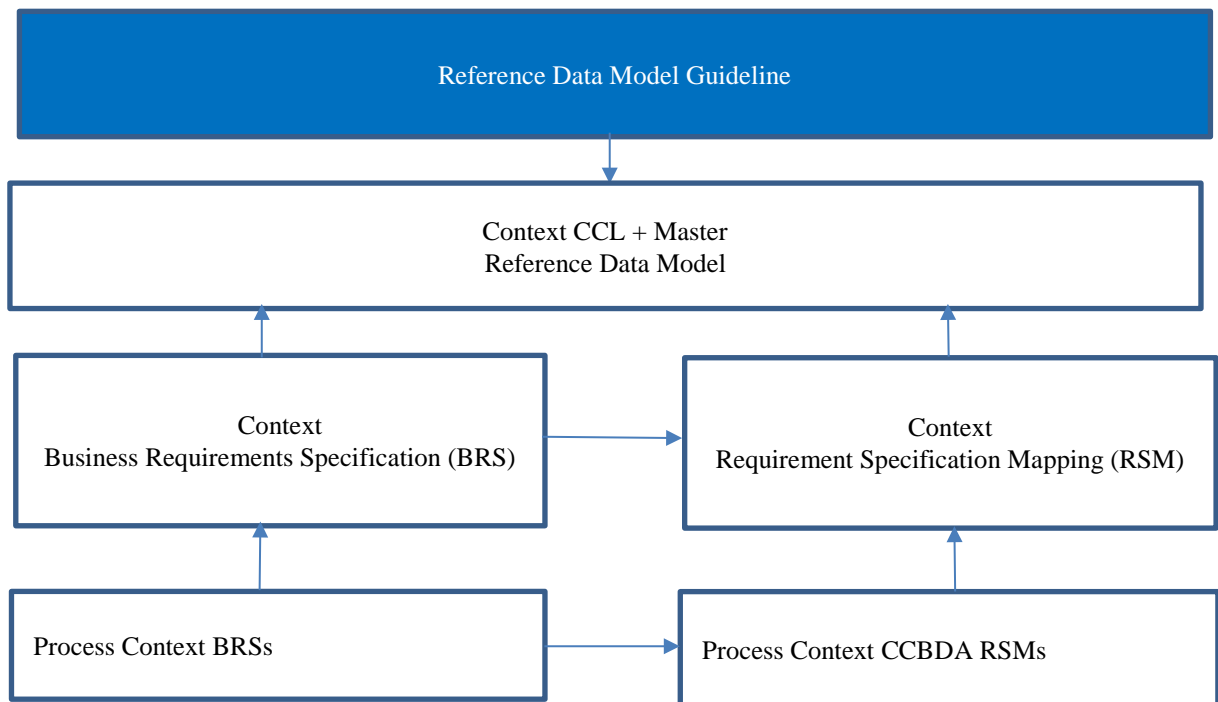


Figure 1. Document Context

III. Project Team

A. Disclaimer

13. The views and specification expressed in this document are those of the authors and are not necessarily those of their employers. The authors and their employers specifically disclaim responsibility for any problems arising from correct or incorrect implementation or use of this technical specification.

B. Project Team Participants

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IV. Introduction

14. The main audience for this document is primarily the UN/CEFACT business and Information Technology (IT) experts who are responsible for specifying, creating or updating existing UN/CEFACT RDMs, the business requirements for e-business solutions in a specific domain, and for furthering the development of solutions as relevant standards. Other audiences may include other standards bodies or users and developers in developed or developing economies.

15. An understanding of data modelling would assist the reader to take full advantage of this document.

16. The information described in this manual is aimed at:

- UN/CEFACT community
- Corporate and Government Chief Technology Officers and their staff
- Business process modelers
- Business data modelers
- Application developers

A. Structure of this document

17. Due to the diversity of the intended audience, this document has been divided into the following sections:

- Section IV: Introduction
- Section V: Reference Data Model
- Section VI: Working Process and Methodology
- Section VII: Steps for using a Reference Data Model
- Section VIII: Steps for updating a Reference Data Model
- Section IX: Steps for creating a Reference Data Model
- Section X: Definition of Terms

18. A business audience may choose to read through the working process and methodology section (section VI) and only reference the sections VII, VIII and IX as needed. A technical audience may choose to focus on the technical details (sections VII, VIII, and IX), referring to the methodology (section VI).

B. Related documents

19. Knowledge and application of the following standards are crucial to the development of RDMs. Other key references are shown in the appropriate part of the document.

- UN/CEFACT White Paper - Reference Data Model (RDM) (Draft v1.0.0.2).
- UN/CEFACT Supply Chain Reference Data Model Business Requirement Specification (SCRDM-BRS) (Draft v1.0.0.2).
- UN/CEFACT Supply Chain Reference Data Model Requirement Specification Mapping (SCRDM-RSM) (Draft v1.0.0.2).
- UN/CEFACT SCRDM Master Structure and Subset of UN/CCL D16B (Context CCL) (Draft v1.0.02).
- UN/CEFACT Core Component Library D16B.
- UN/CEFACT Techniques and Methodologies Group's (TMG) UN/CEFACT Modelling Methodology (UMM): UMM Meta Model Foundation Module (Candidate for 2.0) 2009-01-30.
- UN/CEFACT Core Components Technical Specification – Part 8 of the ebXML Framework dated 15 November 2003 Version 2.01 - (CCTS 2.01).
- UN/CEFACT – Core Component Technical Specification Technical Corrigendum Version 2.01 (Corr. 1) dated 12 February 2007 (CCTS 2.01 Corr.1).
- UN/CEFACT XML Naming and Design Rules Version 2.1, dated 27 May 2014 (NDR 2.1).
- UN/CEFACT Core Components Business Document Assembly Technical Specification (CCBDA) version 1.0 27 June 2012.
- UN/ESCAP UNNExT UNECE Data Harmonization and Modelling Guide for Single Window environment, version 2012, ST/ESCAP/2619.
- UNTDED United Nations Trade Data Elements Directory 2005 (UNTDED)
- UNECE - Recommendation n°1 – United Nations Layout Key for Trade Documents.
- UNECE - Recommendation n°33 Recommendation and Guidelines on establishing a Single Window.

- UNECE - Recommendation n°34 – Data Simplification and Standardization for International Trade.
- UN/CEFACT BRS Cross Industry Quotation, version R1.00.12.
- UN/CEFACT BRS Cross Industry Ordering, version 1.00.09.
- UN/CEFACT BRS Cross Industry Delivery, version 1.00.13.
- UN/CEFACT BRS Cross Industry Scheduling, version 1.00.09.
- UN/CEFACT BRS Cross Industry Invoicing, version: 2.00.06.
- UN/CEFACT BRS Cross Industry Remittance Advice, version: 1.00.01.
- UN/CEFACT CCBDA Requirement Specification Mapping (RSM) Cross Industry Invoicing², version: 1.0.

20. In this document the set of CCTS 2.01 / CCTS 2.01 Corr.1 / NDR 2 / CCDTC 2.1 specifications are referred to as "UN/CEFACT Technical Specifications Version 2".

21. Formal definitions of many of the technical terms used in this reference data model guideline may be found in the above references but, for convenience, some key definitions are included in section X of this document.

22. The SCRDM has been created from the artefacts, semantics used in RSMs³ belonging to the above specified BRSs. The document-centric artefacts were the basis for the development of the non-document, process-driven SCRDM artefacts, which are published in the UN/CCL⁴.

C. Purpose and scope

23. The business goals of this guidelines are:

- To support easy interchange of information models between different domains.
- To support and encourage interoperability between syntaxes for data exchange structures.
- To support future mapping to and from UN/EDIFACT and United Nations Layout Key (UNLK) Documents.
- To support guidelines for using the Reference Data Model to define subsetted data exchange structures.
- To ease the use of the UN/CEFACT standardized and harmonized semantic framework.
- To encourage the use of UN/CEFACT CCTS 2.01 compliant information models.
- To support alignment between UN/CEFACT RDMs.
- To support UN/CEFACT CCBDA.

² At this moment only the CI Invoicing CCBDA RSM has been published.

³ At this moment only the CI Invoicing CCBDA RSM has been published.

⁴ For the initial publication, the latest published UN/CCL is D16B.

D. Target solution

24. In conjunction with the high-level context RDM-BRS and high-level context RDM-RSM document, the purpose of this guideline is to provide standardized guidance for using, updating and creating RDMs published by UN/CEFACT.

V. Reference Data Model

A. Philosophy behind the concept

25. The conceptual design is based on the assumption that information exchanged tends to have a large degree of similarity. Therefore, rather than linking the information to document specific entities, such as an order, each RDM has its own generic Master Data Exchange Structure from which the specific Business Data Exchange Structures, within a business process, can be created. So, the generic Master Data Exchange Structure contains the main semantic payload for all communication exchanges.

B. Business Process Reference Model

26. The elements of data in an RDM are stored in the UN/CEFACT repository, and represented both as human-readable and machine-processable. The UN/CEFACT BRS documents and UN/CCL capture a wealth of information about the business reasons for semantics and structure incorporated in an RDM.

27. The harmonization of business information for the RDM is done by business experts within a UN/CEFACT business domain. The UN/CEFACT harmonization of business information between RDMs is done by experts within the UN/CEFACT Library Maintenance. Within a business community (domain) business experts will focus on the identification of exact information similarities and differences between other RDMs.

28. The SCRDM-BRS is an example of an overview of the business processes complementary to an RDM. This document describes, at a high level, the requirements for the SCRDM supporting the business and regulatory processes involved in the national and the cross-border supply chain, covering the involved business areas, the main parties and the information involved. The SCRDM-BRS, in combination with the UN/CEFACT International Supply Chain (Buy/Ship/Pay) Reference Model (ISCRM) and the BRS for the Multi-Modal Transport RDM (MMT RDM BRS⁵) provides the framework for any cross-border transport-related business and government domains to specify their own specific information exchange requirements whilst complying with the overall process and data structures. In addition, only the high-level process descriptions are described in order that the detailed process analysis of the subset scenarios can provide the detailed process requirements in further refined BRSs.

C. Single Window

29. The need for simplification and harmonization is particularly evident in the preparation and submission of the extensive range of information and documents required by governmental authorities to comply with import, export and transit-related regulations. UNECE Recommendation n°33 addresses this problem by recommending to governments

⁵ Under development.

and traders the establishment of a “Single Window”, whereby trade-related information and/or documents need only be submitted once at a single entry point to fulfil all import, export, and transit-related regulatory requirements. The establishment of a Single Window constitutes an important building block in the area.

30. An RDM, based on the UN/CCL, can bring together the data exchange requirements of international trade, procurement, insurance, customs and other regulatory documents based on the integration of trade facilitation and electronic business best practices. UNECE Recommendation n°1, provides a list of key documents prepared and used by stakeholders at different stages of the international supply chain. The United Nations Layout Key (UNLK) documents are categorized into document sets. These document sets, although separated in the Supply Chain Process by their functionality, have a similar structure which helps to ensure that all documents are aligned. Business Data Exchange Structures derived from a UN/CEFACT RDM follow the concepts described in UNECE Recommendation n°1. This ensures that trading partners can choose the type of document or trade data exchange technology that best meets their business requirements and technology capabilities and also provides a migration path for the adoption of new technologies.

D. Master Data Exchange Structure

31. The ABIE framework provides the structure for components of the body of a Business Data Exchange Structure. An RDM is based on Reference ABIEs taken from the UN/CCL. Today, the business community generally agrees on the definition of a standard Business Data Exchange Structure. Each UN/CEFACT RDM has a generic Data Exchange Structure. The ABIEs, which are made available by means of this structure, commonly have no restrictions on cardinality. Almost all elements of data made available are optional because one or more data exchange structures, required in different contexts, will use them.

32. As an example, within the SCRDM the number of elements of data used across different processes differs for the ABIE Trade Product. In a catalogue data exchange more detailed information about a product could be provided. The Master Data Exchange Structure therefore provides the possibility to create data exchange structures just covering incremental data for a particular business process step. The Core Component Business Document Assembly (CCBDA) is used to create new data exchange structures based on the Master Data Exchange Structure of the RDM.

VI. Working process and methodology

A. Searching for a Reference Data Model

33. UN/CEFACT shall publish the RDMs in human-readable and machine-readable formats. The appropriate model can be selected or downloaded from the list of available RDMs, depending on the context of the business community, such as Supply Chain, can be selected or downloaded. Before looking at the RDM itself, it is strongly recommended to read the high-level BRS and RSM documents belonging to an RDM. If no appropriate RDM is available, then read section VI, chapter D: Creating a Reference Data Model.

B. Using an existing Reference Data Model

34. An existing RDM is a collection of business information elements of data, having a particular standard data exchange structure and built up from one or more business requirements lists. An RDM covers all data of different processes and scenarios written in

the business requirements lists. It is important to identify the business processes for the RDM by selecting the appropriate BRSs, such as the BRS for the Cross Industry Invoicing process. The BRS document specifies the required data in business terms. The related RSM document specifies the elements of data used to cover these business requirements. Thus, the business information (ABIEs) specified in the RSM document of a particular process will only show the used elements of data, whereas the RDM shows the overall data. For this reason, business information specified in an RSM are “Message Business Information Entities” (MBIEs). More information can be found in the CCBDA specification. By using this specification new Business Data Exchange Structures can be derived from the RDM. If business information should be added and/or updated, then read the following sections. (Section VII will provide more detailed information on how to use an RDM.)

C. Updating a Reference Data Model

35. Updating an RDM can be done on two levels. The first level is adding data or changing the cardinality (occurrence) of BIEs in the Context CCL. The RDM represents a subset of the UN/CCL. The business information in this subset is commonly restricted. For example, looking at the SCRDM, business information requirements for a consignment may differ from the one in the Multi Modal Transport Reference Data Model (MMT RDM). The context level puts a “layer” on the BIEs reflecting the use and restrictions for that particular context. Changing the use or cardinality of business information within this level will have impact on all Business Data Exchange Structures derived from the model. The Master Data Exchange Structure is the second level, using the business information of the context level. It is not recommended to change the use or cardinality of BIEs in the Context CCL and/or Master structure. For example, a trade line item could be made mandatory in the Master structure and therefore it will be mandatory for all data exchange structures derived from the master. In addition, at this moment, SCRDM and MMT RDM are using the same UN/CCL subset in order to increase interoperability. Section VIII will provide more detailed information on how to update an RDM.

D. Creating a Reference Data Model

36. Creating an RDM takes some effort and will need close cooperation between the members of the relevant business community. Commonly, a business community might have developed their own RDM, based on their propriety BIEs. The process of developing a new RDM must be covered by a UN/CEFACT project proposal. An important step within the UN/CEFACT Open Development Process (ODP) is requirements gathering. Within this step, business contexts, business processes, business requirements, scenarios, diagrams, etc. must be provided to support requested BIEs—all by using UN/CEFACT Modelling Methodology (UMM). UMM describes a Unified Modeling Language (UML) based modelling approach to develop UMM information entities.

37. Within UN/CEFACT standards, the Core Component framework of Core Components (CCs) and BIEs prescribes the mechanism for discovery, normalization, context specialization and structure of UMM Information entities. The UN/CCL is a rich library containing domain-specific and cross-industry BIEs. In order to avoid creation of new BIEs, the development basis for each new RDM must be the UN/CCL. Section IX will provide more detailed information on how to create an RDM.

VII. Steps for using a Reference Data Model

38. When conducting data harmonization and designing electronic data exchange structures, it is helpful to use an approach of breaking down the task into smaller steps. Each step has a specific objective, and a defined output which becomes an input into the next step. This stepwise approach is considered best practice and is recommended in different data harmonization guides such as the Asia-Pacific Economic Cooperation (APEC) Data Harmonization Guide (APEC ESCG 2009) and the Single Window Implementation Framework (SWIF 2010). The stepwise approach is also implemented and described in the data harmonization concept of UNECE Recommendation n°34. Step 2 (Analyse process), Step 3 (Capture & define data), and Step 4 (Analyse data) explain the development of a simplified, standardized and harmonized data set. Step 5 (Reconcile data) and Step 6 (Structure data) explain the mapping of the data set to an RDM and obtaining the Master structure. The SCRDM is selected as an RDM in this guideline for illustration.

Step 1: Initiate a project



39. It is strongly recommended to initiate a project in case of using a UN/CEFACT RDM with the intention to derive Business Data Exchange Structure(s) to be used internationally, and therefore published by UN/CEFACT as a standard.

Step 2: Analyse process



40. A Business Process Analysis (BPA) is a structured, formal approach for capturing, analysing and simplifying business processes. A BPA provides an “as-is” picture of business processes in the current trade environment. By analysing the “as-is” processes and identifying bottlenecks, recommendations can be developed and implemented to obtain a “to-be” picture. This procedure leads to a simplification of the processes prior to their automation.

41. Often a BPA is carried out as an independent project, before data harmonization. To simplify, standardize and automate data and documents, one has to understand the business processes that generate or use both the data and the documents. The first step in a data harmonization project is to collect all the data requirements in relevant business documents by analysing the target business processes. This step will deliver the list of business documents that are used in a data harmonization project and a description of the business processes in which these documents are used.

42. BPA is conducted in three major phases as shown in Figure 2:

- Phase I: Scope setting
- Phase II: Data collection and process documentation
- Phase III: Process analysis and recommendations development

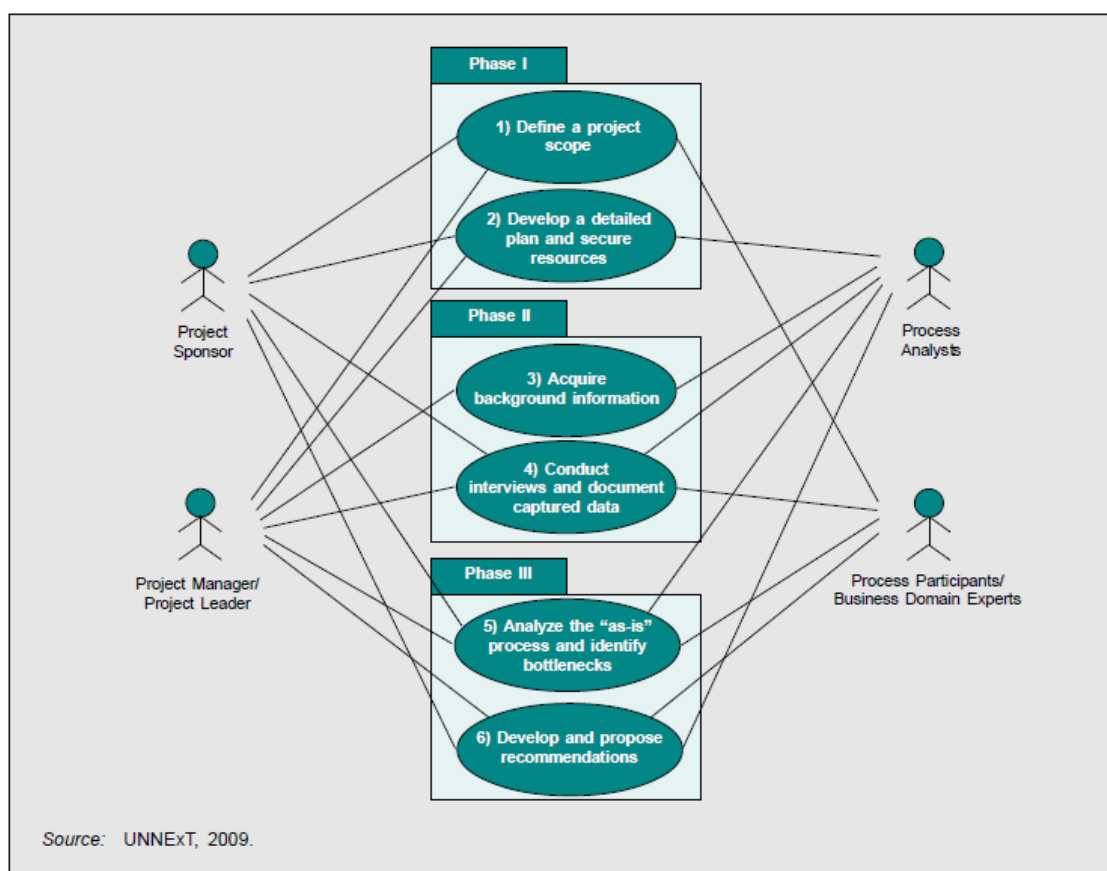


Figure 2. Stepwise approach to Business Process Analysis⁶

43. The outcome of the data collection and process documentation in Phase II helps to understand the data requirements of the stakeholders. If the captured business processes are further simplified in the "to-be" picture, data requirements are likely to be simplified as well.

44. Figure 3 illustrates two types of UML diagrams used in the BRS for visualization of business processes—Use Case diagram and Activity diagram. The primary purpose of the Use Case diagram is to describe the main activities and actors that are included in a BPA (see figure 4 as an example).

45. The diagram provides the framework and the terms of reference for the detailed analysis of the processes in the activity diagrams. Each activity diagram is an elaboration of a use case or business process. It describes how each business process (denoted by a use case in a use case diagram) is carried out step-by-step, who is responsible for carrying out which activity, what documentary requirements are involved, and how the information flows.

⁶ Source: UN/ESCAP UNNExT UNECE Data Harmonization and Modelling Guide for Single Window environment, version 2012, ST/ESCAP/2619.

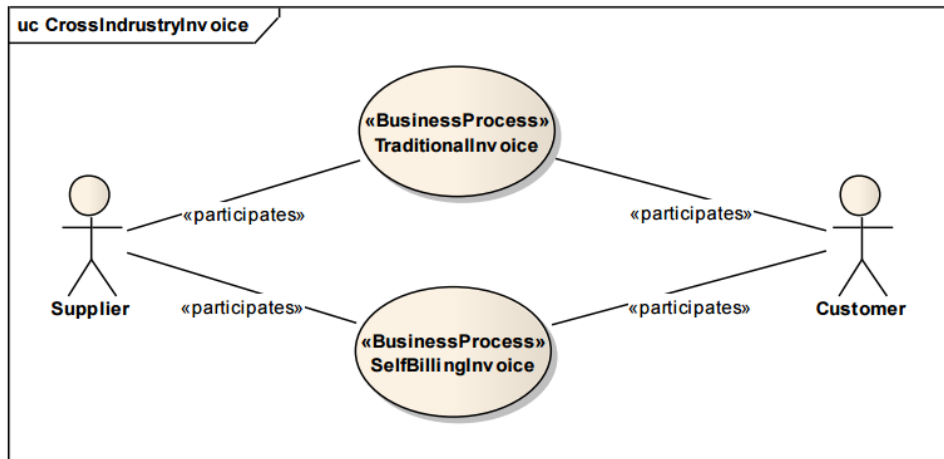


Figure 3. Use Case Diagram: process and actors⁷

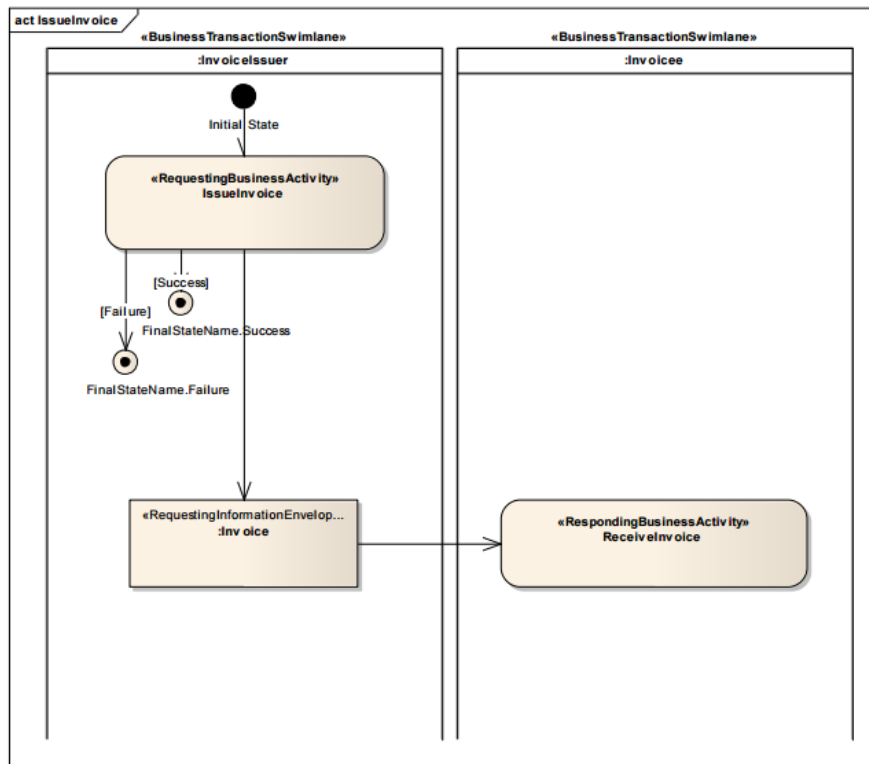


Figure 4. Use Case Activity Diagram

46. From activity diagrams, one can generate a list of paper documents and electronic data exchange structures or messages that fall into the scope of the data harmonization project. The name of the party responsible for issuing each paper document and electronic document or message can also be located. Figure 5 shows a list of forms captured from activity diagrams in an actual BPA.

⁷ See also: UN/CEFACT UMM_userguide_220606.pdf.

Step 3: Capture and define data

47. The purpose of this step is to obtain a precise description of the data requirements. The data is described and specified using the definitions and terminology of business users and experts (e.g. buyer/seller or freight forwarder). This forms the basis for a solid understanding of the semantics of the data, its type, representation, format, and constraints—which are crucial for the automation of the information flow at a later stage. Any ambiguity in the meaning and the usage of data elements delays the process of harmonizing the attributes of these data elements with the selected semantic rules, and creates inconsistency in the mapping. When this step is completed, a data dictionary is available for each document identified in the first part of this step (Capture data), which describes in detail the data elements contained in the document from a user point of view. A data dictionary provides definitions for the data elements in a form. Good sources to identify exact meaning of data elements are often collected during the business process analysis, especially during Phase II.

| | |
|--|---|
| 1. Proforma Invoice | 19. Cover Note |
| 2. Purchase Order | 20. Bill of Lading |
| 3. Application for Permission to Export Rice | 21. Insurance Policy |
| 4. Sales Report | 22. Export Declaration |
| 5. Application for the Collection of the Permit for the Export of Rice | 23. Good Transition Control List |
| 6. Permit for the Export of Rice | 24. TKT 308.2 |
| 7. Application for Certificate of Standards of Product | 25. Equipment Interchange Report (EIR) |
| 8. Rice Quality Certificate | 26. Container Loading List |
| 9. Certificate of Standards of Products | 27. Container List Message |
| 10. Application for Phytosanitary Certificate | 28. Outward Container List |
| 11. Booking Request Form – Border Crossing | 29. Manifest |
| 12. Booking Confirmation – Border Crossing | 30. Phytosanitary Certificate |
| 13. Booking Request Form – Inland Transport | 31. Certificate Origin |
| 14. Booking Confirmation – Inland Transport | 32. Application for Certificate of Origin |
| 15. Cargo Insurance Application Form | 33. Application for Letter of Credit |
| 16. Commercial Invoice | 34. Credit Advice |
| 17. Letter of Credit | 35. Debit Advice |
| 18. Packing List | 36. Remittance Advice |

Source: UNNEXT, 2009

Figure 5. Sample list of forms captured from Activity Diagrams⁸

Step 4: Analyse data

48. The purpose of this step is to organize data specifications from different documents in a comparable manner. This step facilitates a consistent mapping of the data elements to an RDM, which is done in the next step. The compilation of data requirements is based on data definition, i.e. data elements from various documents with identical definition are placed in the same row (see figure 7). To ensure consistent mapping, data dictionaries should be

⁸ Source: UN/ESCAP UNNEXT UNECE Data Harmonization and Modelling Guide for Single Window environment, version 2012, ST/ESCAP/2619.

compiled in such a way that they belong to the same type of business document. The following categories are suggested (see also figure 6):

- Category 1 includes documents that are related to commercial transaction (BUY)
- Category 2 includes documents for transport and official control that provide information on a consignment(s) (SHIP)
- Category 3 includes documents that are related to financial transaction and payment (PAY)

49. Organizing data dictionaries in this manner facilitates the mapping of the data elements with the RDM in step 5 (Reconcile data).

| Process | UNLK Document Family | Documents |
|---------|------------------------|---|
| Buy | Commercial Transaction | <ul style="list-style-type: none"> • All documents exchanged between partners in international trade for the invitation to tender, through the exchange between prospective seller and prospective buyer to the inclusion of contract, i.e., Enquiry/Request for Quotation/Offer Invitation; Offer/Quotation; Order; Acknowledgement of Order/Pro-forma Invoice; Dispatch Advice |
| Pay | Payment | <ul style="list-style-type: none"> • Instructions (or applications) from customers to banks, i.e., Instruction for bank transfer; Application for banker's draft; Application for banker's guarantee; Collection order; Documentary credit application • Advice or information from banks to customers or to beneficiaries of payment, i.e., Collection payment advice; Documentary credit payment; Acceptance or negotiation advice; Documentary credit; Banker's guarantee • Information exchanged between banks |

Figure 6. Example of document categorization⁹

| Name | Description | Type | Source | Mode |
|----------------------------|--|--------------------------------------|-------------------------------|---------------------------|
| Port of Unloading | Location where goods are removed from the ship | 4 digit proprietary code | Carrier | Ship |
| Port of Unlading | Airport where consignment is taken off the airplane | 4 digit proprietary code | Carrier | Air |
| Domestic Port of Unloading | Domestic port where merchandise is removed mode of transport | 4 digit proprietary code UNLOCODE | Carrier Broker Importer | Air, Rail, Ship, Truck |
| Domestic Port of Unlading | Domestic airport where consignment is taken off the airplane | UNLOCODE | Carrier | Air |
| Foreign Port of Unloading | Foreign port where merchandise is unloaded from the conveyance | 5 digit proprietary code | Carrier Exporter | Air, Rail, Ship, Truck |
| Foreign Port of Unlading | Foreign airport where consignment is taken off the airplane | 5 digit proprietary code UNLOCODE | Carrier | Air, Ship |

Figure 7. Example of data dictionary compilation¹⁰

⁹ Source: UN/ESCAP UNNExT UNECE Data Harmonization and Modelling Guide for Single Window environment, version 2012, ST/ESCAP/2619.

¹⁰ Source: ECE_TRADE_400_DataSimplificationand_Rec34E.pdf.

Step 5: Reconcile data

50. Reconciliation is the process of linking an element in one dictionary with a semantically equivalent element in another dictionary. A data dictionary contains data element descriptions of business documents defined from the perspective of a business expert. In this step (Reconcile data), these data elements are mapped to semantically equivalent data elements in an RDM.

51. In this guideline, the SCRDM is used as an RDM for the purpose of illustration. The output of the mapping is the list of data elements of an RDM (here the SCRDM) that are needed for data exchange. These data elements form a subset of the UN/CCL. This subset data model will be used in the final step to produce the specifications for the required Business Data Exchange Structure(s). The main task in this step is to map the data elements in the compiled data dictionary with their corresponding components in the RDM. The corresponding component is identified with the United Nations assigned ID, an alphanumeric unique identifier of the data element. It is recommended that the data modellers record the mapping result by extending the compiled data dictionary with an additional column containing the compiled data dictionary ID (see figure 8).

52. When mapping to the RDM, the data modellers need to deal with the following cases:

1. One data element maps to exactly one RDM data element
2. One data element maps to more than one RDM data element
3. One data element does not have a direct mapping to an RDM data element

53. The first case is ideal. For the second case data elements have a different semantic. The data modeller needs to analyse how the data element is used in the business document and decide which of the two mappings provides the best match. Obviously, the BPA made in step 1 (Analyze Process), can now give valuable information for the decision. In the third case there may be data requirements that are not included in the RDM. These data requirements need to be analysed case by case. It is recommended to leave these data elements to UN/CEFACT experts with advanced experience in building RDMs. They can advise on the appropriate way forward. An organization conducting data harmonization may submit a request to the UN/CEFACT for inclusion of the data element into a future release of the RDM.

| Compiled data dictionary ID | Business Name | Unique UN Assigned ID | ABIE/ BBIE/ ASBIE/ACC/B CC/ASCC/DT/ CC/SC | Dictionary Entry Name (auto generated) | Definition Mandatory |
|-----------------------------|------------------|-----------------------|---|--|--|
| | Header Agreement | UN01011547 | ABIE | Header_ Trade Agreement. Details | The contractual terms of a header trade agreement. |
| 10001 | Seller | UN01011551 | ASBIE | Header_ Trade Agreement. Seller. Trade_ Party | The seller party for this header trade agreement. |
| 10002 | Buyer | UN01011552 | ASBIE | Header_ Trade Agreement. Buyer. Trade_ Party | The buyer party for this header trade agreement. |
| 10010 | Delivery Terms | UN01011560 | ASBIE | Header_ Trade Agreement. Applicable. Trade_ Delivery Terms | The terms of delivery applicable to this header trade agreement. |
| 10011 | Payment Terms | UN01011561 | ASBIE | Header_ Trade Agreement. Applicable. Trade_ Payment Terms | The payment terms applicable to this header trade agreement. |

Figure 8. Reconcile data to the Context CCL (RDM)

Step 6: Obtain a master structure



54. Once the reconciliation of the data set with an RDM is done, one can obtain the Master Data Exchange Structure. From this Master the required Business Data Exchange Structures will be created. In both cases, Master and created Business Data Exchange Structure(s), the CCBDA procedures must be followed. Depending on the business requirements, specific syntax can be applied to the structure of electronic business data exchange such as Extensible Markup Language (XML) and Electronic Data Interchange (EDI). At the end, the XML schema or EDI message contains only the elements that correspond to the data elements of the data exchange in the created Business Data Exchange Structure. This means the XML schema or EDI messages represent the electronic equivalent of the information contained in the Business Data Exchange Structure derived from the RDM.

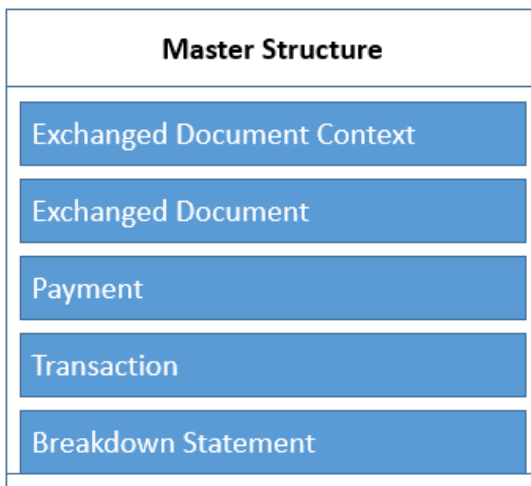


Figure 9. An example of a Master Data Exchange Structure

VIII. Steps for updating a Reference Data Model

Step 1: Initiate a project or create change request(s)



55. Depending on the impact on the reference data model, a project must be initiated or data requests must be created. A brief statement by the data modeller about the affected UN/CEFACT Reference Data Model, the business processes, business data exchange structures and documents involved, and required changes should make it possible for the UN/CEFACT Programme Development Area (PDA) experts to evaluate the impact of changes. Based on the impact, a project will be initiated or change requests will be created.

Step 2: Analyse process



56. The need for updating an RDM may come from changes in the business process with new data requirements existing or even new data exchange structures being required. The required changes should be described using UML diagrams to visualize the changed business process (if applicable). See Figure 10 below for an example of a Business Collaboration Use Case Diagram. For more details, see also section VII, B.

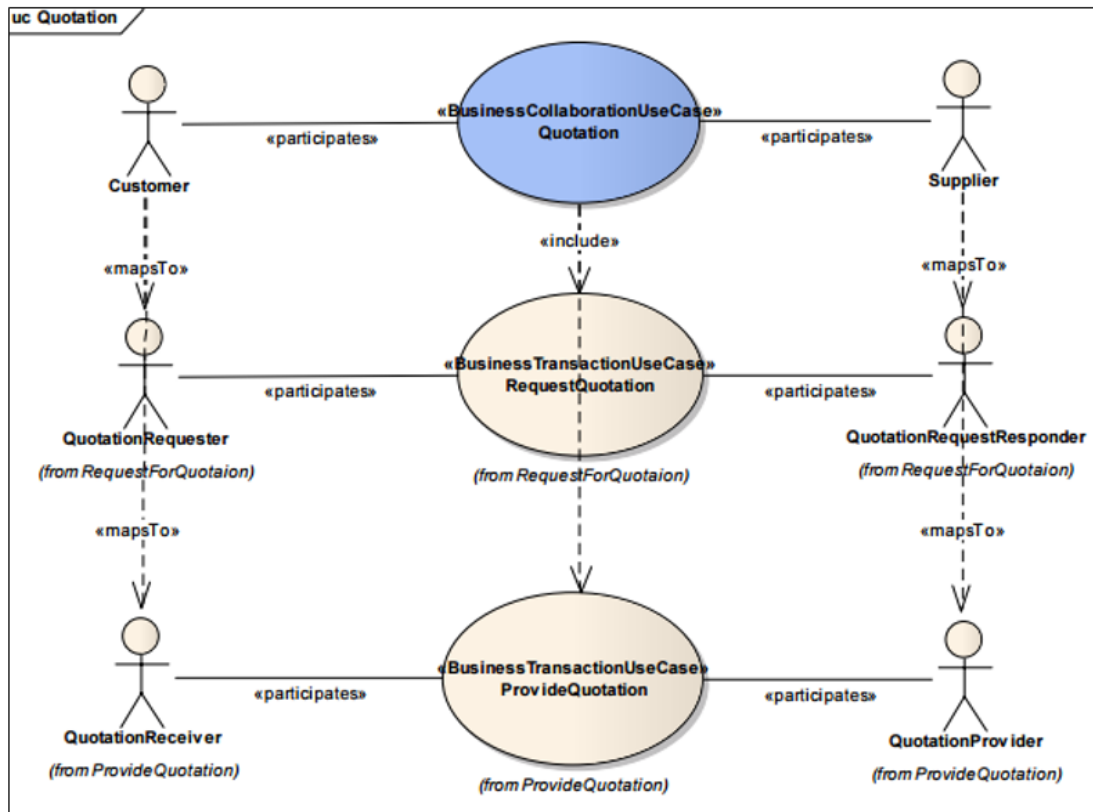


Figure 10. Example of a Business Collaboration Use Case Diagram

Step 3: Capture and define data



57. Before updating an RDM, the steps described in section VIII need to be processed. Updating an RDM from this point, might involve changing the Master Data Exchange Structure of the model and/or the data itself. In case new data is required, this might also impact the Master structure. Therefore, a list of data exchange structures or documents using the newly required data is needed to clarify the need to update the Master structure. In addition, the new and changed data must be provided with a type, representation, format, and constraints. This forms the basis for a solid understanding of the semantics of the data. Any ambiguity in the meaning and the usage of data elements delays the process of harmonizing the attributes of these data elements with the selected semantic rules.

Step 4: Reconcile data



58. A search should be made on the UN/CEFACT website to find an existing business process that meets the business requirement. If no existing business process is found to be appropriate, then the new business process should be modelled using UMM. The changed or new data must be mapped to a BIE in the RDM or to a BIE in the UN/CCL. If mapping to a BIE in the RDM is impossible, the data must be mapped to BIE in the UN/CCL. The steps in Core Component discovery are preparation and search for candidate BIEs. If BIEs available for the specific business process do not address all of the data requirements, the registry of all BIEs should be searched to see if the appropriate BIEs already exists. In case they do not exist, the Core Component Technical Specification describes the steps to raise any new BIE. In case of mapping to the BIE in the RDM or BIE in the UN/CCL, the UNID (unique identification assigned by UN/CEFACT) of the BIE is important in the following step.

| ADD/CHG/DEP | Business Name | Unique UN Assigned ID | ABIE/ BBIE/ ASBIE/ACC/B CC/ASCC/DT/ CC/SC | Dictionary Entry Name (auto generated) | Definition Mandatory | Occurrence Min | Occurrence Max |
|-------------|------------------|-----------------------|---|---|--|----------------|----------------|
| | Header Agreement | UN01011547 | ABIE | Header_Trade Agreement. Details | The contractual terms of a header trade agreement. | | |
| CHG | Seller | UN01011551 | ASBIE | Header_Trade Agreement. Seller. Trade_Party | The seller party for this header trade agreement. | 0 | 1 |
| CHG | Buyer | UN01011552 | ASBIE | Header_Trade Agreement. Buyer. Trade_Party | The buyer party for this header trade agreement. | 0 | 1 |
| CHG | Delivery Terms | UN01011560 | ASBIE | Header_Trade Agreement. Applicable. Trade_Delivery Terms | The terms of delivery applicable to this header trade agreement. | 0 | 1 |
| CHG | Payment Terms | UN01011561 | ASBIE | Header_Trade Agreement. Applicable. Trade_Payment Terms | The payment terms applicable to this header trade agreement. | 0 | 1 |
| | ADD | UN01011563 | ASBIE | Header_Trade Agreement. Seller_Order. Referenced_Document | The seller generated order document referenced in this header trade agreement. | 0 | 1 |

Figure 11. Reconcile data

Step 5: Maintain a master structure



59. Changes in data may have impact on the Master structure of the RDM. From this Master the required Business Data Exchange Structure(s) will be derived. Care must be taken because any change may have impact on existing data exchange structures.

60. In the figure below, the ABIE for Breakdown Statement could be switched off (“not used”). As a result, this ABIE will not be available anymore for any Business Data Exchange

Structure created from this Master. Of course changes would be more applicable to a Basic Business Information Entity (BBIE) such as Exchanged_ Document. Type. Code or ASBIEs. At this moment this BBIE is optional, but when made mandatory, it will be mandatory for all data exchange structures derived from the Master.

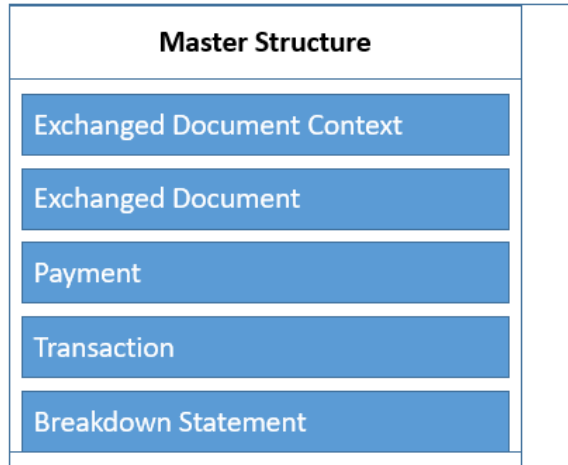


Figure 12. Master structure

Step 6: Submit a change request



61. When this step is completed, a mapped data dictionary including a new, changed and possibly changed Master is available. A change request must be submitted to the experts of the PDA responsible for maintaining the RDM.

Step 7: Update the UN/CCL



62. After validating the harmonization by the PDA experts responsible for the RDM, the requested changes will be laid down in the UN/CCL.

Step 8: Update BRS and/or RSM documents



63. If needed, an update to the Context BRS and/or Context RSM of the RDM will be created.

IX. Steps for creating a Reference Data Model

Step 1: Initiate a project



64. It is mandatory to initiate a project in case of creating a UN/CEFACT RDM. The steps in the UN/CEFACT Open Development Process (ODP) incorporate some steps described in this section.

Step 2: Analyse process



65. Especially in the case of creating an RDM, the business process analysis is strongly recommended. Within different PDAs business requirements and business processes have been described in a BRS for one or more business processes using UML diagrams to visualize the business process. See Figure 13 below for an example of a Business Entity Lifecycle diagram. For more details, see also section VII, B.

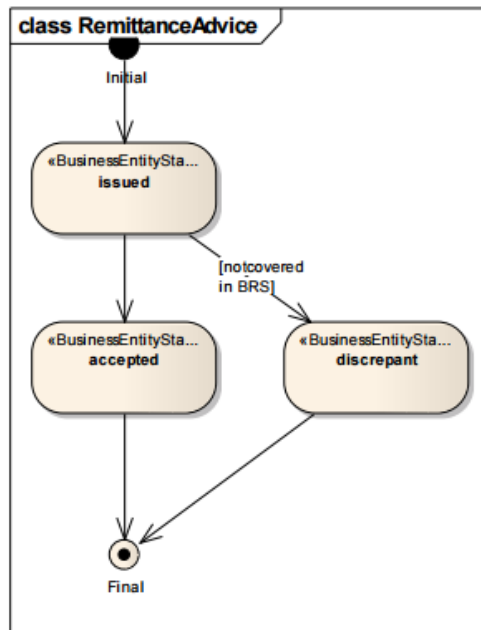


Figure 13. Business Entity Lifecycle diagram

Step 3: Capture and define data



66. The purpose of this step is to obtain a precise description of the data requirements. The data is described and specified using the definitions and terminology of business users and experts (e.g. buyer/seller or freight forwarder). This forms the basis for a solid understanding of the semantics of the data, its type, representation, format, and constraints, crucial for the automation of the information flow at a later stage. Any ambiguity in the meaning and the usage of data elements delays the process of harmonizing the attributes of

these data elements with the selected semantic rules, and creates inconsistency in the mapping. When this step is completed, a data dictionary is available for each document identified in step 3 (Capture & Define data), which describes in detail the data elements contained in the document from a user point of view. A data dictionary provides definitions for the data elements in a form. Good sources to identify exact meaning of data are often collected during the business process analysis.

Step 4: Reconcile data



67. The collected dictionary data must be mapped to a BIE in the UN/CCL. A search should be made in the registry to find the business process that meets the business requirement. If no existing business process is found to be appropriate, then the new business process should be modelled using UMM. The steps in Core Component discovery are preparation and search for candidate BIEs. If the BIEs available for the specific business process do not address all of the data requirements, the registry of all BIEs should be searched to see if the appropriate BIEs already exist. In case they do not exist, the Core Components Technical Specification describes the steps to raise any new BIEs. The UNID (unique United Nations assigned ID) of the BIE in the UN/CCL is important in the following step.

| Compiled data dictionary ID | Business Name | Unique UN Assigned ID | ABIE/ BBIE/ ASBIE/ACC/B CC/ASCC/DT/ CC/SC | Dictionary Entry Name (auto generated) | Definition Mandatory |
|-----------------------------|------------------|-----------------------|---|--|--|
| | Header Agreement | UN01011547 | ABIE | Header_ Trade Agreement. Details | The contractual terms of a header trade agreement. |
| 10001 | Seller | UN01011551 | ASBIE | Header_ Trade Agreement. Seller. Trade_ Party | The seller party for this header trade agreement. |
| 10002 | Buyer | UN01011552 | ASBIE | Header_ Trade Agreement. Buyer. Trade_ Party | The buyer party for this header trade agreement. |
| 10010 | Delivery Terms | UN01011560 | ASBIE | Header_ Trade Agreement. Applicable. Trade_ Delivery Terms | The terms of delivery applicable to this header trade agreement. |
| 10011 | Payment Terms | UN01011561 | ASBIE | Header_ Trade Agreement. Applicable. Trade_ Payment Terms | The payment terms applicable to this header trade agreement. |

Figure 14. Reconcile data

Step 5: Obtain a Master structure



68. Once the reconciliation of the data set is done, one can move to obtain the standard structure for Data Exchanges (Master). From this Master the required data exchange structures will be created, following the CCBDA procedures. Depending on the business requirements, specific syntax can be applied in obtaining the structure of electronic business documents such as XML and EDI.

69. At the end, the XML schema or EDI message contains only the elements that correspond to the data elements of the data exchange in the created Business Data Exchange Structure(s). This means the XML schema or EDI messages represent the electronic equivalent of the information contained in the Business Data Exchange Structure derived from the Reference Data Model. In Figure 15 below, two ABIEs are marked as not used. This means that Payment related information and a breakdown statement will not be used in any data exchange structure derived from the Master.

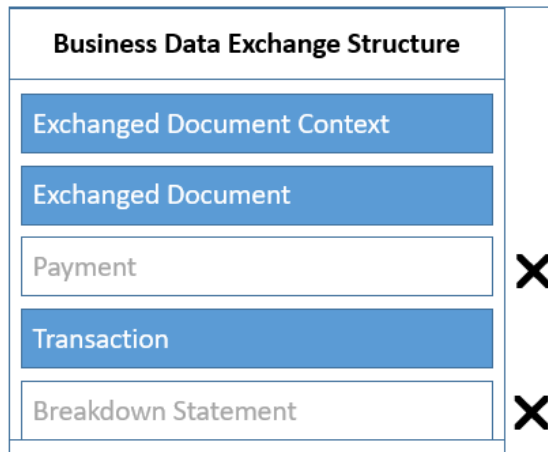


Figure 15. Business Data Exchange Structure – Not used ASBIEs

Step 6: Submit a request



70. When this step is completed, a mapped data dictionary (including mapping to BIEs) is available to be submitted to the experts of the UN/CEFACT PDA responsible for maintaining the RDM.

Step 7: Update the UN/CCL



71. After validating the harmonization by the PDA experts, the requested data will be laid down in the UN/CCL. After approval of the requested data, the RDM will be built.

Step 8: Create a Context RDM-BRS and RDM-RSM



72. The objective of the Contextualized RDM-BRS is to describe, at a high level, the requirements for the RDM supporting the business and regulatory processes, the involved business areas, the main parties, and the information involved. The Context RDM-RSM provides the requirements mapping to the Context CCL and specifies the Master structure of the RDM.

X. Definition of terms

| <i>Term</i> | <i>Definition</i> |
|----------------------------------|--|
| Master Data Exchange Structure | A collection of information structured in such a way that it covers the data exchange structures required by users within the Reference Data Model domain, such as Supply Chain. From the Master Data Exchange Structure, different Business Data Exchange Structures can be derived. |
| Business Data Exchange Structure | A collection of information used within a particular business process, structured in such a way that it covers the business data exchange needs. These structures can be a complete business document, such as an invoice, or a mini document (snippet) as a result of a query (e.g. on master data). |
| Single Window | A Single Window is defined as a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export, and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once. |
