# DATA HARMONIZATION AND MODELLING GUIDE

## FOR SINGLE WINDOW ENVIRONMENT

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UNITED NATIONS NETWORK OF EXPERTS FOR PAPERLESS TRADE
IN ASIA AND THE PACIFIC

UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

In cooperation with
WORLD CUSTOMS ORGANIZATION

# Data Harmonization and Modelling Guide for Single Window Environment

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# FOREWORD

International supply chains demand traders to improve efficiency in their practices while duly complying with a myriad of procedural, regulatory and documentary requirements. In recent years these requirements have multiplied and become more complicated as a result of increasing attention to safety measures, security concerns, border protection and control by governments. Traders and Government agencies have a new challenge. To remain competitive they have to conduct business faster, at lower costs and to higher security standards in a rapidly changing and increasingly complex global trading environment.

Simplification and harmonization of trade data and documentary requirements can contribute significantly to the reduction of the time and costs of international trade transactions. Harmonizing data used in trade documents and aligning them with international standards also ensures data interoperability among the various parties engaged in the international supply chain. In addition, data harmonization is a necessary step towards trade automation and the introduction of electronic Single Window facilities for electronic data sharing and exchange.

Based on the experiences and practices of various countries and building on the previous work, such as the Single Window Data Harmonization Guidelines from the World Customs Organization (WCO) and the United Nations Economic Commission for Europe (UNECE) Recommendation No. 34 on Data Simplification and Standardization for International Trade, this United Nations Network of Experts for Paperless Trade in Asia and the Pacific (UNNExT) Data Harmonization and Modelling Guide for Single Window Environment aims to assist governments and businesses in harmonizing and standardizing the international trade data required in fulfilling all import, export, and transit-related regulatory requirements.

This *Guide* is part of the UNNExT suite of capacity building tools designed to support the implementation of paperless trade and Single Window facilities.  It complements other UNNExT tools, such as the *Business Process Analysis Guide To Simplify Trade Procedures and* the *Legal Guide for Single Window Implementation and Paperless Trade*. It is recommended to be used together with them for maximum benefits.  It is our hope that the Data Harmonization and Modelling Guide will help government officials as well as the trading community in their efforts to harmonize and streamline trade data for the implementation of paperless trade, especially in a Single Window environment. We believe this will ultimately contribute to efficiency and competitive-ness in international supply chains.

Ravi Ratnayake
Director
Trade and Investment Division
ESCAP

Virginia Cram-Martos
Director
Trade and Sustainable Development Division
UNECE

# ACKNOWLEDGEMENTS

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# ABBREVIATIONS

| | |
|---|---|
| ADB | Asian Development Bank |
| APEC | Asia Pacific Economic Cooperation |
| APEC ECSG | Asia Pacific Economic Cooperation Electronic Commerce Steering Group |
| ASEAN | Association of South East Asian Nations |
| ATIGA | ASEAN Trade in Goods Agreement |
| B2B | Business-to-Business |
| B2G | Business-to-Government |
| DEN | Dictionary Entry Name |
| DM | Data Model |
| ESCAP | United Nations Economic and Social Commission for Asia and the Pacific |
| G2B | Government-to-Business |
| G2G | Government-to-Government |
| ISO | International Organization for Standardization |
| NSW | National Single Window |
| OECD | Organisation for Economic Co-operation and Development |
| PERT | Project Evaluation and Review Technique |
| SWIF | Single Window Implementation Framework |
| TDED | Trade Data Elements Directory |
| TOGAF | The Open Group Architecture Framework |
| UML | Unified Modeling Language |
| UN/CEFACT | United Nations Centre for Trade Facilitation and Electronic Business |
| UNECE | United Nations Economic Commission for Europe |
| UN/EDIFACT | United Nations Electronic Data Interchange For Administration, Commerce and Transport |
| UNLK | United Nations Layout Key |
| UNNExT | United Nations Network of Experts for Paperless Trade in Asia and the Pacific |
| UNTDED or TDED | United Nations Trade Data Elements Directory or Trade Data Elements Directory |
| WCO | World Customs Organization |

# 1. INTRODUCTION

## 1.1 BACKGROUND

Simplification and harmonization of trade data and documentary requirements can contribute significantly to the reduction of time and costs for international trade transactions. Harmonizing data used in trade documents and aligning them with international standards ensure data interoperability among the various parties engaged in a trade transaction. In particular, harmonization is a necessary step toward trade automation and the introduction of electronic Single Window facilities, where all trade-related information and data should be submitted only once so that repetitive keying of the same data can be reduced. Data harmonization is a prerequisite in introducing a system for electronic data sharing and exchange.

**Figure 1.1. Step-by-step approach to the development of electronic Single Window and paperless trading**
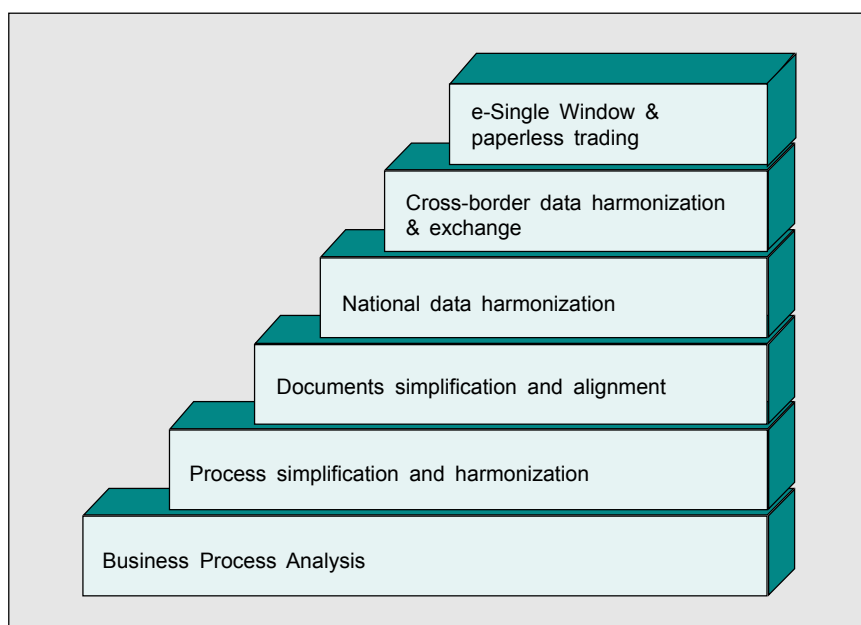


This UNNExT *Data Harmonization and Modelling Guide for Single Window Environment* is developed as a tool to assist governments and businesses in harmonizing and standardizing the international trade data required in fulfilling all import, export, and transit-related regulatory requirements through the elimination of redundant data and duplication in exchanging and recording information. The improvement in data quality will lead to greater simplification of trade processes and predictability in trade transactions. Less complexity and fewer delays will help to enhance trader compliance and secure revenues. It can also facilitate regional and international agreements on harmonization and automation of cross border data exchange.

## 1.2 PURPOSE OF THE GUIDE

This *Guide* provides a stepwise approach on how to conduct a data harmonization exercise and a basic concept for assembling electronic messages. It complements the ESCAP and UNECE UNNExT *Business Process Analysis Guide to Simplify Trade Procedures*[1] and is an extension to the WCO Single Window Data Harmonization Guidelines and UNECE Recommendation No. 34.[2] It is also intended to be used as an UNNExT instrument for building the technical capacity of stakeholders needed for conducting data harmonization in implementing a Single Window and paperless trade.

The *Guide* should help project managers, data modellers, and data analysts to harmonize data element names and the structure of trade, transport, and administrative documents exchanged across the international supply chain with reference data models. The step-by-step approach demonstrates how to create data models to specify the structure and properties of particular documents. These data models then can serve as a basis for developing messages.

The steps described in the *Guide* are based on the experience gained from national projects, such as the data harmonization exercises Thailand carried out in preparation for the development of its Single Window e-Logistics,[3] which simplified and made trade documents ready for automation.

## 1.3 TARGET AUDIENCE

The *Guide* is intended to serve practitioners, project managers, data modellers, and data analysts from government agencies, the private sector and the business community involved in harmonization and simplification of international trade procedures through harmonization of

related data requirements with international standards.

## 1.4 OUTLINE OF THE GUIDE

This *Guide* provides information about data harmonization and details on the organizational and procedural processes necessary to achieve data harmonization. It outlines the systematic approach, standards and tools to facilitate a data harmonization exercise, practical recommendations for data harmonization, cases and application of the results of data harmonization exercises.

The sections of the *Guide* are as follows:

- *Chapter 1* briefly presents the importance of data harmonization, the purpose of the UNNExT Data Harmonization and Modelling Guide, and how it can be used for the benefits of target audience;

- *Chapter 2* introduces the concept of data harmonization, its scope and role for trade facilitation and how it contributes to greater efficiency in fulfilling documentary requirements of the international trade transactions;

- *Chapter 3* suggests how to plan a data harmonization project and how to structure management and implementation teams;

- *Chapter 4* introduces standards, technology, and tools to be used in conducting data harmonization and developing electronic trade documents;

- *Chapter 5* describes the processes and steps to follow in conducting data harmonization and developing an electronic message;

- *Chapter 6* provides practical recommendations for data harmonization exercises, including the iterative and incremental approach to data harmonization, criteria for standard selection, and maintenance of outputs from the data harmonization project;

- The *Glossary* lists terms used in the *Guide*;

- The *References* provide sources for which any reference is made in the *Guide*; and

- The *Annexes* contain some of sample data harmonization deliverables as well as separate cases of data harmonization, which describe relevant national experiences and illustrate how the *Guide* can be used in actual practice.

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[1] UNNExT. (2009). *Business Process Analysis Guide to Simplify Trade Procedures*. Thailand: United Nations

[2] http://www.unece.org/fileadmin/DAM/cefact/recommedations/rec34/ECE_TRADE_400_DataSimplificationand_Rec34E.pdf

[3] Thailand's Single Window e-Logistics is also called National Single Window to align with ASEAN Single Window Initiative.

# 2. OVERVIEW OF DATA HARMONIZATION

## 2.1 TRADE FACILITATION AND DATA HARMONIZATION

International trade procedures encompass all activities ranging from the ordering of goods, physical transfer of goods, and payment for goods along the supply chain (UNECE, 2001). They entail activities, practices and formalities involved in collecting, presenting, communicating and processing data to fulfil business and regulatory requirements prior to and during the movement of goods across borders (OECD, 2002).

Trade documents and data, whether in paper or electronic format, are important as they provide the means to exchange information associated with commercial, transport, regulatory or financial procedures. Traders often face complex and myriad formalities and documentary requirements. They have to deal with repeated requests for the same information. Cumbersome, repetitive and non-standardized trade documents and data required for border crossings are identified by the business community as a major deterrent to entering certain markets (UNESCAP, 2009).

According to the Asia Pacific Economic Cooperation (APEC) Business Advisory Council (1996), each international trade transaction requires an average of 40 documents to meet rules and regulations set for international trade and transport. These documents are made up of approximately 200 data elements of which 15 per cent are repeated at least 30 times and 60 to 70 per cent are repeated more than once.

These documentary requirements are costly and are a major cause of delay in cross-border operations. A study commissioned by the European Commission states that the costs of complying with these requirements amount to accounting for 3.5 to 7 per cent of the value of goods (OECD, 2002). It can be as high as 10 to 15 per cent, if there are typing and other errors (UNCTAD, 1994).

Trade facilitation is recommended by many international and intergovernmental organizations as a strategy to remove the redundancies and bottlenecks in international trade. Although the scope of trade facilitation is defined differently from one organization to another, what is found in many is that the harmonization and standardization of information and information flows associated with international trade transaction are important elements of trade facilitation. As illustrated in Table 2.1, most organizations regard the harmonization and standardization of information and information flows associated with the international trade transaction as one of the key improvement measures for facilitating trade.

Harmonizing data used in trade documents and aligning them with international standards would help automate and streamline trade procedures. Reducing information requirements can benefit the trading community through improved quality and timeliness of data submissions. Streamlined trade procedures and documents can also significantly help reduce transmission cost and improve trade competitiveness.

In the context of trade facilitation, the scope of data harmonization covers the data requirements of all stakeholders in the international supply chain. According to UNECE (2001), stakeholders of the international supply chain are categorized into four groups. They are:

## Table 2.1. Definition of trade facilitation

| Trade Facilitation | APEC (Woo and Wilson, 2000) | OECD (OECD, 2002) | UNECE (UNECE, 2002; OECD, 2002) | WCO (WCO, 1999) | WB (World Bank, 2005) | WTO (WTO Website, 2005; OECD 2002) |
|---|---|---|---|---|---|---|
| The simplification and harmonization of trade procedures | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **The harmonization and standardization of information and information flows associated with the international trade transaction** | | ✓ | ✓ | ✓ | ✓ | ✓ |
| The use, standardization, and improvement of physical infrastructure and facilities | ✓ | | ✓ | | ✓ | |
| The harmonization of applicable laws and regulations with the international standards | | | ✓ | | ✓ | |
| The automation of trade procedures | ✓ | | ✓ | ✓ | ✓ | ✓ |
| The removal of barriers to the mobility of business people | ✓ | | | | | |

- A supplier (exporter/seller) who sells goods or services as stipulated in a sales contract;

- A customer (importer/buyer) to whom goods and services are sold as stipulated in a sales contract;

- An intermediary who provides commercial, financial, and/or transport services within an international supply chain, such as freight forwarder, customs broker, third party logistics service provider, express integrator, carrier of all modes, port and terminal operator, inland container depot, bank, insurance company, Information Technology (IT) value-added service provider, bank and financial institutions; and

- An authority (including an authorized private inspection agency) of the exporting country, the importing country, and the country in transit, who monitors cross-border movement of goods in a way that reflects national and international public interests.

The United Nations Layout Key for Trade Documents (UNECE, 2002) provides a list of key documents prepared and used by stake-holders in different stages of the international supply chain and categorizes those documents into four document families which are:

- **The Commercial transaction document family**, which includes documents applied between commercial parties in the production, sale and purchase phases of a transaction. The buyer and the seller are key originators of documents in this sector.

- **The Payment document family,** which includes documents that are exchanged between partners in international trade and their banks as well as between banks to

process payments for commercial transactions.

- **The Transport and related services document family**, which includes documents relevant to the physical international movement of goods. It covers documents used in 1) the forwarding and handling of goods activities in terminals, warehouses and ports, 2) payment for such intermediary services, and 3) cargo insurance.

- **The Official controls document family**, which includes documents that government authorities in exporting country, importing country, and country where goods are in transit use as one of instruments to facilitate the control of international goods flow.

Given the complex scope of trade facilitation with many stakeholders involved, the efforts required to complete a full scope of data harmonization can be extensive. Under resource constraints, a phased implementation of data harmonization may be considered (see Section 6.3 for further explanation).

## 2.2 WHAT IS DATA HARMONIZATION?

In our daily lives, we often encounter situations where we have to provide our personal or business *data* in a certain *form*. As illustrated in Figure 2.1, a form mainly consists of 1) a *data element name* which is also known in UNECE Recommendation No. 1 as a *field heading* expressed in a plain language of text or code specifying the nature of the data in a data field and 2) a *data field* which is an area designated for a specified data entry.

There is always a possibility that each of us interprets each data element differently. For example, a delivery date can mean different things to different parties.

- For a buyer, a delivery date can be "date and optionally time when goods are *requested* to be delivered."

- For a seller, a delivery date can be "date and optionally time when goods are *estimated* to be delivered."

### Figure 2.1. Components of a form



Form: A data carrier designed to carry a visible record of data entries

**Field heading or Data Element Name** A field identifier expressed in plain language, in full or abbr.

1. Goods consigned from (Exporter's business name, address, country)
2. Goods consigned to (Consignee's name, address, country)

Reference No.

ASEAN TRADE IN GOODS AGREEMENT/ ASEAN INDUSTRIAL COOPERATION SCHEME CERTIFICATE OF ORIGIN (Combined Declaration and Certificate)

FORM D

Issued in ———— (Country) See Overleaf Notes

**Data Field** An area designated for a specified data entry

3. Means of transport and route (as far as known)

Departure date

Vessel's name/ Aircraft etc.

Port of Discharge

4. For Official Use

☐ Preferential Treatment Given Under ASEAN Trade in Goods Agreement

☐ Preferential Treatment Given Under ASEAN Industrial Cooperation Scheme

☐ Preferential Treatment Not Given (Please state reason/s)

Signature of Authorised Signatory of the Importing Country

- For a driver delivering packages, a delivery date can be "date and period of time during which goods are *scheduled* to be delivered." It can also be "*actual* date and time when goods are delivered."

Without clear instructions, we provide data for each field heading in a format that we assume appropriate. For example, the data regarding a delivery date of 20 August 2010 can be expressed in various representation formats, i.e.

- DD/MM/YY:                       20/08/10
- DD/MM/YY (Buddhist year): 20/08/53
- DD-MM-YYYY:                   20-08-2010
- MM/DD/YY:                       08/20/10
- MM-DD-YYYY:                   08-20-2010
- YYMMDD:                         100820
- YYYYMMDD:                     20100820
- YYYY-MM-DD:                   2010-08-20
- DD MONTH YYYY:             20 August 2010
- MONTH DD, YYYY:             August 20, 2010

Party A may provide data for a delivery date using DD/MM/YY format while Party B may use MM/DD/YY format. The provision of data under the same category in different representation formats makes electronic sharing and integration of data within an organization and across organizations incompatible.

In addition, the meaning of a data element can be addressed using different vocabularies. "A hereditary name common to all members of a family,[4]" for example, can be referred to as surname, last name, and family name. The identical meaning of these three different words can be understood by human beings but not by different computer applications built on different platforms. Without reconciling different data elements of identical meaning, electronic sharing and integration of data becomes complex and costly.

Data harmonization is an act of reconciling the definition and representation formats of data elements in a domain of interest. It entails a set of activities that improves the consistency in the use of data elements in terms of their meaning and representation format. Through data harmonization, a set of *core data elements* (data elements expressed using different vocabularies but with identical meaning) can be extracted. Description of each core data element inclusive of its definition and representation format can then be formalized. Examples of core data elements are shown in Figure 2.2.

Sharing common data with business partners is one way to improve the efficiency of data usage. By sharing common data with partners, those data can be reused in a way that benefits organizational objectives and goals. An electronic document can be a data carrier that facilitates data sharing and reuse beyond what a paper document can offer.

## 2.3 OBJECTIVE AND GOAL OF DATA HARMONIZATION

The objective of data harmonization, in the context of trade facilitation, is to eliminate redundancies and duplication in international trade data.

Data harmonization enables data interoperability among individual information systems in the international supply chain, including Single Windows[5], by producing a set of harmonized core data elements with semantic standard.

## 2.4 BENEFITS OF DATA HARMONIZATION

The standardization of data requirements formalizes the definition and representation format of data elements used by various stakeholders. Clear definitions of data elements enhance the way in which data ele-

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[4]    The New Oxford American Dictionary, 2nd Edition.

[5]    A Single Window is "a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic, then individual data should only be submitted once." *UNECE Recommendation N[o]. 33.*

**Figure 2.2. Examples of core data elements**

| | Source<br>Definition | Certificate of<br>Product Standards | Phytosanitary<br>Certificate | Certificate of<br>Origin |
|---|---|---|---|---|
| **Core Data<br>Element 1** | The first point of arrival in the country of final destination* | Place of destination | Declared point of entry | Destination (Place) |
| **Core Data<br>Element 2** | Free form description of the marks and numbers on a transport unit or package** | Shipping mark | Distinguishing mark | Mark |

\* International Standards for Phytosanitary Measures, Guidelines for Phytosanitary Certificates (Publication No. 12)

\*\* UN/CEFACT Export Certification (eCert) RSM

ments are interpreted. A clear representation format serves as a guideline for providing accurate data. They contribute to use of better quality data in the business process and reduce the risk of errors, costs and delays.

According to a case experience of the European Commission Taxation and Customs Union,[6] the process of standardizing data requirements leads to the discovery of redundancy in data requirements and core data elements. A set of these core data elements then serves as input for the development of a Single Administrative Document (SAD). Given that a SAD contains a minimum list of data elements that every authority responsible for administering border control needs at different points in the trading process and a maximum list of data elements that some authorities may require, it abolishes the use of different administrative forms, removes duplicate data requirements, and simplifies data collection in a border control process.

The outputs of data harmonization provide a basis for coordinated development of various information systems used in the different stages of the international supply chain domain. It sets the semantic standard for different development teams within the trade community to adopt as a basis in developing different information systems.

The results of data harmonization also provide a basis for automating a seamless Business-to-Business (B2B), Business-to-Government (B2G) and Government-to-Government (G2G) information exchange in a Single Window facility; data harmonization provides semantic rules that can be used to govern domestic sharing and integration of electronic data at least within the border. If all the information systems in the supply chain use the same set of data attributes and semantic rules, they can commonly interpret the exchanged data and automatically process it to achieve their intended business objectives.

In summary, the benefits of data harmonization are as follows:

- It provides a common basis for standardizing data for import, export and logistics information.

- It reduces data redundancy and costs of data exchange.

- It ensures data compatibility and enables data interoperability among stakeholders, resulting in further facilitation of trade procedures.

- It facilitates the establishment of Single Window facilities and cross border data exchange among Single Windows.

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[6] European Commission Taxation and Customs Union, *The Single Administrative Document (SAD) Characteristics*, Available at: http://ec.europa.eu/taxation_customs/resources/documents/sad-characteristics_en.pdf.

# 3. PLANNING A DATA HARMONIZATION PROJECT

After a data harmonization project is formally authorized and its high-level scope is identified, a designated project manager develops a detailed work plan that helps guiding the harmonization of data requirements falling into the scope of interest.

A project manager of a data harmonization project, in cooperation with appropriate stakeholders, should:

- Identify and list the required tasks in a logical sequence;
- Form management and work teams;
- Estimate the efforts required for carrying out each task;
- Develop a project schedule;
- Assign tasks to team members including data analysts; and
- Develop a detailed project plan.

## 3.1 IDENTIFYING TASKS IN A DATA HARMONIZATION PROJECT

To identify project tasks, one can use a technique normally used in developing a work breakdown structure. A work breakdown structure is basically an output-oriented description of project tasks. It typically starts with outputs. The work components of the outputs are then broken down into the tasks necessary to achieve them.

In the context of data harmonization, it is necessary to identify the tasks required to derive the following outputs:

- A list of (paper/electronic) documents and messages that fall within the scope of the data harmonization project

- A set of data dictionaries that include the data that corresponds to the identified list of designated documents and electronic documents and messages

- A National Data Model that 1) consolidates data requirements listed in each data dictionary and 2) contains the standard semantic definition and representation format for each data requirement mapped to a data model

- A set of Message Implementation Guidelines for key documents that supports both UN/EDIFACT and XML message syntaxes

The steps listed in this *Guide* can be adopted as project tasks. Table 3.1 provides a snapshot of main tasks that data analysts need to carry out to derive each project output.

## 3.2 PREPARING MANAGEMENT AND TEAM FOR DATA HARMONIZATION IMPLEMENTATION

In implementing a data harmonization project, it is essential to establish project management and to assign roles and responsibilities clearly to team members, in order to ensure a high-quality successful implementation. This part of the *Guide* describes the roles of project sponsors, project leader/manager, a change management unit, and team members.

### a. Identifying the right project sponsor

Project sponsors, committed senior executives representing the key stakeholders of a project such as the Single Window implementation, who will oversee the data harmonization project, provide advice on the project's directions and make policy decisions, should be

### Table 3.1. Tasks-outputs relationship in a data harmonization project

| Main Tasks | Outputs |
|---|---|
| 1. Capture the documentary requirements of the business processes that are within the scope of the data harmonization project | • A list of collected documents, electronic documents or messages falling under the scope of a data harmonization project |
| 2. Define captured data elements in a Data Dictionary | • A set of data dictionaries that corresponds to the identified list of paper and electronic documents/ messages |
| 3. Analyse data elements | • National Data Set |
| 4. Map core data elements to a reference data model | • A set of Message Implementation Guidelines for key documents |

identified. They will regularly review project status, take note of emerging issues and risks, and provide direction on overcoming any issues and risks and approve potential solutions. They will be also responsible for convincing stakeholders and concerned parties that the results gained from the data harmonization project will be implemented.

### b. Assigning a competent project manager

The project manager is an individual with strong management and communication skills who understands the operation and objectives of the project implementation. This individual is responsible for planning, monitoring, controlling, and adjusting the project plan, its execution and the quality of the outputs. It may help if a project manager has a good understanding on electronic data interchange and/or experience in implementation and operation of large-scale information systems.

### c. Designating Change Management Unit

A Change Management Unit (CMU) is the group authorized to oversee a version control and manage any revision of the standard that may occur as a result of a project. The CMU will assess the feasibility of any issue, analyse the impact of a change, decide on the necessity of the requested change, and determine the need for formal verification of the change.

### d. Comprising team members

Team members for data harmonization implementation may include data analysts, data modelers, and technical engineers who may perform the following roles. It is also highly recommended to include business domain experts to properly collect and integrate business requirements. Typical functions of data analysts, data modelers, and technical engineers are listed below. Depending on the expertise available, a team member may take on multiple functions.

*Data Analyst*

• Conduct data analysis

• Organize data elements and their attributes in a comparable manner

• Describe different attributes of data elements including their definitions, their representation format, and the number of times (occurrence) that a particular type of data could appear in a document.

• Work with domain experts or data owners to prepare the required data.

• Provide support by addressing data related errors, provide any potentially new data required as a result of changes and perform data maintenance activities as project moves through the various levels of testing.

*Data Modeler*

• Translate business requirements into conceptual, logical and physical data models with a focus on issues such as reducing redundancy of data within an existing computer system or improving the way in which it moves from one system to another.

- Design, build, and maintain the logical and physical data models to support the business requirements in a dynamic, client oriented environment.

- Develop data models for organizational data domains.

- Work with resources resulting from development, data architecture, and business units to create an integrated model for operational database and data warehouse.

*Technical Engineer*

- Update and maintain all technical specifications

- Provide guidance on technical and architectural issues related to international standards and best practices

The tasks of the different participants in the data Harmonization Project are outlined in Table 3.2:

## 3.3 ESTIMATING EFFORTS FOR EACH TASK IN A DATA HARMONIZATION PROJECT

Based on the identified tasks, the project manager estimates the time required to complete each task. In a data harmonization project, significant amounts of time and effort are spent on analyzing and defining data elements and mapping the local definitions to a standard definition. This is particularly in the cases where:

- Instructions or international conventions that define data requirements in the documents are not available.

- Forms with sample data are not available.

- Forms that carry data elements under the scope of harmonization are not aligned with the international standards.

In these circumstances, data analysts need to consult the owner of the document from which data elements are extracted from in order to gain a better understanding of the data elements. With better understanding, data analysts are able to provide a definition for each data element with greater accuracy.

There is no standard benchmark time to complete each step in a data harmonization project. Describing the data definition, representation format, and the number of times (occurrence) that a particular type of data could appear in a simple document may take only one hour. For a complicated document, the same task may take more than one working day. Likewise, there is no one-size-fits-all solution to determine the amount of required resources. However, the Project Evaluation and Review Technique (PERT) may be helpful for time and resource estimation (Marchewka, 2006).

### Table 3.2. Summary of project team roles and responsibilities

| Responsibilities | Project Sponsor | Project Leader/ Manager | Change Management Unit | Data Analysts | Data Modelers | Technical Engineers |
|---|---|---|---|---|---|---|
| Risk Management | x | x | | | | |
| Project Planning | x | x | | | | |
| Project Monitoring and Control | | x | | | | |
| People Management | | x | | | | |
| Development Process and Operation | | x | x | x | x | x |
| Quality Management | | x | x | x | x | x |
| Change Management | | x | x | | | |
| Communication | x | x | x | x | x | x |

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**Box 1: Project Evaluation and Review Technique (PERT)**

The PERT provides probabilistic treatment of activity duration in the estimation. The PERT estimate may be used to compute a weighted average for each individual task. A three-point estimate includes pessimistic, most likely, and optimistic times as described below.

- The Optimistic Time is the minimum time in which a task can be completed. It is the best-case scenario set with the assumption that all activities go as planned and no internal or external obstacles will occur.
- The Most Likely Time is an estimate of the expected time that is required to complete the task.
- The Pessimistic Time is the maximum time of the worst-case scenario in which the task should be completed.

To calculate the estimated time it takes to complete each step, the most likely time, and the pessimistic time have to be identified and placed in a following equation.

$$\text{Task Estimate} = \frac{\text{Optimistic Time} + (4 * \text{Most Likely Time}) + \text{Pessimistic Time}}{6}$$

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## 3.4 DEVELOPING A PROJECT SCHEDULE

Based on the set of tasks identified in a logical sequence, the project task estimates, and the duration of the project stated in the contractual arrangement made with the project sponsor, the project manager prepares the project schedule. The schedule containing the start date, the finish date, and duration of time to complete each output can be presented in the form of a Gantt chart (Marchewka, 2006).

## 3.5 DESIGNATING TASKS

The number of data analysts/modellers required on a project depends on the project scope and duration specified by the project sponsor. The shorter the project duration is or the broader the project scope is, the larger the number of data analysts/modellers is required. In a data harmonization project, data analysts/modellers are responsible for:

- Describing different attributes of data elements including their definitions, their representation format, and the number of times (occurrence) that a particular type of data could appear in a document.
- Organizing data elements and their attributes in a comparable manner.

- Developing message implementation guidelines.

Data analysts/modellers should be selected based on the following skills:

- *Technology skills*: Although it is not necessary, basic knowledge of database management and data modelling techniques is desirable. Related work experience in information systems development is complementary.
- *Business/organization skills*: It is useful if they have a knowledge of a particular organization or industry under the scope of data harmonization.
- *Interpersonal and communication skills*: It is important that they are able to effectively communicate and interact with the project's stakeholders. They should have the ability to create and sustain reasonably good relationships with the people who represent the owner of documents under the scope of the data harmonization project.
- *Analytical skills*: They should be able to think critically. They should be mindful and capable of spotting the commonalities in the differences, i.e. 1) data elements with different names but with an identical definition and 2) data elements with identical names but different definitions. Finally, they should be able to organize captured data elements in a comparable manner.

## 3.6 DEVELOPING A DETAILED PROJECT PLAN

The project manager compiles the project task estimates, project schedules and project staff into the detailed plan. The detailed plan should be circulated to all project stakeholders for comments and resource reconciliation. It is important that the project manager takes into account their feedback and ensure that the plan is realistic.

# 4. INTRODUCTION TO STANDARDS AND CONCEPTS FOR DATA HARMONIZATION AND DEVELOPMENT OF ELECTRONIC TRADE DOCUMENTS

Modern global trade takes place in a multilingual environment, touches the legislation of different countries and economic regions and involves many different, independent parties. Trade documents, in both paper-based and electronic format, are frequently used to exchange and record information in trade transactions. Simplifying and standardizing these documents is a key step for implementing a smooth exchange of information and for facilitating a successful cross-border exchange of goods.

This Chapter provides an overview of the key standards for trade documents in paper and electronic format. It introduces important standards, such as the United Nations Layout Key (UNLK), which was introduced for the simplification of paper-based trade documents and the WCO Data Model[7] used for the design of electronic trade documents.

## 4.1 THE UNITED NATIONS LAYOUT KEY (UNLK)

The UNLK is a key instrument for the simplification of trade documents. In the early 1960s, the UNECE set up a Working Party on Facilitation of International Trade Procedures to develop a standard for simplified trade documents. The Working Party was first charged with preparing an international *Model Form* based on agreed paper size, form design principles and list of items to be included. The *Model Form* was finalised based on contributions of governments, interested international organisations and the business community, and adopted as the United Nations Layout Key for Trade and Transport Documents (UNLK).

Due to the practical value of aligning international trade documents to the UNLK, and its international acceptance, this standard form was formally introduced as UNECE Recommendation No.1, in 1973.[8] Today the UNLK is the lead standard for the simplification of trade documents. Nearly all forms for international trade documents are aligned to the UNLK. The Single Administrative Document (SAD) for EU Customs declarations, IATA and FIATA transport documents, the Transports Internationaux Routier (TIR) or the General System of Preferences (GSP), to mention only some, are trade documents aligned to the UNLK.

To support trade facilitators in designing aligned trade documents, UNECE and ESCAP developed a "Guide for the Design of Aligned Trade Forms for Paperless Trade"[9] and a

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[7] The WCO Data Model is a set of carefully combined data requirements that are mutually supportive; it will be updated on a regular basis to meet the procedural and legal needs of cross-border regulatory agencies such as Customs, controlling export, import and transit transactions. © 2011, World Customs Organization (WCO), Brussels, Belgium, All rights reserved. WCO Data Model is accessible at www.wcopublications.org or please contact dm@wcoomd.org,

[8] The full text of the recommendation, along with addendum and guidelines for applications, is available on: http://www.unece.org/cefact/recommendations/rec_index.htm.

[9] The guide is available at http://www.unece.org/fileadmin/DAM/trade/Publications/ece_372_ManualForDesignAlignedTradeForms.pdf.

simple electronic tool to design aligned trade documents.

Although the UNLK is a standard initially designed for paper-based documents, it contains essential principles that provide the basis for the development of an electronic document specification. Such principles include:

## Reusability of data

In an aligned trade document, each piece of information is placed on a specific, designated location. This allows producing a *Master Form*, which contains information that is used in several trade documents. *Master Forms* were first used with typewriters for paper-based trade documents. A set of trade documents with carbon sheeted back sides would be put into a typewriter, with the *Master Form* on the top. The information would be printed on the *Master Form* and, through the carbon copy process, copied on the relevant fields of the underlying set of trade documents. By filling in the Master Form, one would establish a **"one-run system"** in which the whole set of documents for the trade transaction would be produced in a single instance.

The benefits of this one-run system are obvious:

- Data are typed only once,
- Data are checked only once,
- Data are transferred error-free to the individual documents,
- Form sizes could be standardized, etc.

An example of an aligned series of export documents, based on a *Master Form* and intended to be completed by the "one-run" method, is explained in the "United Nations Layout Key for Trade Documents Guidelines for Application". The Guidelines include the Master Form and the forms for the Offer, Acknowledgment of Offer, Invoice, Dispatch Advice, Banking Instructions, and Forwarding Instructions.[10]

Even if paper is still the most commonly used medium for trade documents, electronic trade documents are now becoming more and more common. Electronic documents require standards to describe their semantic and syntax[11] for electronic data interchange. So, the concept of the *Master Form* for paper-based documents has its equivalent in the concept of a common data model for electronic trade documents, where the same data structures are used in different documents. This will be later described in Section 4.3.

## Box-design to group data

Traditionally, documents consisted of a continuous "running" text, leaving gaps for filling in variable data. As a means of rationalizing trade forms, the UNLK groups data that belong together into boxes. A particular box is identified by a box heading (or "guide words") indicating the nature of the data to be entered. This method is commonly referred to as "box design".

For example, a form would contain a box with a heading "Consignor". This box would contain information such as the Consignor name and address, but also contact details such as telephone and fax numbers or the reference number of the Consignor.

**Example of Box design Principle from FIATA Forwarding Instructions FFI**

| 3336 Consignor | Emblem of National Association | (Approved by FIATA) 1492 Consignor Reference No. |
|---|---|---|

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[10] These are available at http://www.unece.org/cefact/recommendations/rec01/ece_trade_270_E.pdf.

[11] Semantic describes the meaning of information; syntax describes the way information is represented in a document. For example; the information that a Consignor is "*The name of the party consigning goods as stipulated in the contract by the party ordering the transport*" provides semantic. The information that Consignor data is transmitted through a character string with a maximum length of 512 characters is information on syntax.

The "Box Design principle" of the UNLK is similar to the concept of object classes which is used for the development of electronic trade documents in chapter 5.

## 4.2 THE UNITED NATIONS TRADE DATA ELEMENT DIRECTORY (UNTDED, ISO 7372)

Each box in an aligned trade document has a "box heading", such as *Consignor*, which specifies data that can be put into the box. To provide clear and unambiguous meaning of the information in the trade documents, the UNLK "headings" are recorded in a dictionary that is published as the United Nations Trade Data Elements Directory (UNTDED, ISO 7372).[12] UNTDED elements mainly consist of a data element tag in the form of a four-digit number to identify the data element, a data element name and a description that provides a definition of the data element.

Over the years, the UNTDED has been continuously expanded. Today it provides an internationally accepted standard repository for the semantic of trade data elements used in international trade. UNTDED definitions describe information from the point of view of a business expert, such as a trader or a Government official. The UNTDED has also been integrated into the latest standards for electronic trade documents, such as the UN/CEFACT Core Component Library (CCL)[13] and UN/EDIFACT[14]. The definition data in an aligned form using the UNTDED provides a very useful basis for developing electronic specifications of this information in a later step.

The definition of data objects based on an internationally accepted standard also simplifies the cross-border exchange of data and harmonizes procedures.

**Examples of UNTDED data elements**

> **3336:** Consignor
>
> **Description:** Name of the party consigning goods as stipulated in the transport contract by the party ordering transport

## 4.3 DATA MODELS AS A TOOL TO DESIGN ELECTRONIC TRADE DOCUMENTS

The rapid expansion of global trade in the 1990s and the availability of modern information and communication infrastructure for traders and government administration posed an increasing need for the automated processing of documents and trade information.

Today there are a number of initiatives to move from paper-based trade to the use of electronic trade documents. The main difference in moving from paper to electronic document processing lies in the fact that paper documents are processed by humans, who can contextualize the information they receive. For example, if the *Consignor* box in the Forwarding Instructions contains the information "1200 Geneva" then the human reader would associate this information with the information on the location of the Consignor. If this information were to be processed electronically, the computer explicitly has to be told that "1200" is the postal code of the city and "Geneva" is the name of the city. Thus information in electronic documents needs to be defined and structured much more precisely than in paper documents.

Many countries now implement Single Window systems[15], which allow exchanging the complete set of information needed for exporting

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[12] For the UNTDED, ISO7372 Data Elements, see: http://www.unece.org/trade/untdid/UNTDED2005.pdf.

[13] For the UN/CEFACT CCL, see: http://www.unece.org/cefact/codesfortrade/unccl/CCL_index.html.

[14] UNECE developed UN/EDIFACT and ebXML (ISO 15000) as international standards for electronic exchange of trade information.

[15] The Single Window is a facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfill all import, export, and transit-related regulatory requirements. If information is electronic then individual data elements should only be submitted once. See also UNECE Recommendation 33: http://www.unece.org/cefact/recommendations/rec33/rec33_trd 352e.pdf.

or importing goods. This means that the data such as the *"Consignor"* information in the Forwarding Instructions can appear, for example, as the "Exporter" information in the Certificate of Origin. This requires that the IT systems of both the freight forwarders and authorities that issue the Certificate use the same data definition and structure for data elements such as the "Consignor".

A Data Model (DM) is a description of all data objects that are needed to manage the international supply chain process. A DM is a key tool in the development of modern Information and Communication Technology (ICT) applications that need to interchange data with other applications.

The data description in a Data Model includes:

* A precise and commonly accepted **definition** of the semantic of the information. For

example, a Data Model could define an "Exporter" as:

| Exporter | Person who makes or on whose behalf an export declaration is made |
|---|---|

* A **description** of the structure of this information.

For example, a Data Model would describe that information about an "Exporter" consists of the Exporter's name, address and contact information.

Data Models that are used in international trade should be developed based on the UN/CEFACT Core Component Technical Specification (CCTS)[16]. The CCTS provides a methodology to describe the semantic and the logical structure of trade information independently

## Figure 4.1. Exporter data structure



Source: WCO DM 3.0

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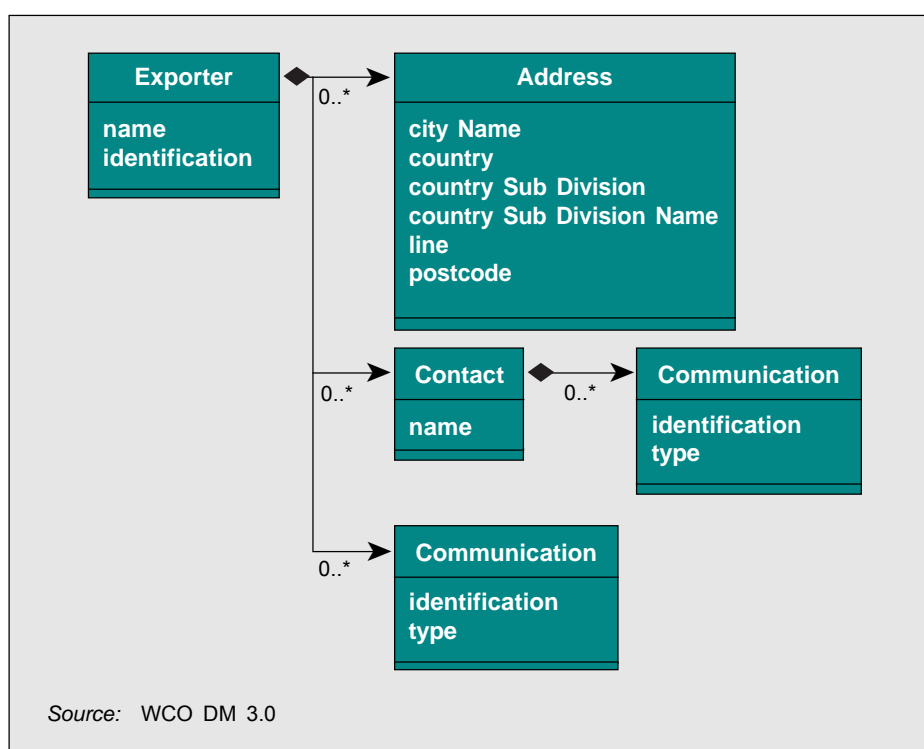
[16] For the UN/CEFACT CCTS see: http://www.unece.org/cefact/codesfortrade/CCTS_index.htm.

from the implementation of a specific syntax[17] for data interchange. This means that the electronic documents can be produced using many different syntax implementation tools, such as UN/EDIFACT[18], Extensible Markup Language (XML)[19] or other formats. This openness to different technical implementations is important, as Single Windows have to provide interconnectivity to many proprietary systems in a country.

**Table 4.1. Relationship between data element, data model, electronic document specification and electronic message**

| | Purpose | Builds on | Standards | Application |
|---|---|---|---|---|
| **Data Element, in UML[20] called a Property Term** | Describes a piece of information used in international trade such as "Exporter name" and "Exporter identification" in Figure 4-1 | | UNTDED | Define data from the perspective of a business expert |
| **Data Object, in UML called Object Class** | Describes a set of data elements that belong together such as the "Exporter" or the "Address" Data Class in Figure 4-1 | Grouped data elements | CCTS, CCL | Define data from the perspective of a system analyst/developer |
| **Data Model** | Describes the structure of data objects used in international trade, including their relationship. | Data Models consist of data objects and other building blocks, such as business process models and information models | WCO DM, CCL | Define data structures and relations for later processing of information in ICT applications |
| **Electronic document specification** | Describes the technical standard on message structure using specific syntax. | It is a subset of the Data Model | XML Schemas and UN/EDIFACT Message Implementation Guide provided by WCO Data Model or other sources | Define a *framework* from which electronic messages can be built. |
| **Electronic message** | Contains detailed information that is structured according to a message specification | Electronic document specification | XML and UN/EDIFACT | Instances implemented based on electronic message specification |

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[17] Syntax describes the way information is encoded in a message. Depending on the standard chosen, there are different ways that the same piece of information can be encoded.

[18] UN/EDIFACT is the "United Nations Electronic Data Interchange for Administration, Commerce and Transport". It comprises a set of internationally agreed standards, directories and guidelines for the electronic interchange of structured data, and in particular that related to trade in goods and services between independent, computerized information systems." For more, see http://www.unece.org/cefact/edifact/welcome.html.

[19] Extensible Markup Language (XML) is a set of rules for encoding documents in machine-readable form.

[20] Please refer to 4.4.1.

When using a DM, each electronic document uses only the data needed for that exchange; therefore, it becomes a subset of the used DM. Only the structures of the DM that are actually used in the trade document will be included in the specification of the electronic document. For example, a Certificate of Origin will include the name and address structure of the DM for the "*Exporter*", but not the one for the "*Importer*".

In the UN/EDIFACT, such an adaptation is called a Message Implementation Guideline (MIG). A MIG could, for example, prescribe that certain fields that are marked as optional in a UN/EDIFACT message specification published by UNECE are not used in message exchanges in the specific country. Likewise, in XML the specification of the structures included in a message is called an XML Schema.

The relationship between Data Element, Data Model, Electronic Document specification and Electronic Message are summarised in Table 4.1.

## 4.4 THE WORLD CUSTOMS ORGANIZATION (WCO) DATA MODEL

The development of a standard Data Model that meets the information requirements of the large number of parties and business processes that participate in international trade is a complex task. To aid users, the World Customs Organization (WCO) has developed the WCO Data Model (DM). The WCO recommends the use of this DM for simplification and automation of information in cross border trade. Governments are invited to use this DM and to adapt it to their specific requirements.

The WCO DM has been developed as a result of a Group of Seven (G7) agreement to standardize and simplify customs data requirements of the G7 countries, in compliance with the "Kyoto Customs Data Principles". The WCO took over the maintenance and management of the output of the G7 initiative in January 2002. The WCO published the data set and the message implementation guidelines as "WCO Customs Data Model – version 1.0".

As a consequence of the event of 11 September 2001, the WCO established a Task Force on Supply Chain Security. In order to meet the requirements defined by this Task Force, the WCO Customs Data Model was updated to version 1.1. Version 2.0 of the WCO Customs Data Model covered conveyance reporting as well as a data set for transit, as defined by the Common Transit Convention[21].

The increasing emphasis on Single Window concepts identified a need for further inclusion of Cross Border Regulatory Agency (CBRA) requirements. This work formed the basis of Version 3.0 of the renamed WCO Data Model, also referred to WCO DM in the later chapters.

The benefits of using the WCO DM for cross border data exchange are as follows:

- Data can be submitted once and reused in many different business processes;
- Data collection and validation processes are greatly simplified; and
- Applications can be developed according to one single data interchange standard.

### 4.4.1 Unified Modelling Language (UML) and Object Classes

Information in a DM is described using the Unified Modelling Language (UML). In UML, trade information is structured according to the object class, property term and representation term:

- The **object class** describes the domain to which object the information belongs. Typical objects in cross border trade are exporters, importers, goods item descriptions, locations, etc.
- A **property term** (or attribute) represents a distinguishable piece of information of the

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[21]   For the Common Transit Convention, see: http://eur-lex.europa.eu/Notice.do?mode=dbl&lang=en&ihmlang=en&lng1=en,de& lng2=cs,da,de,el,en,es,et,fi,fr,hu,it,lt,lv,nl,pl,pt,sk,sl,sv,&val=393167:cs&page=

object class. For example, for the object "Location" the name of the location would be a property term/an attribute.

- The **representation term** describes the data format of the property term. For example, the name of the location would be given in text format.

For example, in the WCO DM, the object class "Exporter" has the two property terms, the "Name" and the "Identification". The property term "Name" is represented by a string of characters (text), maximum 70 characters. The "Identification" is represented by a code (identifier), maximum 17 characters

| WCO ID | WCO DEN | Definition | Format |
|--------|---------|------------|--------|
| R031 | Exporter. Name. Text | Name [and address] of party who makes - or on whose behalf - the export declaration - is made - and who is the owner of the goods or has similar right of disposal over them at the time when the declaration is accepted. | an..70 |
| R032 | Exporter. Identification. Identifier | To identify the name and address of party who makes, or on whose behalf the export declaration is made, and who is the owner of the goods or has similar rights of disposal over them at the time when the declaration is accepted. | an..17 |

## 4.4.2 Dictionary Entry Names and ISO 11179

The objects in a DM are identified through a Dictionary Entry Name (DEN). When developing electronic documents, it is useful to understand the structure of the DEN as it helps to understand the meaning of the information object.

The WCO DM uses the ISO 11179 standard to define the DEN. A DEN consists of a tripartite name, with a format of "Object Class. Property Term. Representation Term", as shown in Figure 4.2.

**Figure 4.2. Examples of Dictionary Entry Name (DEN)**

Tripartite Dictionary Entry Name

| Object Class (OC) | Property Term (PT) | Representation Term (RT) |
|---|---|---|
| Exporter | Name | Text |
| Supplier | Identification | Identifier |
| Commodity | Value | Amount |

Dictionary Entry Names in WCO DM 3.0

R031: Exporter. Name. Text
R053: Supplier. Identification. Identifier
306: Commodity. Value. Amount

**Figure 4.3. UML class diagram of WCO Data Model 3.0**
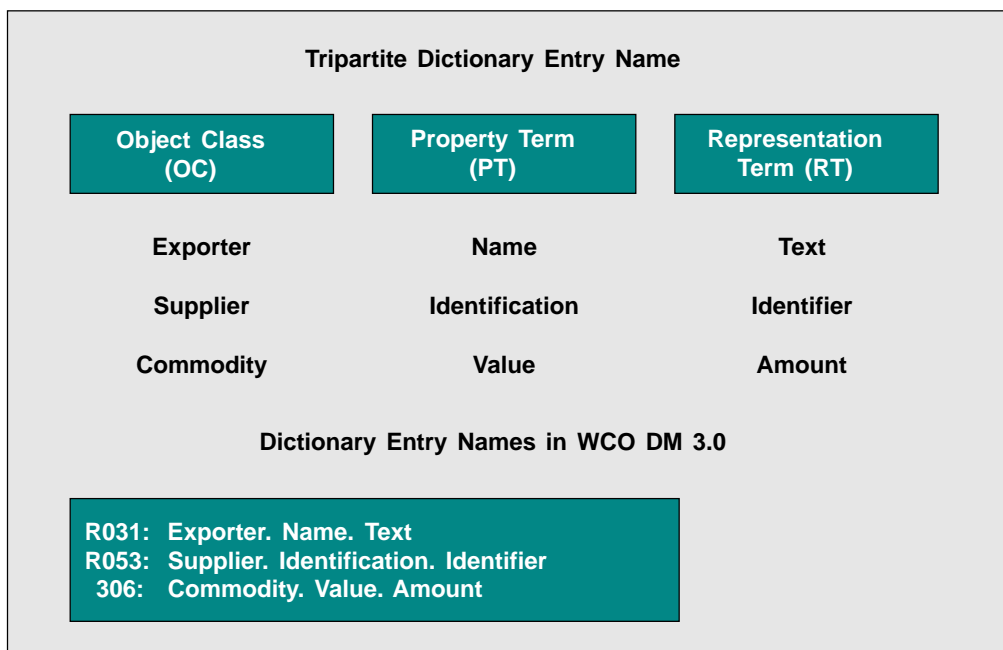
*Source:* WCO
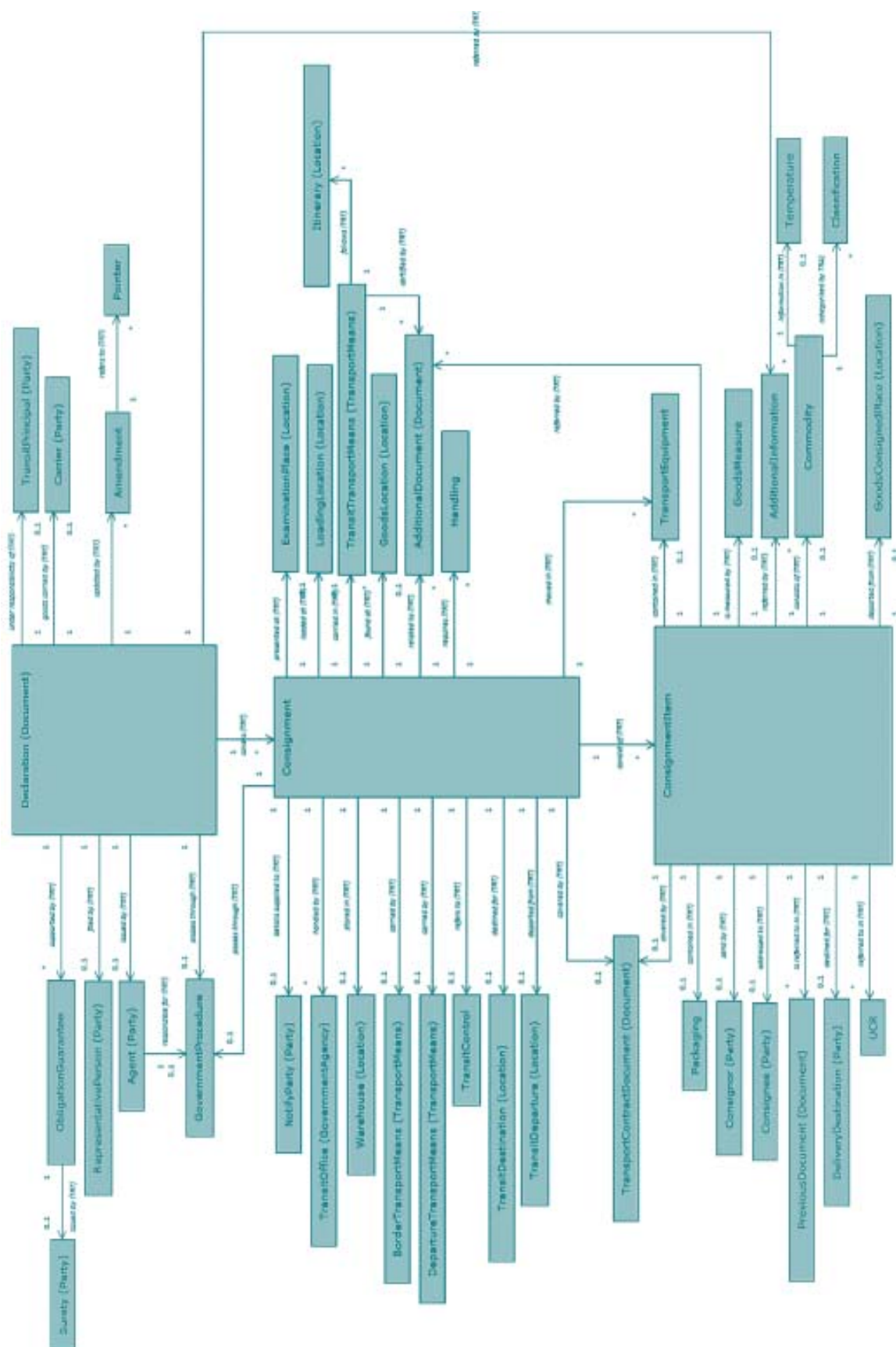
For example, the Dictionary Entry Name of the data element R031 "Exporter. Name. Text" of the WCO Data Model can be decomposed as Object Class=Exporter, Property Term =Name and Representation Term = Text

To better understand the meaning of the data element, it is useful to read the DEN backward, replacing the "." with the word "*of the*":

The text *of the* name *of the* Exporter

**Table 4.2. Data elements of the class "Declaration"**

| WCO ID | Name | Definition | WCO DEN |
|---|---|---|---|
| 013 | Number of loading lists | The number of loading lists, manifests or similar documents. | Declaration. Loading List. Quantity |
| 019 | Document/message status, coded | Code specifying the status of a document. | Declaration. Status. Code |
| 023 | Goods declaration acceptance date (Customs), coded | Date on which a Goods declaration has been or will be accepted by Customs in accordance with Customs legislation. | Declaration. Acceptance. Date Time |
| 065 | Office of declaration, coded | To identify a location at which a declaration is lodged. | Declaration. Declaration Office. Identifier |
| 104 | Authentication | Proof that a document has been authenticated indicating where appropriate the authentication party. | Declaration. Authentication. Text |
| 109 | Total invoice amount | Total of all invoice amounts declared in a single declaration. | Declaration. Invoice. Amount |
| 131 | Total gross weight | Weight (mass) of goods including packaging but excluding the carrier's equipment for a declaration. | Declaration. Total Gross Mass. Measure |
| 187 | Customs office of duty/tax payment declaration, coded. | To identify a location at which a subsequent declaration is lodged. | Declaration. Subsequent Declaration Office. Identifier |
| 227 | Number of seals | To specify the number of seals affixed. | Declaration. Seals Affixed. Quantity |
| 228 | Total number of items | Count of the total number of goods items within a declaration | Declaration. Goods Item. Quantity |
| 373 | Document/message cancellation date and time | Date and time when the document/message was cancelled. | Declaration. Cancellation. Date Time |
| 374 | Document/message rejection date and time | Date and time when the document/message was rejected. | Declaration. Rejection. Date Time |
| 383 | Version number | The sequential number that determines the version of a specific document/message number. | Declaration. Version. Identifier |

### 4.4.3 UML Diagram of the WCO Data Model

The WCO Data Model describes the relationship between the object classes using the UML class diagram as shown in Figure 4.3.

Each blue box in Figure 4.3 represents one object class. For example, Declaration (Document) means a class derived from the super class "document" as described below:

This class "Declaration" consists of the following data elements shown in Table 4.2:

| WCO ID | Class Name | Definition |
|--------|-----------|------------|
| 42A | Declaration | Any statement or action, in any form prescribed or accepted by the Governmental Agency, giving information or particulars required by the Governmental Agency |

# 5. THE STEP-BY-STEP APPROACH FOR DATA HARMONIZATION AND DEVELOPMENT OF ELECTRONIC TRADE DOCUMENTS

This chapter explains the practical steps for data harmonization, for the mapping of data elements to a data model and for developing specifications for electronic messages and documents. Such specifications provide the basis for paperless trade and for the use of electronic messages in the Single Window system.

### Table 5.1. Steps for data harmonization and development of electronic documents

|  | Step 1 (5.1) | Step 2 (5.2) | Step 3 (5.3) | Step 4 (5.4) | Step 5 (5.5) |
|---|---|---|---|---|---|
| Purpose | Capture data requirements in business documents identified through Business Process Analysis | Provide a precise definition for the data elements | Analyse data elements across various documents | Reconcile data elements and obtain a data model | Obtain structure of the electronic document |
| Activity | Business Process Analysis (optional) Collect a list of documents and basic data requirements | Analyse each document to define data definition, type, format and constraints | Organize data elements in a comparable manner for analysis | Map the data elements to reference data model (for example, WCO DM) | Generate electronic document(s) (If using WCO DM, customize XML schema by referring to Implementation Guide provided by WCO DM |
| Input | BPA results, target business documents | List of Documents | List of Document Data Dictionaries | Document Data Dictionary Compilation | Message Implementation Guide (MIG) (If using WCO DM,WCO DM XML schemas) |
| Output | Collection of documents, forms and messages. Optional Business Process description (UML Diagrams) | Document Data Dictionary for each document | Document Data Dictionary compilation for each document family | Data Dictionary with mapping to reference data model | Electronic Document(s) (If using the WCO DM, Customized XML schemas and XML messages in compliance with WCO DM) |

When conducting data harmonization and designing electronic trade documents, 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 become an input into the next step.

This stepwise approach is considered best practice and is recommended in different data harmonization guides such as the APEC Data Harmonization Guide (APEC ESCG 2009) and the Single Window Implementation Framework (SWIF 2010) developed under European Union (EU) Information Technology for Adoption and Intelligent Design for EGovernment (ITAIDE) Project. The stepwise approach is also imple-mented and described in the data harmoniza-tion concept of UNECE Recommendation 34.

The steps and activities are summarized in Table 5.1.

Steps 1, 2, and 3 develop a simplified, stan-dardized and harmonized data set for cross border trade. The Steps 4 and 5 explain the mapping of the data set to a reference data model.  The WCO DM is selected as a refer-ence data model in this *Guide* for illustration because it is expected that many countries support the WCO DM as international standard for B2G and G2G data exchange in cross border trade.

## 5.1  Step 1: Capture Data Requirements of Business Documents Identified through Business Processes Analysis
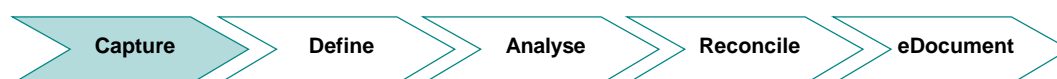


In a Single Window environment, documents and information are used to drive business processes. To simplify, standardize and auto-mate data and documents, one has to under-stand the business processes that generate or use both the data and the documents.

The first step in a data harmonization project is to collect all the data requirements in relevant business documents by analyzing the target trade processes.  This step will deliver the list of trade documents that are used in a data harmonization project and a description of the business processes in which these documents are used.

A Business Process Analysis (BPA), a struc-tured, formal approach for capturing, analysing and simplifying business processes, is recom-mended in this step.  The *UNNExT Business Process Analysis Guide to Simplify Trade Procedures*[22] provides guidelines for conduct-ing a BPA.

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.

A BPA is conducted in three major phases as shown in Figure 5.1:

• Phase I: Scope setting

• Phase II: Data collection and process documentation

• Phase III: Process analysis and recommen-dations development

The outcome of the data collection and process documentation in Phase II helps to understand the data requirements of the stake-holders in the supply chain. If the captured business processes are further simplified in the "to-be" picture, data requirements are likely to be simplified as well (ADB and ESCAP, 2009).

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[22]  For more see: http://www.unescap.org/unnext/tools/business_process.asp

## Figure 5.1. Stepwise approach to Business Process Analysis



*Source:* UNNExT, 2009.
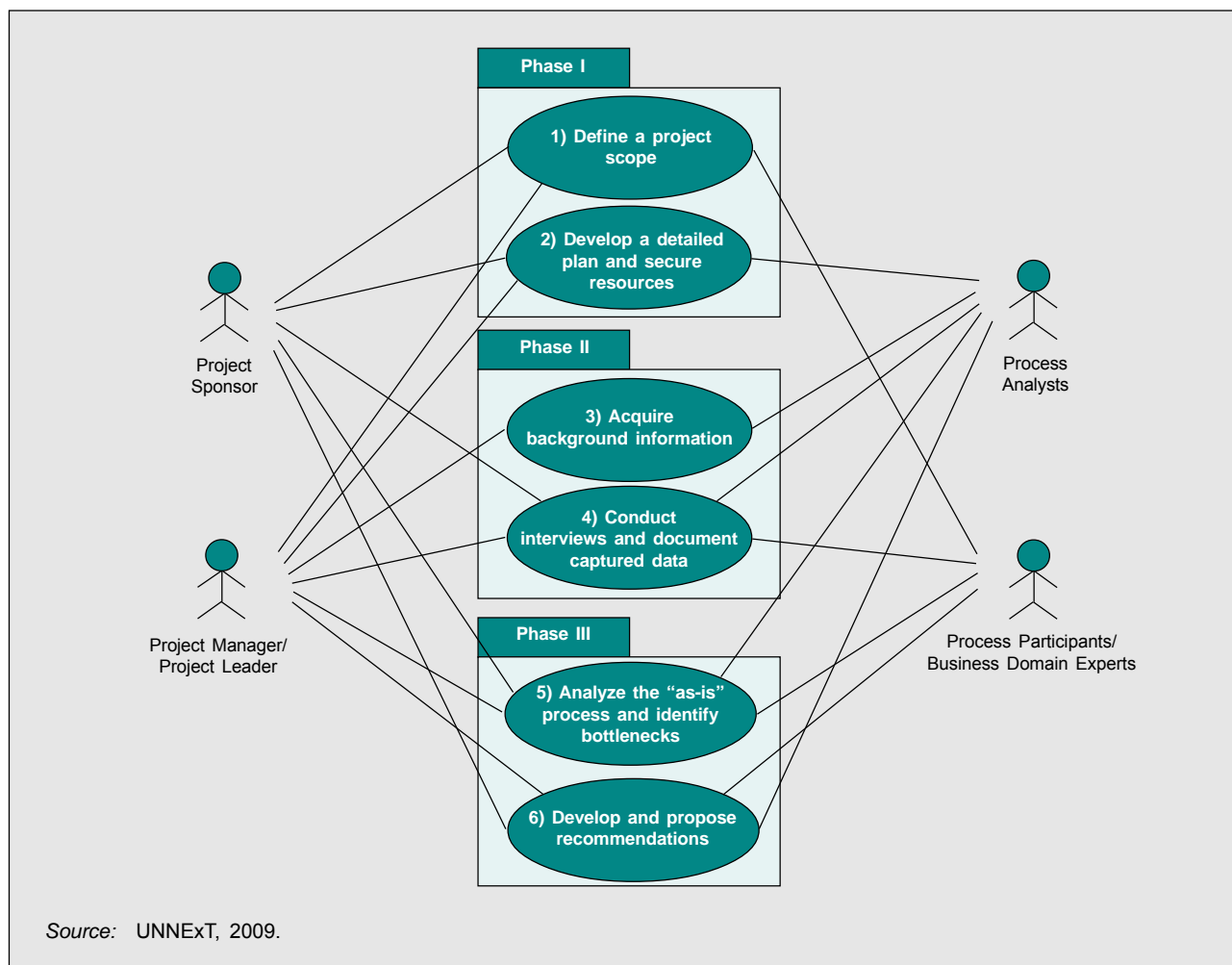
Figure 5.2 illustrates two types of Unified Modelling Language (UML) diagrams used in the UNNExT BPA Guide for visualization of business processes – Use Case diagram and Activity diagram.

The primary purpose of the Use Case diagram is to describe the main activities and actors that are included in a BPA (See Figure 5.1 as an example). 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

which activity, what documentary requirements are involved, and how the information flows. An example of UML activity diagram is shown in Figure 5.3, which is an elaboration of "Obtain Export Permit" use case. This activity diagram describes how an exporter or representative obtains an export permit; documentary requirements, denoted by rectangles, can be easily spotted.

From activity diagrams, one can generate a list of paper documents and electronic documents 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 5.4 shows a list of forms captured from activity diagrams in an actual BPA.

**Figure 5.2. UML diagrams used in Business Process Analysis**



Source:   UNNExT, 2009
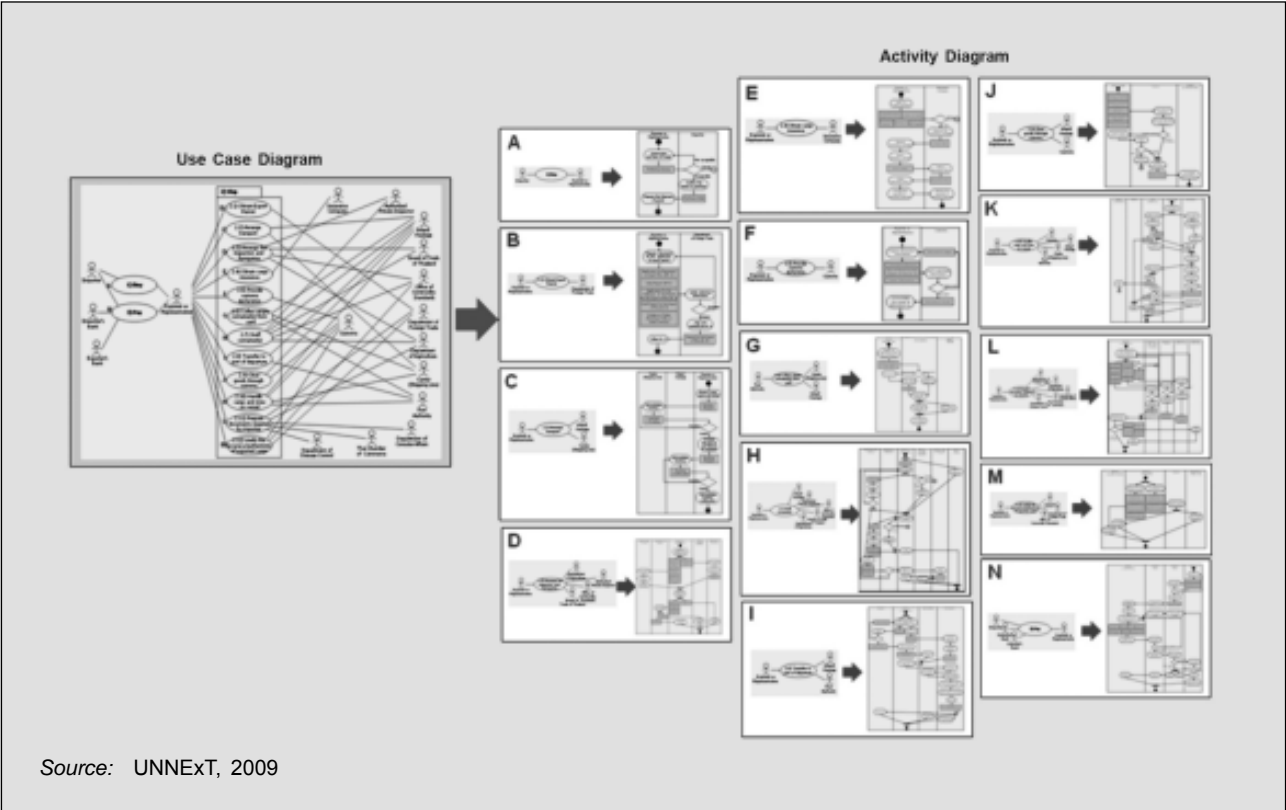
**Figure 5.3. Activity diagram for "Obtain Export Permit" use case**
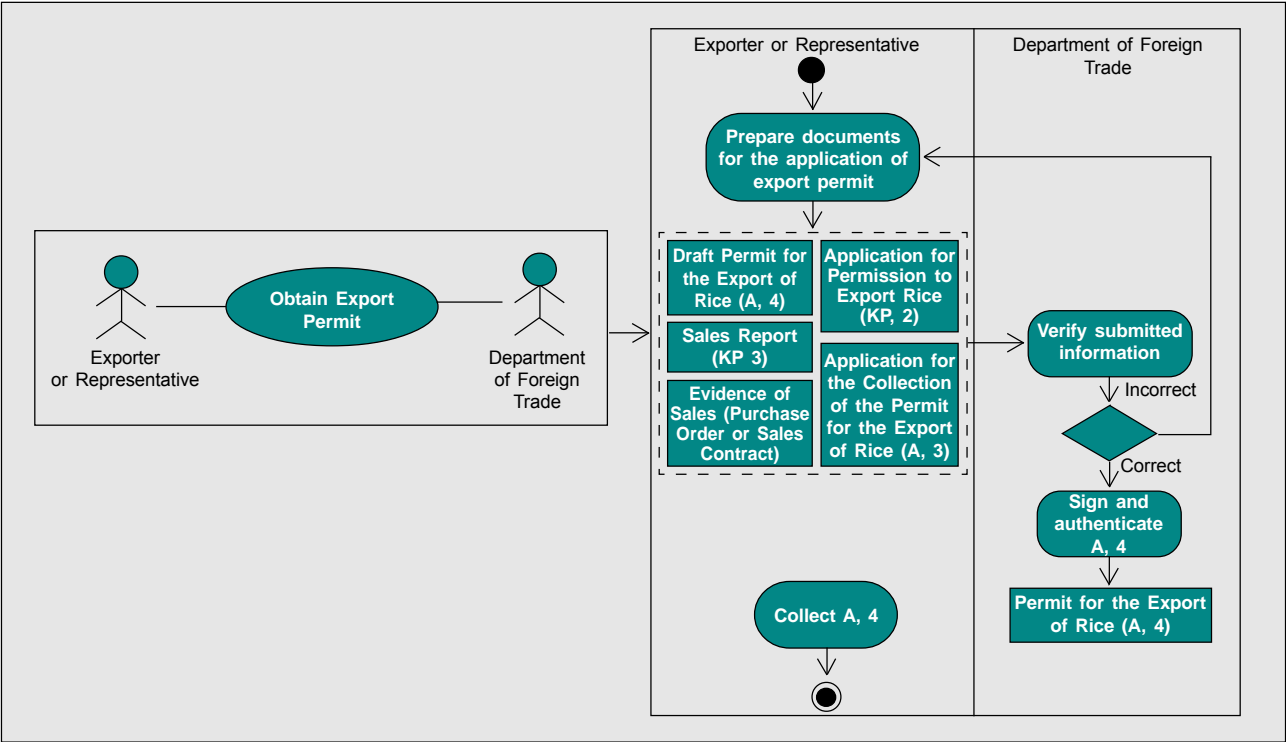
## Figure 5.4 Sample list of forms captured from Activity Diagrams

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

*Source:* UNNExT, 2009

Often a BPA is carried out as an independent project, before data harmonization. Not every data harmonization project might be able to secure resources and time for a formal Business Process Analysis project. If it is not possible to conduct a formal BPA, then at least the most basic information on documents and data included in the data harmonization project should be collected. The information that needs to be collected in this step includes:

- List of forms

- Sample documents (forms with sample data)

- Information on how the document is used (who issues the document, who approves/certifies the document, who uses the information)

- Box completion guidelines, rules and regulations on filling the data, relevant international conventions

- Rules, regulations and laws that govern the use of the document

- Description on electronic documents (XML Schemas, EDI Message Implementation Guides, sample messages)

- Code list used when filling in forms or by electronic documents

Figure 5.5 shows an example of a document that can be collected in the process of capturing documentary requirements; it is the Association of South-East Asian Nations (ASEAN) Trade in Goods Agreement (ATIGA) Form D in the UNLK format. The form itself suggests data requirements that must be fulfilled by the relevant party. Examples of data that are required for this document include data about the exporter, an importer, a conveyance route, a product, a country that issued the certificate and the purpose of the form.

Its Overleaf Notes shown in Figure 5.6 provides valuable information that helps improve its users' understanding about how to enter the data and how to use the form.

## Figure 5.5. Image of the ASEAN ATIGA Form D

| 1. Goods consigned from (Exporter's business name, address, country) | Reference No.<br>ASEAN TRADE IN GOODS AGREEMENT/<br>ASEAN INDUSTRIAL COOPERATION SCHEME<br>CERTIFICATE OF ORIGIN<br>(Combined Declaration and Certificate)<br><br>FORM D<br>Issued in ——————<br>(Country)<br>See Overleaf Notes |
|---|---|
| 2. Goods consigned to (Consignee's name, address, country) | |
| 3. Means of transport and route (as far as known)<br>Departure date<br>Vessel's name/ Aircraft etc.<br>Port of Discharge | 4. For Official Use<br><br>☐ Preferential Treatment Given Under ASEAN Trade in Goods Agreement<br><br>☐ Preferential Treatment Given Under ASEAN Industrial Cooperation Scheme<br><br>☐ Preferential Treatment Not Given (Please state reason/s)<br><br>........................................................<br>Signature of Authorised Signatory of the Importing Country |

| 5. Item number | 6. Marks and numbers on packages | 7. Number and type of packages, description of goods (including quantity where appropriate and HS number of the importing country) | 8. Origin criterion (see Overleaf Notes) | 9. Gross weight or other quantity and value (FOB) | 10. Number and date of invoices |
|---|---|---|---|---|---|
| | | | | | |

| 11. Declaration by the exporter<br><br>The undersigned hereby declares that the above details and statement are correct; that all the goods were produced in<br><br>.....................................................<br>(Country)<br><br>and that they comply with the origin requirements specified for these goods in the ASEAN Trade in Goods Agreement for the goods exported to<br><br>.....................................................<br>(Importing Country)<br><br>.....................................................<br>Place and date, signature of authorised signatory | 12. Certification<br><br>It is hereby certified, on the basis of control carried out, that the declaration by the exporter is correct.<br><br><br><br><br><br><br><br><br><br>.....................................................<br>Place and date, signature and stamp of certifying authority |
|---|---|
| 13.<br>• Third Country Invoicing    • Exhibition<br>• Accumulation    • De Minimis<br>• Back-to-Back CO    • Issued Retroactively<br>• Partial Cumulation | |

## Figure 5.6. Overleaf Note of the ASEAN ATIGA Form D

**OVERLEAF NOTES**

1. Member States which accept this form for the purpose of preferential treatment under the ASEAN Trade in Goods Agreement (ATIGA) or the ASEAN Industrial Cooperation (AICO) Scheme:

| | | |
|---|---|---|
| BRUNEI DARUSSALAM | CAMBODIA | INDONESIA |
| LAO PDR | MALAYSIA | MYANMAR |
| PHILIPPINES | SINGAPORE | THAILAND |
| VIETNAM | | |

2. CONDITIONS: The main conditions for admission to the preferential treatment under the ATIGA or the AICO Scheme are that goods sent to any Member States listed above must:

   (i) fall within a description of products eligible for concessions in the country of destination;
   (ii) comply with the consignment conditions in accordance with Article 32 (Direct Consignment) of Chapter 3 of the ATIGA; and
   (iii) comply with the origin criteria set out in Chapter 3 of the ATIGA.

3. ORIGIN CRITERIA: For goods that meet the origin criteria, the exporter and/ or producer must indicate in Box 8 of this Form, the origin criteria met, in the manner shown in the following table:

| Circumstances of production or manufacture in the first country named in Box 11 of this form | Insert in Box 8 |
|---|---|
| (a) Goods wholly obtained or produced in the exporting Member State satisfying Article 27 (Wholly Obtained) of the ATIGA | "WO" |
| (b) Goods satisfying Article 28 (Non-wholly obtained) of the ATIGA<br><br>• Regional Value Content<br><br>• Change in Tariff Classification<br><br>• Specific Processes<br><br>• Combination Criteria<br><br>(c) Goods satisfying paragraph 2 of Article 30 (Partial Cumulation) of the ATIGA | Percentage of Regional Value Content, example "40%"<br><br>The actual CTC rule, example "CC" or "CTH" or "CTSH"<br><br>"SP"<br><br>The actual combination criterion, example "CTSH + 35%"<br><br>"PC x %, where x would be the percentage of Regional Value Content of less than 40%, example "PC 25%" |

4. EACH ARTICLE MUST QUALIFY: It should be noted that all the goods in a consignment must qualify separately in their own right. This is of particular relevance when similar articles of different sizes or spare parts are sent.

5. DESCRIPTION OF PRODUCTS: The description of products must be sufficiently detailed to enable the products to be identified by the Customs Officers examining them. Name of manufacturer and any trade mark shall also be specified.

6. HARMONISED SYSTEM NUMBER: The Harmonised System number shall be that of in ASEAN Harmonised Tariff Nomenclature (AHTN) Code of the importing Member State.

7. EXPORTER: The term "Exporter" in Box 11 may include the manufacturer or the producer.

8. FOR OFFICIAL USE: The Customs Authority of the importing Member State must indicate (✓) in the relevant boxes in column 4 whether or not preferential treatment is accorded.

9. MULTIPLE ITEMS: For multiple items declared in the same Form D, if preferential treatment is not granted to any of the items, this is also to be indicated accordingly in box 4 and the item number circled or marked appropriately in box 5.

10. THIRD COUNTRY INVOICING: in cases where invoices are issued by a third country, "the Third Country Invoicing" box should be ticked (✓) and such information as name and country of the company issuing the invoice shall be indicated in box 7.

11. BACK-TO-BACK CERTIFICATE OF ORIGIN: In cases of Back-to-Back CO, in accordance with Rule 11 (Back-to-back CO) of Annex 8 of the ATIGA, the "Back-to-Back CO" box should be ticked (✓).

12. EXHIBITIONS: In cases where goods are sent from the exporting Member State for exhibition in another country and sold during or after the exhibition for importation into a Member State, in accordance with Rule 22 of Annex 8 of the ATIGA, the "Exhibitions: box should be ticked (✓) and the name and address of the exhibition indicated in box 2.

13. ISSUED RETROACTIVELY: In exceptional cases, due to involuntary errors or omissions or other valid causes, the Certificate of Origin (Form D) may be issued retroactively, in accordance with paragraph 2 of Rule 10 of Annex 8 of the ATIGA, the "Issued Retroactively" box should be ticked (✓).

14. Accumulation: In cases where goods originating in a Member State are used in another Member State as materials for finished goods, in accordance with paragraph 1 of Article 30 of the ATIGA, the "Accumulation" box should be ticked (✓).

15. PARTIAL CUMULATION (PC): If the Regional Value Content of the material is less than forty percent (40%), the Certificate of Origin (Form D) may be issued for cumulation purposes, in accordance with paragraph 2 of Article 30 of the ATIGA, the "Partial Cumulation" box should be ticked (✓).

16. DE MINIMIS: If a good that does not undergo the required change in tariff classification does not exceed ten percent (10%) of the FOB value, in accordance with Article 33 of the ATIGA, the "De Minimis" box should be ticked (✓).

## 5.2 Step 2: Define Data in Each Document and Define the Semantic of the Data and the Data Formats

Capture ⟩ Define ⟩ Analyse ⟩ Reconcile ⟩ eDocument
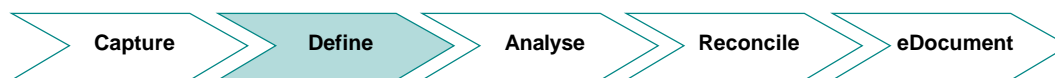
The purpose of this step is to obtain a precise description of the data requirements. The data is described and specified using the definitions and terminology of business users and experts, for example buyer/seller, Customs officer or freight forwarder. This forms a basis for a solid understanding of the semantic of the data, its type, representation, format, and constraints, which is 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 1, 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, especially during Phase II. Examples are:

- Document/form, with sample fill-in data and/or box completion guideline if available

- EDI Message Implementation Guide

- User Interface (Data Entry Screens), with its data dictionary if available

- Interviews with users of the document

A Data Dictionary of one document can contain the following pieces of information:

- Document title

- Document purpose

- Name of document owner

- Identification number for each data element name such as the box number in the document

- Name of each data element as it appears in a document

- Definition of each data element in local language and/or English as given by the owner of the document and/or relevant standard such as WCO Data Model, UNTDED, and UN/CEFACT Core Component Library

- Format (alphabetic, numeric, alpha-numeric) and size (length of a data element, value in terms of digits or characters) of each data element

- Constraint on the occurrence of each data element (MinOccurs, MaxOccurs)

- Code lists and subsets of code lists

Data modellers must have a solid understanding of data elements in terms of definition, data type, data format, and data constraints in actual operation. They should maintain close consultation with the document owner when defining the data elements of a specific document to ensure that the data definitions are correct.

Table 5.2 shows an example of a data dictionary. The data dictionary is made for the ASEAN ATIGA Form D issued by ASEAN national government (See Annex 1 for the full data dictionary). In this case, the definition and data representation format of each data element are drawn from UNTDED and WCO DM v3.0.

The data elements of the compiled data dictionary were primarily extracted from the data element names specified on the paper form of ASEAN ATIGA Form D with additional reference to the information provided in the overleaf note. Correspondence of data elements between paper form and the compiled data dictionary is illustrated in Figure 5.7.

## Table 5.2. Example of document data dictionary (ASEAN ATIGA Form D)

**Document Title**      ASEAN ATIGA FORM D
**Document Purpose**    A Certificate of Origin is a document/message identifying goods, in which the authority or body authorized to issue it, certifies expressly that the goods to which the certificate relates originate in a specific country.
**Name of Document Owner**  Issuing Authorities, ASEAN Nations

| ASEAN ATIGA FORM D Data |
|---|
| **0-1 Reference Number**<br>TDED 1004: Reference number identifying a specific document. an..35<br>(Min=1, Max=1) |
| **1 Goods consigned from (Exporter's business name, address, country)**<br>TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.) an..35<br>(Min=1, Max=1) |
| **2 Goods consigned to (Consignee's name, address, country)**<br>TDED 3132: Name and address of party to which goods are consigned an..512<br>(Min=1, Max= 1) |
| **3-1 Departure date**<br>TDED 2380: The value of a date, a date and time, a time or of a period in a specified representation. an..35<br>(Min=1, Max= 1) |
| **3-2 Vessel's name/aircraft etc.**<br>TDED 8212: Name of a specific means of transport such as the vessel name an..35<br>(Min=1, Max= 1) |
| **3-3 Port of discharge**<br>TDED 3224: Name of a location. an..256<br>(Min=1, Max=1) |
| **4 For official use (Declaration Type)**<br>TDED 1001: Code specifying the name of a document. an..3<br>(Min=1, Max=1) |
| **5 Item No.**<br>TDED 1050: To identify a position within a sequence an..10<br>(Min=1, Max=1) |

The definitions required at this point are from the perspective of the users of the document. Depending on the circumstances of the data harmonization project, it may be necessary to provide more than one definition for the data element. For example:

• The definition of the data element in the national/original language, as given in the national legislation, administrative instructions, etc.; and,

• The definition of this data element taken from an international repository of definition of trade terms such as the UNTDED or the WCO Data Element Directory. Some documents are governed by international conventions which include definitions of data elements, for example the TIR, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or Convention on the Contract for the International Carriage of Goods by Road (CMR). The data definitions could also be included in the Data Dictionary. When defining the data elements, definitions from an international standard should always be included in the Data Dictionary.

## Figure 5.7. Mapping of data between paper form and compiled data dictionary with UNTDED

| | | ASEAN ATIGA FORM D Data |
|---|---|---|
| 1. Goods consigned from (Exporter's business name, address, country) | Reference No.<br><br>ASEAN TRADE IN GOODS AGREEMENT/ ASEAN INDUSTRIAL COOPERATION SCHEME CERTIFICATE OF ORIGIN (Combined Declaration and Certificate)<br><br>FORM D<br><br>Issued in ———<br>(Country)<br>See Overleaf Notes | **0-1 Reference Number**<br>TDED 1004: Reference number identifying a specific document. an..35<br>(Min=1, Max=1) |
| 2. Goods consigned to (Consignee's name, address, country) | | **1 Goods consigned from (Exporter's business name, address, country)**<br>TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.) an..35<br>(Min=1, Max=1) |

| | |
|---|---|
| 3. Means of transport and route (as far as known)<br><br>Departure date<br><br>Vessel's name/ Aircraft etc.<br><br>Port of Discharge | 4. For Official Use<br><br>☐ Preferential Treatment Given Under ASEAN Trade in Goods Agreement<br>☐ Preferential Treatment Given Under ASEAN Industrial Cooperation Scheme<br>☐ Preferential Treatment Not Given (Please state reason/s)<br><br>..................................................<br>Signature of Authorised Signatory of the Importing Country |

**2 Goods consigned to (Consignee's name, address, country)**
TDED 3132: Name and address of party to which goods are consigned an..512
(Min=1, Max= 1)

**3-1 Departure date**
TDED 2380: The value of a date, a date and time, a time or of a period in a specified representation. an..35
(Min=1, Max= 1)

| 5. Item number | 6. Marks and num-bers on pack-ages | 7. Number and type of packages, description of goods (including quantity where appropriate and HS number of the importing country) | 8. Origin criterion (see Overleaf Notes) | 9. Gross weight or other quantity and value (FOB) | 10. Number and date of invoices |
|---|---|---|---|---|---|
| | | | | | |

**3-2 Vessel's name/aircraft etc.**
TDED 8212: Name of a specific means of transport such as the vessel name an..35
(Min=1, Max= 1)

**3-3 Port of discharge**
TDED 3224: Name of a location. an..256
(Min=1, Max=1)

| 11. Declaration by the exporter<br><br>The undersigned hereby declares that the above details and statement are correct; that all the goods were produced in<br><br>..................................................<br>(Country)<br><br>and that they comply with the origin requirements specified for these goods in the ASEAN Trade in Goods Agreement for the goods exported to<br><br>..................................................<br>(Importing Country)<br><br>..................................................<br>Place and date, signature of authorised signatory | 12. Certification<br><br>It is hereby certified, on the basis of control carried out, that the declaration by the exporter is correct.<br><br><br><br>..................................................<br>Place and date, signature and stamp of certifying authority |
|---|---|

**4 For official use (Declaration Type)**
TDED 1001: Code specifying the name of a document. an..3
(Min=1, Max=1)

**5 Item No.**
TDED 1050: To identify a position within a sequence an..10
(Min=1, Max=1)

| 13.<br>• Third Country Invoicing<br>• Accumulation<br>• Back-to-Back CO<br>• Partial Cumulation | • Exhibition<br>• De Minimis<br>• Issued Retroactively |
|---|---|

## 5.3 Step 3: Analyse Data Elements across Various Documents and Organize Them in a Comparable Manner

Capture ▸ Define ▸ **Analyse** ▸ Reconcile ▸ eDocument
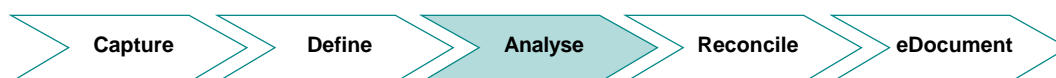
The purpose of this step is to organize data specifications from different documents in a comparable manner. This step facilitates a consistent mapping of the data elements to a data model, which is done in the next step.

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.

To ensure consistent mapping, Data Dictionaries should be compiled in such a way that they belong to the same type of trade document. The following categories are suggested[23]:

- Category 1 includes documents that are related to commercial transaction and payment.
- Category 2 includes documents for transport and official control that provide information on a single consignment (e.g. customs declaration).

- Category 3 includes documents of transport and official control that provide information on multiple consignments (e.g. manifest).

Organizing Data Dictionaries in this manner facilitates the mapping of the data elements with the reference data model in step 4.

Table 5.3 provides an example of trade documents and their categorization in document families Upon completion of this step, a data dictionary compilation is available for each document family. Table 5.4 shows an example of a data dictionary compilation, illustrating the comparison of ASEAN ATIGA Form D with two Thai export forms.

Data elements that occur in several documents may have identical names but show differences in definitions, data representation, code lists, or usage. The difference implies that these data elements will be mapped to different data structures of the data model.

## 5.4 Step 4: Map Data Elements to Reference Data Model

Capture ▸ Define ▸ Analyse ▸ **Reconcile** ▸ eDocument
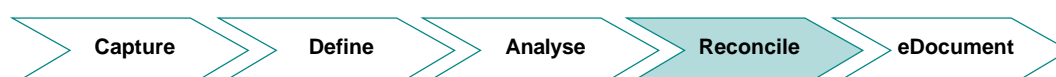
Mapping is the process of linking an element in one dictionary with a semantically equivalent element in another dictionary. A data dictionary contains data element descriptions of national trade documents defined from the perspective

of a business expert. In Step 4, these data elements are mapped to semantically equivalent data elements in a reference data model. In this Guide, the WCO DM is used as a reference data model for the purpose of illustration. Data elements in the WCO DM describe the same data with the detailed structure and precision required for automated information processing.

The output of the mapping in Step 4 is the list of data elements of a reference data model, the WCO DM in the case of illustration in this

---

[23] Annex IV-2 provides an example of trade documents grouped under the different document families. An example for the categorization of a set of national trade documents used in the export of Jasmine Rice from Thailand into UNLK document families is given in Annex IV-2 of this *Guide.*

## Table 5.3. Example of document categorization

| Process | UNLK Document Family | | Documents |
|---|---|---|---|
| **Buy** | Commercial Transaction | | • 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 |
| **Ship** | Transport and Related Services | Forwarding and Cargo Handling | • Instructions from customers to forwarders, i.e., Forwarding instructions<br>• Goods receipts, i.e., Forwarder's warehouse receipt; Dock receipt; Warehouse (shed) receipt<br>• Advice documents, i.e., Forwarder's advice to import agent, Forwarder's advice to exporter<br>• Authorization and instructions, i.e., Delivery order; Handling order; Gate pass<br>• Administrative documents, i.e., Forwarder's invoice; Port charges documents |
| | | Transport | • Contract documents, i.e., Bill of Lading; Waybills; Rail and road consignment notes; Dispatch notes for post parcels<br>• Receipt documents, i.e., Receipt of goods for carriage; Mate's receipt; Certificate of transport<br>• Contents documents listing foods in transport units or means of transport, i.e., Cargo and freight manifests<br>• Administrative and legal documents, i.e., Road list; Discharge report<br>• Notification documents, i.e., Booking confirmation, Arrival notice; Delivery notices |
| | | Insurance | • Insurance agreements, i.e., Insurance contract; Insurance policy; Insurance certificate<br>• Notification documents, i.e., Insurance notice; Cover note<br>• Administrative documents, i.e., Premium notice; Insurer's invoice |
| | Official Controls | | • Collection of customs duties and taxes safeguarding of revenue, i.e., Customs goods declaration; Cargo Declaration; Customs invoice; Transit bond-notes<br>• Quantitative restrictions on exports and imports, i.e., Application for export/import licenses; Export/import licenses<br>• Controls and restrictions regarding exchange, i.e., Application for exchange allocation; Foreign exchange permit<br>• Sanitary, veterinary and plant controls, i.e., Phytosanitary, Sanitary and Veterinary certificates; Application for such certificates<br>• Controls of quality and product standards, i.e., Goods control and inspection certificates; Application for such certificates<br>• Granting of preferential treatment for goods of certain origin, i.e., Certificate of Origin; Application for such certificates<br>• Restrictions imposed to safeguard public security, cultural heritage, etc., i.e., Dangerous goods declaration<br>• Collection of foreign trade statistics, i.e., Statistical documents for export/import |
| **Pay** | Payment | | • 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<br>• 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<br>• Information exchanged between banks |

## Table 5.4. Example of data dictionary compilation

| ASEAN ATIGA FORM D A Certificate of Origin certifies expressly that the goods to which the certificate relates originate in a the specific country. Issuing Authorities, Thailand | Permit for the Export of Rice (A. 4) Permit for the Export of Rice (A. 4) is only given to rice exporters who follow the Ministry of Commerce's Regulation for Rice Exportation 1997. Department of Foreign Trade, Ministry of Commerce, Thailand | Certificate of Standards of Products (MS. 24) Certificate of Standards of Products (MS. 24) certifies that rice to be exported has the quality set by importer. Board of Trade of Thailand |
|---|---|---|
| | **11 Place of departure** TDED 3214: Name of the port, airport or other type of location from which a means of transport is scheduled to depart or has departed an.. 256 (Min = 1, Max = 1) | **20 Place of departure** TDED 3214: Name of the port, airport or other type of location from which a means of transport is scheduled to depart or has departed an.. 256 (Min = 1, Max = 1) |
| **11-2 Country of Exportation** TDED 3229: Country subdivision where goods begin their journey to export location an..9 (Min=1, Max=1) | **5 Destination country** TDED 3216:Name of the country to which the goods are to be delivered to the final consignee or buyer an..35 (Min = 1, Max = 1) | **21 Country of destination of goods** TDED 3014: Name of the country to which a consignment of goods is to be or has been delivered an..35 (Min = 1, Max = 1) |
| **5 Item No.** TDED 1050: To identify a position within a sequence. n..10 (Min = 1, MAX = unbounded) | **12 Line item** TDED 1082: An identifier differentiating an individual line item from within a series an..6 (Min = 1, Max = unbounded) | |
| **9-2 Item Price** TDED 5032: Amount declared for Customs purposes of those goods in a consignment which are subject to the same Customs procedure, and have the same tariff/statistical heading, country information and duty regime. an..18 (Min = 1, Max = unbounded) | **17 Price (FOB)** TDED 5032: Amount declared for customs purposes of those goods in a consignment which are subject to the same customs procedure, and have the same tariff/statistical heading, country information and duty regime an..18 (Min = 1, Max = unbounded) | **13 FOB Amount** TDED 5032: Amount declared for customs purposes of those goods in a consignment which are subject to the same customs procedure, and have the same tariff/statistical heading, country information and duty regime an..18 (Min = 1, Max = unbounded) |
| **6 Marks and Numbers on Packages** TDED 7102: Free form description of the marks and numbers on a transport unit or package. an..512 (Min = 1, Max = 1) | | **18 Marks and numbers on packages** TDED 7102: Marks and numbers identifying individual packages an..512 (Min = 1, Max = 1) |

*Guide*, that are needed for national cross border data exchange. These data elements form a subset of the WCO DM. This subset can be called the national Data Model. The national data model will be used in the final step to produce the specifications for the national electronic trade documents.

The main task in this step is to map the data elements in the compiled data dictionary with their corresponding components in the WCO DM. The corresponding component in the WCO DM is identified with the WCO ID, an alphanumeric unique identifier of the data element in the Data Model. It is recommended

that the data modellers record the mapping result by extending the compiled data dictionary with an additional column containing the WCO ID. The sample output of the mapping is shown in Table 5.5. Due to limitation in space, the Table includes only some part of one sample document, the Certificate of Origin (CoO) (See Annex II for fully mapped list).

### Table 5.5. Data dictionary of Certificate of Origin (ASEAN ATIGA Form D) mapped to WCO Data Model 3.0

| ASEAN ATIGA FORM D Data | WCO ID | Data Model Classes | WCO Dictionary Entry Name |
|---|---|---|---|
| **0-1 Reference Number**<br>TDED 1004: Reference number identifying a specific document. an..35<br>(Min=1, Max=1) | D014 | Declaration | Declaration. Identification. Identifier |
| **1 Goods consigned from (Exporter's business name, address, country)**<br>TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.)<br>(Min=1, Max=1) | R031 | Exporter | Exporter. Name. Text |
| **2 Goods consigned to (Consignee's name, address, country)**<br>TDED 3132: Name and address of party to which goods are consigned an..256<br>(Min=1, Max= 1) | R037 | Importer | Importer. Name. Text |
| **3-1 Departure date**<br>TDED 2380: Date and optionally time of the departure of the goods from original consignor. an..35<br>(Min=1, Max= 1) | 030 | Goods Shipment | GoodsShipment. Departure. Datetime |
| **3-2 Vessel's name/aircraft etc.**<br>TDED 8212: name of specific means of transport such as vessel name an..35<br>(Min=1, Max= 1) | T001 | Arrival Transport Means | ArrivalTransportMeans. Name. Text |
| **3-3 Port of discharge**<br>DED 3224: Name of a location an..256<br>(Min=1, Max=1) | L012 | Unloading Location | UnloadingLocation. Name. Text |
| **4 For official use (Declaration Type)**<br>TDED 1001 : Code specifying the name of a document. an..3<br>(Min=1, Max=1) | D013 | Declaration | Declaration. Type. Code |
| **5 Item No.**<br>TDED 1050: Number indicating the position in a sequence n..10<br>(Min=1, Max=1) | 006 | Commodity | Commodity. Sequence. Numeric |

The following example explains how the mapping process is done technically:

The data modelers map each data element of the compiled Data Dictionary with the equivalent data element from the WCO Data Model. The distribution of the WCO DM includes the Data Model Class and Dictionary entry name which are included in an Excel table called the "Interactive Data Set". Open the Excel file "WCO Data Model Version 3.0 – The Interactive Data Set" by clicking the green icon, the one circled in Figure 5.8. The spreadsheet also contains explanatory notes that explain the data in the spreadsheet.

**Figure 5.8. WCO DM 3.0 with link to the Interactive Data Set**
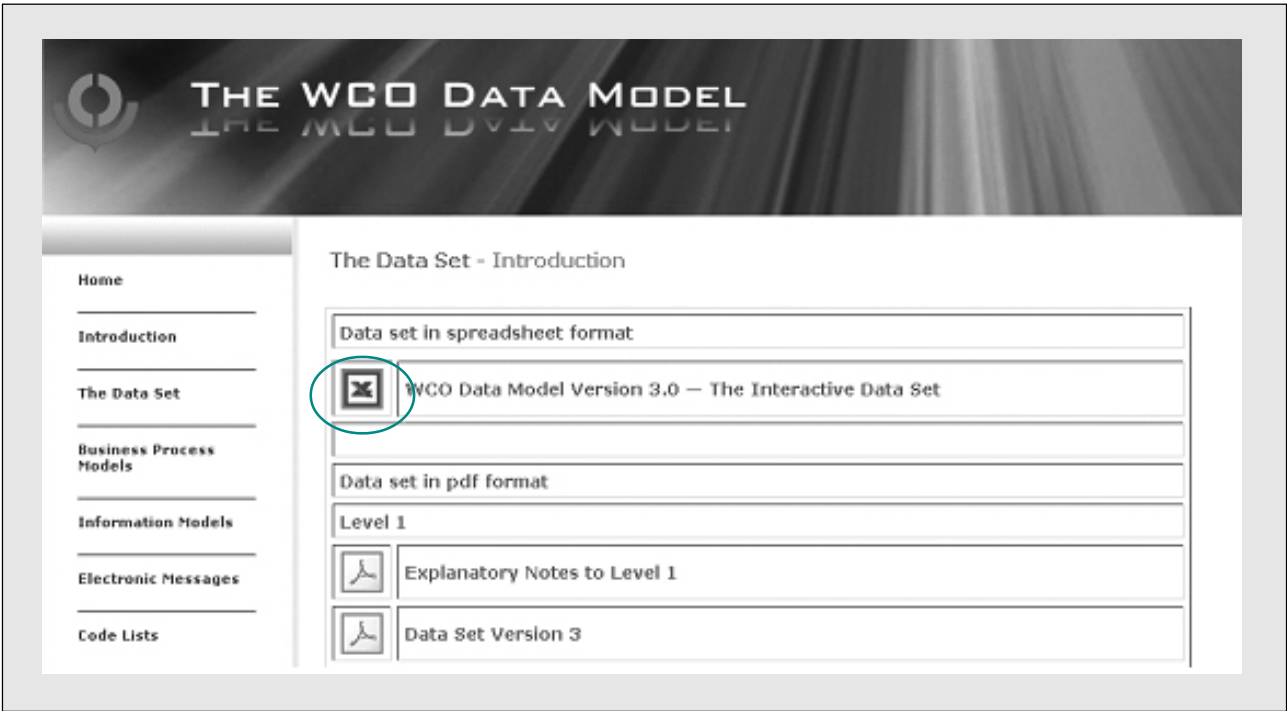


For the mapping exercise in this step the most important column is the "UID" Column which identifies the UNTDED tag of the data element and the "WCO ID" column which identifies the corresponding WCO ID. The information can be found in the tabs "Data Set Version 3" or in the "Super class" tabs marked in orange color.



When mapping to the WCO Data Model, the data modeler need to deal with the following cases:

- **One TDED Data Element maps to exactly one WCO Data Element**

    Ideally, by searching the column "UID" with a TDED tag, the data modeler obtains one single WCO Data Element. In Table 5.4 the data element in box "Marks and numbers on

packages" of the CoO is mapped to TDED "7102" which corresponds to WCO ID "142".

- **One TDED Data Element maps to more than one WCO Data Element**

    In the WCO Data Model, one TDED element can be mapped to several WCO ID's. For example, TDED element "7002" can be mapped to either WCO ID "137" or "258" as shown below. The two WCO Data Ele-

| WCO details | | | | | Import | Export | Conveyance | Transit | Response | WCO details | | UNTDED Details | | DENs | SAFE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WCO ID | Name | Definition | Data Model Classes | | | | | | | Format | Code remarks | UID | Name | | |
| ▼ | ▼ | ▼ | | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
| 142 | Shipping marks | Free form description of the marks and numbers on a transport unit or package. | Package | | x | x | | x | | an. 512 | UN/ECE Recommendation 15 | 7102 | Goods Item. Shipping Marks. Text | | x |

| WCO details | | | | | Import | Export | Conveyance | Transit | Response | WCO details | UNTDED Details | | DENs | SAFE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WCO ID | Name | Definition | Data Model Classes | | | | | | | Format | UID | Name | | |
| ▼ | ▼ | ▼ | | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
| 137 | Description of goods | Plain language description of the nature of a goods item sufficient to identify it for customs, statistical or transport purposes. | Commodity | | x | x | | x | | an. 512 | 7002 | Goods Item. Description Text | | x |
| 258 | Commodity name | A name or a term that identifies the goods are assigned by a seller as distinct from those of other sellers, also known in legal terms as trademark. A brand helps to identify one item, a family of items, or all items of that seller. | Commodity | | x | x | | | | an. 35 | 7002 | Goods Item. Description Text | | |

ments have a different semantic. The data modeller needs to analyse how the data element is used in trade document and decide which of the two mappings provides the best match. Obviously, the Business Process Analysis made in Step 1 can now give valuable information for the decision. For example the box "Description of goods" of the CoO should be mapped to WCO ID "137".

- **One TDED Data Element does not have a direct mapping to a WCO Data Model Data Element**

In the WCO DM, some data elements are mapped to a generic TDED tag instead of a specified one. The box "Supplementary details" in CoO can be mapped to TDED "4142" (Document.Information.Text). For this data element there is no direct map-

ping in WCO DM V 3.0. Instead all related data elements of the WCO DM 3.0 are mapped to the generic TDED data element "4440" (Free Text. Text) as shown below.

In the example of the CoO Box "Supplementary Details," the TDED 4142 should be mapped to WCO ID "225" (Additional statement text).

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | WCO details | | | | Conveyance | | Response | WCO details | | UNDED Details | | | |
| 2/3 | WCO ID | Name | Definition | Data Model Classes | Import | Export | | Transit | | Format | Code remarks | UID | Name | DENs | SAFE |
| 4 | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
| 45 | 105 | Free text | Free text field available to the message sender for information. | Additional Information | x | x | x | x | | an. 512 | | 4440 | Free Text. Text | | |
| 117 | 225 | Additional Statement text | Description of an additional statement | Additional Information | x | x | | x | x | an. 512 | Certificate text | 4440 | Free Text. Text | | |
| 172 | 304 | Criteria conformance text | A statement indicating specific conformance with statutory and regulatory requirements | Commodity | x | | | | | an. 512 | | 4440 | Free Text. Text | | |
| 229 | 362 | Package filler description | Free text description of the material found within a package used to cushion the commodity or otherwise empty space. | Commodity Related Packaging | x | | | | | an. 256 | | 4440 | Free Text. subject code | | |
| 231 | 364 | Ship-to-ship activity | Text description of ship-to-ship activity | Border Transport Means | | | x | | | an. 256 | | 4440 | Free Text. Text | | |

### Data Element in Super Class Table

In the WCO Data Model Version 3.0, certain data elements that belong to frequently used object classes are grouped together in so called "Super Classes". There are five super classes in the Data Model: Document, Government Agency, Location, Party and Transport Means. The data elements of the Super Classes are located in separate tables of the spreadsheet with orange coloured tags. If a UNTDED element cannot be found in the table

"Data Set Version 3" then the table of the appropriate super class should be searched.

### National Data Requirements that are not included in the WCO Data Model

There may be national data requirements that are not included in the WCO Data Model. These data requirements need to be analysed case by case. It is recommended to leave these data elements to national/international experts with advanced experience in building

Data Models. They can advise on the appropriate way forward. An organization conducting national data harmonization may submit a request to the WCO for inclusion of the data element into a future release of the WCO Data Model. For this purpose, WCO has defined the procedure for submitting "Data Maintenance Requests".

## 5.5 Step 5: Obtain the Structure of an Electronic Document

Capture  Define  Analyse  Reconcile  **eDocument**
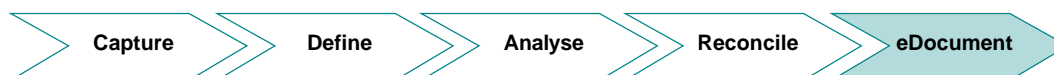
Once you are done with reconciling your national data set with an internationally recognized data model, you can move to obtain the structure of electronic document, which will be used for data interchange among stakeholders. Depending on your business requirements, specific syntax can be applied in obtaining the structure of electronic document such as XML and Electronic Data Interchange (EDI) (See Box 2). Obtaining the structure of an electronic document demands technical capacity in available syntaxes and relevant technical standards.

Though the ultimate purpose of data harmonization is its use for obtaining the structure of an electronic document in an interoperable manner, it is beyond the scope of this *Guide* to cover the method to obtain the structure of an electronic document. However, in this *Guide*, illustration serves to make readers aware of how to obtain the structure of electronic document using XML syntax, in particular packages available in the WCO DM 3.0.

In the case of using the WCO DM, the elements of the WCO DM can be mapped to XML structures to develop the XML Schemas for the national trade documents at this step. An XML Schema is a specification that describes the data structures of an electronic XML message. The Schema is the equivalent of the paper form in an electronic format. The publication of the WCO DM includes XML Schemas that can be adapted to build the XML Schemas of the national trade documents.

The XML Schemas provided with the WCO DM 3.0 include all data elements for a set of top level business processes. These Schemas are generic because they can support the data

---

**Box 2: XML and EDI**

**Extensible Markup Language (XML)** is a set of rules for encoding documents in machine-readable form. It is defined in XML Specifications, produced by the World Wide Web Consortium (W3C), and several other related technical specifications. http://www.w3.org/XML/

Due to its nature of extensibility, multiple entities, including standards bodies, define electronic messages with their own rules based on the XML specification. UN/CEFACT also publishes standard XML message schemas biannually, which are available at http://www.unece.org/uncefact/xml_schemas/index.htm

**Electronic Data Interchange (EDI)** is the structured transmission of data between organisations by electronic means; i.e., the computer-to-computer interchange of strictly formatted messages that represent documents other than monetary instruments. There exist multiple national EDI standards. However, the only international EDI standard is UN/EDIFACT (United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport). More details on UN/EDIFACT can be found at http://live.unece.org/tradewelcome/areas-of-work/un-centre-for-trade-facilitation-and-e-business-uncefact/outputs/standards/unedifact/tradeedifactwelcome.html

requirements of several trade documents. The objective of this step is to identify those data elements in the WCO Schemas that are actually used in the national trade documents and to remove those data elements from the Schema that are not used in the national context.

By eliminating all data elements from the generic Schema that are not used in the national trade document, a specific Schema is generated that exactly matches the data requirements of the national document such as the electronic Certificate of Origin or the Customs declaration. This Schema can be used directly for paperless trade. It should be noted that the modification of XML Schemas requires some detailed work and technical expertise which are not within the scope of this *Guide*. Instead, this Guide outlines the general steps to obtain the specific Schema for the electronic document.

### Select the appropriate WCO Schema

The WCO Data Model provides a set of XML schemas that are oriented on the Customs Procedures specified in the revised Kyoto Convention. For each document in the Data Dictionary, the data modeller needs to identify the WCO Schema that most closely meets the data requirements of the trade document. If a determination can not be made, the Schema of the Declaration "DEC" should be taken as

this Schema includes maximum data requirements.

### Customise the WCO Schema by removing unused data elements

The modeller needs to remove all data requirements from the Schema that are not specified in the national trade document. The data elements that are used in national trade documents are listed in the Data Dictionary.

To remove the unused data elements the Schema is opened in an XML Editor. The data element name in the XML Schema is the same as the WCO Dictionary Entry Name. For each data element in the Data Dictionary, the modeller will search in the Schema using the "Dictionary Entry Name". This data element is then marked in the Schema. When all data elements of the Data Dictionary are marked in the Schema then the unmarked data elements of the Schema are removed.

Example:

In the data dictionary for the ASEAN ATIGA Form D, the element Exporter is with the WCO DEN "Exporter. Name. Text"

In the XML Schema this dictionary entry name is associated with XML tag "NameText" of Object Class "Exporter".

| ASEAN ATIGA FORM D Data | WCO ID | Data Model Classes | WCO Dictionary Entry Name |
|---|---|---|---|
| **Goods consigned from (Exporter's business name, address, country)**<br>TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.) (Min=1, Max=1) | R031 | Exporter | Exporter. Name. Text |

```
<xsd:element name="Name" type="ds:ExporterNameTextType" minOccurs="0">
    <xsd:annotation>
        <xsd:documentation xml:lang="en">
            <ccts:UniqueID>WCOIDR031</ccts:UniqueID>
            <ccts:DictionaryEntryName>Exporter. Name. Text</ccts:DictionaryEntryName>
             <ccts:Definition>Name [and address] of party who makes – or on whose behalf – the
export declaration – is made – and who is the owner of the goods or has similar right of disposal
over them at the time when the declaration is accepted.</ccts:Definition>
            <ccts:Cardinality>0..1</ccts:Cardinality>
            <ccts:ObjectClassTerm>Exporter</ccts:ObjectClassTerm>
            <ccts:PropertyTerm>Name</ccts:PropertyTerm>
            <ccts:RepresentationTerm>Text</ccts:RepresentationTerm>
        </xsd:documentation>
    </xsd:annotation>
</xsd:element>
```

At the end of this procedure, the Schema contains only the elements that correspond to the data elements of the document in the Data Dictionary. This means the Schema represents the electronic equivalent of the information contained in the document.

Figure 5.9 illustrates trimming down of a schema for customization. In the overall schema, each data element in the data dictionary are marked to be remained; in Figure 5.9, the part contained in a black box are elements to be remained. The customization process is completed when all the unnecessary elements are removed from a schema while all the marked ones remain.

After the trimming down process has been completed, a customized schema suitable for ASEAN ATIGA Form D is obtained, as shown in Figure 5.10 (See Annex III for full Schema).

## Figure 5.9 Example of Schema trim-down for customization

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- edited with XMLSpy v2009 sp1 (http://www.altova.com) by kAREN Garside (World Customs Organization) -->
<?xml-stylesheet href="GenHTML(vH).xslt" type="text/xsl"?>
<!-- ================================================================= -->
<!-- ===== DEC (Overall Declaration) Schema ===== -->
<!-- ================================================================= -->
<!--
WCO Data model V3 « Copyright © 2008 World Customs Organization. All rights reserved.
Requests and inquiries concerning translation, reproduction and adaptation rights should be
addressed to copyright@wcoomd.org ».
-->
<!-- ================================================================= -->
<xsd:schema xmlns="urn:wco:datamodel:WCO:DEC:1" xmlns:ds="urn:wco:datamodel:WCO:DS:1" xmlns:ccts="urn:un:unece:uncefact:documentation:sta
ndard:CoreComponentsTechnicalSpecification:2" xmlns:xsd="http://www.w3.org/2001/XMLSchema" targetNamespace="urn:wco:datamodel:WCO:DEC:1"
elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.0">
    <!-- ================================================================= -->
    <!-- ===== Imports ===== -->
    <!-- ================================================================= -->
    <xsd:import namespace="urn:wco:datamodel:WCO:DS:1" schemaLocation="..\common\DS_1p0.xsd"/>
    <!-- ================================================================= -->
    <!-- ===== Root element ===== -->
    <!-- ================================================================= -->
    <xsd:element name="Declaration">
      <xsd:annotation>
        <xsd:documentation xml:lang="en">
          <ccts:Definition>Any statement or action, in any form prescribed or accepted by the Governmental Agency, giving information or particulars
          required by the Governmental Agency.</ccts:Definition>
          <ccts:Cardinality>1</ccts:Cardinality>
          <ccts:ObjectClassTerm>Declaration</ccts:ObjectClassTerm>
        </xsd:documentation>
      </xsd:annotation>
      <xsd:complexType>
        <xsd:sequence>
          ┌─────────────────────────────────────────────────────────────────────────┐
          │ <xsd:element name="AcceptanceDateTime" type="ds:DeclarationAcceptanceDateTimeType" minOccurs="0">
          │   <xsd:annotation>
          │     <xsd:documentation xml:lang="en">
          │       <ccts:UniqueID>WCOID023</ccts:UniqueID>
          │       <ccts:DictionaryEntryName>Declaration. Acceptance. Date Time</ccts:DictionaryEntryName>
          │       <ccts:Definition>Date on which a Goods declaration has been or will be accepted by Customs in accordance with Customs
          │       legislation.</ccts:Definition>
          │       <ccts:Cardinality>0..1</ccts:Cardinality>
          │       <ccts:ObjectClassTerm>Declaration</ccts:ObjectClassTerm>
          │       <ccts:PropertyTerm>Acceptance</ccts:PropertyTerm>
          │       <ccts:RepresentationTerm>Date Time</ccts:RepresentationTerm>
          │     </xsd:documentation>
          │   </xsd:annotation>
          │ </xsd:element>
          └─────────────────────────────────────────────────────────────────────────┘
          <xsd:element name="Authentication" type="ds:DeclarationAuthenticationTextType" minOccurs="0">
            <xsd:annotation>
              <xsd:documentation xml:lang="en">
                <ccts:UniqueID>WCOID104</ccts:UniqueID>
                <ccts:DictionaryEntryName>Declaration. Authentication. Text</ccts:DictionaryEntryName>
                <ccts:Definition>Proof that a document has been authenticated indicating where appropriate the authentication party.</ccts:Defi>
                <ccts:Cardinality>0..1</ccts:Cardinality>
                <ccts:ObjectClassTerm>Declaration</ccts:ObjectClassTerm>
                <ccts:PropertyTerm>Authentication</ccts:PropertyTerm>
                <ccts:RepresentationTerm>Text</ccts:RepresentationTerm>
              </xsd:documentation>
            </xsd:annotation>
          </xsd:element>
          <xsd:element name="CancellationDateTime" type="ds:DeclarationCancellationDateTimeType" minOccurs="0">
            <xsd:annotation>
              <xsd:documentation xml:lang="en">
                <ccts:UniqueID>WCOID373</ccts:UniqueID>
                <ccts:DictionaryEntryName>Declaration. Cancellation. Date Time</ccts:DictionaryEntryName>
                <ccts:Definition>Date and time when the document/message was cancelled.</ccts:Definition>
                <ccts:Cardinality>0..1</ccts:Cardinality>
                <ccts:ObjectClassTerm>Declaration</ccts:ObjectClassTerm>
                <ccts:PropertyTerm>Cancellation</ccts:PropertyTerm>
                <ccts:RepresentationTerm>Date Time</ccts:RepresentationTerm>
              </xsd:documentation>
            </xsd:annotation>
          </xsd:element>
```

### Figure 5.10 XML Schema for ASEAN ATIGA Form D

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet href="GenHTML(vH).xslt" type="text/xsl"?>
<!-- ================================================================= -->
<!-- ===== ASEAN ATIGA FORM D Schema ===== -->
<!-- ================================================================= -->
<!--
    WCO Data model V3 ? Copyright ? 2008 World Customs Organization.  All rights reserved.
    Requests and inquiries concerning translation, reproduction and adaptation rights should be
    addressed to copyright@wcoomd.org ?.
-->
<!-- ================================================================= -->
<xsd:schema xmlns:udt="urn:un:unece:uncefact:data:standard:UnqualifiedDataType:6" xmlns:ds="urn:wco:datamodel:standard:WCO:DS:1"
xmlns:ccts="urn:un:unece:uncefact:documentation:standard:CoreComponentsTechnicalSpecification:2"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.0">
            <!-- ================================================================= -->
            <!-- ===== Imports ===== -->
            <!-- ================================================================= -->
    <xsd:import namespace="urn:un:unece:uncefact:data:standard:UnqualifiedDataType:6" schemaLocation="http://www.unece.org/uncefact/
data/standard/UnqualifiedDataType_6p0.xsd"/>
    <xsd:import namespace="urn:wco:datamodel:standard:WCO:DS:1" schemaLocation="..\common\DS_1p0.xsd"/>
    <!-- ================================================================= -->
    <!-- ===== Root element ===== -->
    <!-- ================================================================= -->
      <xsd:element name="Declaration">
        <xsd:complexType>
          <xsd:sequence>
          <!--Declaration Date-->
          <xsd:element name="AcceptanceDateTime" type="ds:DeclarationAcceptanceDateTimeType"/>
          <!--Declaration Place-->
          <xsd:element name="DeclarationOfficeID" type="ds:DeclarationDeclarationOfficeIDType"/>
          <!--Declarant's reference number-->
          <xsd:element name="ID" type="ds:DeclarationIdentificationIDType"/>
          <!--Submission Date/Time-->
          <xsd:element name="IssueDateTime" type="ds:DeclarationIssueDateTimeType"/>
          <!--DocumentCode-->
          <xsd:element name="TypeCode" type="ds:DeclarationTypeCodeType"/>
          <xsd:element name="AdditionalDocument">
            <xsd:complexType>
              <xsd:sequence>
              <!--CertificationPlace-->
              <xsd:element name="AuthenticationLocationName" type="ds:AdditionalDocumentAuthenticationLocationNameTextType"/>
              <!--Issued in (Country) Code-->
              <xsd:element name="IssueLocationID" type="ds:AdditionalDocumentIssueLocationIDType"/>
              <!--Issued in (Country) Name-->
              <xsd:element name="IssueLocation" type="ds:AdditionalDocumentIssueLocationTextType" minOccurs="0"/>
              </xsd:sequence>
            </xsd:complexType>
          </xsd:element>
          <xsd:element name="AdditionalInformation" minOccurs="0" maxOccurs="unbounded">
            <xsd:complexType>
              <xsd:sequence>
              <!--For Official use-->
              <xsd:element name="Content" type="ds:AdditionalInformationContentTextType" minOccurs="0"/>
              <!--C/O Type-->
              <xsd:element name="StatementCode" type="ds:AdditionalInformationStatementCodeType" minOccurs="0"/>
              </xsd:sequence>
```

# 6. PRACTICAL RECOMMENDATION FOR DATA HARMONIZATION

## 6.1 GAINING SUPPORT FOR DATA HARMONIZATION

The issue of data harmonization remains primarily in the technical and operational domain and is often not adequately communicated to policy makers who make decisions. Data harmonization has to deal with many technical decisions and involves numerous parties and key players in practice. To secure proper support for data harmonization, the following activities are recommended:[24]

- *Establish an institutional mechanism for managing data harmonization* – An institutional arrangement should be made for managing the data harmonization initiative in the form of a steering committee or taskforce. It is crucial that such an institution includes a strong lead agency that can coordinate and synchronize the simplification and harmonization of the trade data of the various individual agencies. The data harmonization steering committee or taskforce should include not only high-level policy implementers but also mid-level managers whose positions are usually more stable in their post over a longer period. The members of such a managerial institution should be selected from individuals with managerial, technical and organizational expertise; these people should also have collaboration and communication skills, because they are responsible for successful stakeholder management and gaining interagency support throughout a data harmonization initiative.

- *Identify main stakeholders, define their roles and accommodate their objectives and concerns* – Stakeholders include organizations or people who have influence, who are affected by, or have some other interest in a data harmonization initiative and its result. They can be divided into stakeholders that directly participate in the initiative (i.e. take part in development and implementation) and the others that influence or are affected by the initiative. It is important to pay particular attention to the interests, viewpoints and concerns of stakeholders so that their roles and responsibilities can be clearly defined for their support and active involvement in specific phases of data harmonization throughout the initiative.

- *Pay due attention to regional and international initiatives that develop regulations and standards affecting trade documents* – Due attention should be given to regional and international initiatives that can affect the substance of trade documents. It is important to understand their influence on the national data harmonization initiative. Due consideration should be given to active use of them. Highlighting their importance in developing a harmonized national data set that can facilitate international information exchange can help gain policy support for data harmonization. To keep track of development on regulations and standards by such regional and international initiatives, a list of projects being developed by them that may influence the data harmonization operation should be compiled and prioritized according to their importance.

## 6.2 COORDINATING REQUIREMENTS OF NATIONAL DATA HARMONIZATION WITH RELEVANT REGIONAL AND INTERNATIONAL PARTNERS

In addition to coordination among national stakeholders, due attention should be also

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[24] TOGAF (2009) and SWIF (2010).

given to cooperation with regional and international partners. It is recommended that national data harmonization initiatives be aligned with regional and international initiatives as well as global standardization efforts. The following recommendations are suggested in promoting coordination with regional and international partners:

- *Develop a strategy for involvement in international initiatives* – A strategy for active involvement in regional and international initiatives should be developed. The relevance of any national effort to international initiatives should be monitored and analysed for their interdependence. When found relevant, effort should be made to build a link between them to ensure harmonization, if possible, or at least alignment, if total harmonization is not possible.

- *Establish a joint working group.* – A working group delegated to conduct development of harmonized national data set and harmonization of national data requirements with regional and international developments should be formed. Members of such a joint working group should have the relevant skills and capacities. The joint working group should coordinate and communicate regularly with relevant international partners so that their interests and concerns are discussed, and expectations are fulfilled in a timely manner.

- *Take into account regional and international trade arrangement in developing a standard data set* – In developing a harmonized national data set, Government should carefully take into account any regional or international trade arrangements and protocols, and ensure that the national data set is aligned to the requirements of such regional and international arrangements.

## 6.3 ITERATIVE AND INCREMENTAL APPROACH TO DATA HARMONIZATION

A Single Window, when it operates in full scale, supports various business processes of the international supply chain from the time that the goods are ordered until the payment for the goods is made.

### Figure 6.1. Scope of Single Window and International Supply Chain



Source: UNECE, 2001
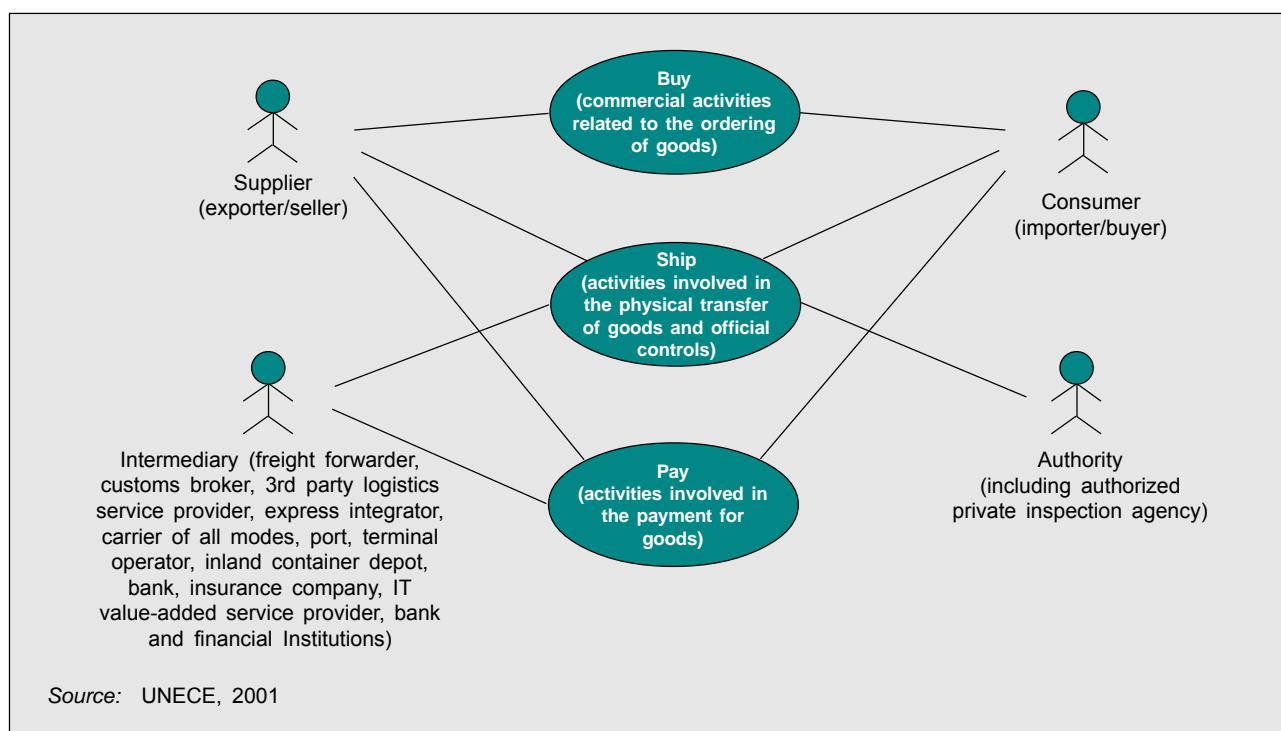
It should be noted that the scope of data harmonization for a Single Window implementation covers the documentary requirements of the whole international supply chain. Because the full scope of a Single Window is far reaching, harmonization of data elements that cover all documentary requirements of the international supply chain in one run may not be feasible, primarily due to resource constraints. Therefore, data harmonization for a Single Window implementation is often carried out in a number of phases.

Data requirements to be harmonized in the first phase are usually from documents that hold the greatest strategic importance. The strategic importance of a particular document may be measured using the estimation on the total number produced or issued per year. Documents that hold the greatest strategic importance are usually those used in the Customs domain, e.g., the customs declaration and supporting documents, the conveyance report, and the manifest.

The degree to which document owners[25] are willing to participate in the data harmonization process may be considered as another criterion for determining the scope of data harmonization. Without support from document owners, there is a risk that the data harmonization project will not be successful and the project outputs will not be used.

## 6.4 CRITERIA FOR STANDARD SELECTION

Prior to harmonizing data requirements, a data model that provides generic semantic rules and that serves as a building block for aligning definition and representation as well as the cardinality and location of each data element in the electronic message has to be identified, assessed and selected. Comprehensiveness and compliance with prevailing internationally accepted standards for electronic data exchange are criteria that have to be taken into consideration when selecting the data standards.

- Comprehensiveness The selected data model should be generic yet sufficiently contextualized that the documentary requirements of all stakeholders in the international supply chain are covered.

- Compliance with internationally accepted standards for electronic data exchange The selected data model should comply with relevant international recommendations and standards that promote semantic interoperability. They include:

  – The UN/CEFACT Core Component Technical Specification (CCTS: ISO 15000-5/ebXML) which provides the methodology for the identification of dictionary entry names (data elements) in the data model and the development of a data model that in turn defines the structure of an electronic message;

  – The UN/CEFACT Core Component Library (CCL) which provides reusable CCTS-compliant dictionary entry names and their standard definitions;

  – The United Nations Layout Key (UNLK) which promotes the principle of reusable document template and outlines a set of minimum data elements of key trade and transport documents; and

  – The WCO Data Model is an example of standard data model for B2G and G2G data exchange that cover data requirements needed for Customs and regulatory purposes. The WCO Data Model supports development of electronic documents in UN/EDIFACT and XML syntax.

- The selected data model is built upon stable version of standards.

## 6.5 MAINTENANCE OF OUTPUTS FROM DATA HARMONIZATION PROJECTS

The outputs of data harmonization projects, such as harmonized data set/data elements, data model and message implementation guides, should be properly maintained for their reusability and sustainability. National specifica-

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[25] The Regulatory agency responsible for managing the regulations governing the description and use of a document.

tions providing mappings between national requirements and international standards should be published and appropriately disseminated to key stakeholders. Business environment and requirements are continuously changing due to the rapid development of technologies, shifting of business practices, modification of legal and regulatory framework, organizational change, etc. When the outputs of data harmonization are properly managed and updated, the outputs can be continuously reused and accommodate interoperability in future use. For proper maintenance, the following recommendations are suggested:

- *Keep baselines of the project outputs in a platform* – A listing or collection of data elements, data structure, standardized data set, and data model produced as the outputs of data harmonization projects should be recorded as a database in a form of data registry and/or repository. The data registry and repository are platforms designed to support the management of project deliverables throughout their life cycles. The physical location of the registry could either be local or accessed over a network. The registry could easily be in the form of a simple web site or a more complicated database or repository system accessible by intended beneficiaries. Government may decide to set up a responsible unit, such as a National Data Registry and Repository Office, to take charge of monitoring and controlling standards and outputs related to data harmonization.

- *Facilitate adoption of the project outputs* – The outputs of data harmonization projects should be presented to policy authorities for their proper understanding and support, so that political support and funding for continuous implementation and maintenance of data harmonization can be secured. In addition, the project deliverables should be publicized and disseminated to stakeholders and agencies for their use. It is recommended that the knowledge and experiences gained from data harmoniza-

tion are publicly shared with interested parties, and the application cases of the outputs are presented to promote more data harmonization activities.

- *Monitor and maintain changes in data harmonization baselines* – As mentioned earlier, there might be circumstances where development of technologies, shifting of business practices, modification of the legal and regulatory framework, organizational change, etc. occur, which may affect data harmonization baselines. It is important to consistently monitor and maintain changes in data harmonization baselines. A comprehensive maintenance process may integrate analysis of key issues, including problems of existing version, needs for changes, impact of changes and so on, with a multi-stage review by relevant parties and stakeholders. Various measures such as surveys, interviews, focus groups, public hearings, and other communication media should be used throughout the process in order to solicit inputs needed for changes and to obtain feedback from concerned parties. A task force may be formed to:

1. Develop drafts,

2. Review all comments and suggestions resulting from surveys, interviews, and focus groups,

3. Conduct revisions,

4. Receive further reviews and feedbacks, and

5. Carry out testing or trials.

As a result of this process, the final versions can be broadly accepted by the general public and stakeholders. They should then be approved by the relevant authority and announced as new baselines. The new baselines of data harmonization should be publicized and promoted through public awareness raising, seminars and publication, to facilitate their adoption in businesses.

# GLOSSARY

*Aggregate Business Information Entity (ABIE)* – A collection of related pieces of business information that together convey a distinct business meaning in a specific *Business Context*. Expressed in modelling terms, it is the representation of an *Object Class*, in a specific *Business Context*. (Source: UN/CEFACT CCTS V2.01)

*Aggregate Core Component (ACC)* – A collection of related pieces of business information that together convey a distinct business meaning, independent of any specific *Business Context*. Expressed in modelling terms, it is the representation of an *Object Class*, independent of any specific *Business Context*. (Source: UN/CEFACT CCTS V2.01)

*Association Business Information Entity (ASBIE)* – A *Business Information Entity* that represents a complex business characteristic of a specific *Object Class* in a specific *Business Context*. It has a unique *Business Semantic* definition. An *Association Business Information Entity* represents an *Association Business Information Entity Property* and is therefore associated to an *Aggregate Business Information Entity*, which describes its structure. An *Association Business Information Entity* is derived from an *Association Core Component*. (Source: UN/CEFACT CCTS V2.01)

*Association Core Component (ASCC)* – A *Core Component* which constitutes a complex business characteristic of a specific *Aggregate Core Component* that represents an *Object Class*. It has a unique *Business Semantic* definition. An *Association Core Component* represents an *Association Core Component Property* and is associated to an *Aggregate Core Component*, which describes its structure. (Source: UN/CEFACT CCTS V2.01)

*Basic Business Information Entity (BBIE)* – A *Business Information Entity* that represents a singular business characteristic of a specific *Object Class* in a specific *Business Context*. It has a unique *Business Semantic* definition. A *Basic Business Information Entity* represents a *Basic Business Information Entity Property* and is therefore linked to a *Data Type*, which describes it values. A *Basic Business Information Entity* is derived from a *Basic Core Component*. (Source: UN/CEFACT CCTS V2.01)

*Basic Core Component (BCC)* – A *Core Component* which constitutes a singular business characteristic of a specific *Aggregate Core Component* that represents a *Object Class*. It has a unique *Business Semantic* definition. A *Basic Core Component* represents a *Basic Core Component Property* and is therefore of a *Data Type*, which defines its set of values. *Basic Core Components* function as the properties of *Aggregate Core Components*. (Source: UN/CEFACT CCTS V2.01)

*Business Information Entity (BIE)* – A piece of business data or a group of pieces of business data with a unique *Business Semantic* definition. A *Business Information Entity* can be a *Basic Business Information Entity* (BBIE), an *Association Business Information Entity* (ASBIE), or an *Aggregate Business Information Entity* (ABIE). (Source: UN/CEFACT CCTS V2.01)

*Business Process Analysis (BPA)* – A systematic examination of business processes in order to gain better understanding and to develop improvement strategies. (Source: UNNeXT Business Process Analysis Guide to Simplify Trade Procedures. United Nations 2009)

*Core Component (CC)* – A building block for the creation of a semantically correct and meaningful information exchange package. It contains only the information pieces necessary to describe a specific concept. (Source: UN/CEFACT CCTS V2.01)

*Core Component Library (CCL)*: The *Core Component Library* is the part of the registry/repository in which *Core Components* shall be stored as *Registry Classes*. The *Core Component Library* will contain all the *Core Component Types, Basic Core Components, Aggregate Core Components, Basic Business Information Entities* and *Aggregate Business Information Entities*. (Source: UN/CEFACT CCTS V2.01)

*Core Component Type (CCT)*: A *Core Component*, which consists of one and only one *Content Component*, that carries the actual

content plus one or more *Supplementary Components* giving an essential extra definition to the *Content Component*. *Core Component Types* do not have *Business Semantics*. (Source: UN/CEFACT CCTS V2.01)

*Data*: A representation of facts, concepts or instructions in a formalized manner suitable for communication, interpretation, or processing by human being or by automatic means (Source: ISO 2382/I)

*Data element*: A unit of data that in a certain context is considered indivisible (Source: ISO 2382/4). A basic container for data (Source: ISO 11179)

*Data field*: An area designated for a specified data entry (Source: UN/CEFACT Recommendation No. 1)

*Data entry*: Data entered on a data carrier (Source: UN/CEFACT Recommendation No. 1)

*Data harmonization*: An act of capturing, defining, analysing and reconciling the definition and representation of data elements in a domain of interest.

*Data model*: A logical map that represents the inherent properties of the data independent of software, hardware or machine performance considerations. The model shows data elements grouped into records, as well as the association around those records. (Source: http://www.information-management.com/glossary/d.html)

*Data modelling*: A method used to define and analyse data requirements needed to support the business functions of an enterprise. These data requirements are recorded as a conceptual data model with associated data definitions. Data modelling defines the relationships between data elements and structures. (Source: http://www.information-management.com/glossary/d.html)

*Field heading*: A field identifier expressed in plain language, full or abbreviated (Source: UNECE Recommendation No. 1)

*Form*: A data carrier designed to carry a visible record of data entries (Source: UNECE Recommendation No. 1)

*Extensible Markup Language (XML)*: A set of rules for encoding documents in machine-readable form. (Source: Wikipedia. http://en.wikipedia.org/wiki/XML)

*XML schema* – A generic term used to identify the family of grammar based XML document structure validation languages to include the more formal W3C XML Schema Technical Specification, Document Type Definition, Schematron, Regular Language Description for XML (RELAX), and the OASIS RELAX NG. (Source: UN/CEFACT CCTS V2.01).

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## Annex I: Compiled Data Dictionary of ASEAN ATIGA Form D

**Document Title**          ASEAN ATIGA FORM D
**Document Purpose**        A Certificate of Origin is a document/message identifying goods, in which the authority or body authorized to issue it, certifies expressly that the goods to which the certificate relates originate in a specific country.
**Name of Document Owner**  Issuing Authorities, ASEAN Nations

| ID | Data Element Name | Data Element Definition | Format | Min Occur | Max Occur |
|---|---|---|---|---|---|
| 0 | Declaration Type | TDED 1001 : Code specifying the name of a document. | an..3 | 1 | 1 |
| 0-1 | Reference Number | TDED 1004: Reference number identifying a specific document. | an..35 | 1 | 1 |
| 1 | Goods consigned from (Exporter's business name, address, country) | TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.) | an..35 | 1 | 1 |
| 2 | Goods consigned to (Consignee's name, address, country) | TDED 3132: Name and address of party to which goods are consigned | an..512 | 1 | 1 |
| 3-1 | Departure date | TDED 2380: The value of a date, a date and time, a time or of a period in a specified representation. | an..35 | 1 | 1 |
| 3-2 | Vessel's name/ aircraft etc. | TDED 8212: name of specific means of transport such as vessel name | an..35 | 1 | 1 |
| 3-3 | Port of discharge | TDED 3224:  Name of a location | an..256 | 1 | 1 |
| 4 | For official use (Declaration Type) | TDED 1001 : Code specifying the name of a document. | an..3 | 1 | 1 |
| 5 | Item No | TDED 1050:  To identify a position within a sequence. | an..10 | 1 | unbounded |
| 6 | Marks and Numbers on Packages | TDED 7102: Free form description of the marks and numbers on a transport unit or package | an..512 | 1 | 1 |
| 7-1 | Number of packages | TDED 6061:Numeric representation of a quantity value. | n..16 | 1 | 1 |
| 7-2 | Type of packages | TDED 7064: Description of the type of packaging of an item. | an..35 | 1 | 1 |
| 7-3 | Description of goods | TDED 7357: Code specifying a type of goods for Customs, transport or statistical purposes. | an..35 | 1 | unbounded |
| 9-1 | Gross Weight | TDED 6018: Weight (mass) of line item including packaging but excluding the transport equipment | n..16 | 1 | 1 |
| 9-2 | Item Price | TDED 5032: Amount declared for Customs purposes of those goods in a consignment which are subject to the same Customs procedure, and have the same tariff/statistical heading, country information and duty regime | n..18 | 1 | unbounded |

*(continued)*

**Annex I:** *(Continued)*

| ID | Data Element Name | Data Element Definition | Format | Min Occur | Max Occur |
|---|---|---|---|---|---|
| 9-3 | Payment Currency | TDED 6345: Code specifying a monetary unit or currency. | An..3 | 1 | 1 |
| 10-1 | Invoice Number | TDED 1334 Reference number to identify an invoice | an..35 | 1 | 1 |
| 10-2 | Invoice Date | TDED 2376 Date of issue of an invoice, in figures and words | an..17 | 1 | unbounded |
| 11-1 | Country of Origin | TDED 3225: Identification of the place in country or country from which the goods were initially despatched to the importing country | an..35 | 1 | 1 |
| 11-2 | Country of Exportation | TDED 3229: Country subdivision where goods begin their journey to export | an..9 | 1 | 1 |
| 12-1 | Place of issue of document | TDED 3410: Name of the location where a document was issued and when appropriate, signed or otherwise authenticated | an..256 | 1 | 1 |
| 12-2 | Place/location | TDED 3224: Name of a location. | an..256 | 1 | 1 |
| 13 | C/O Type | TDED 4441: Code specifying the format of free text | an..17 | 1 | 1 |

## Annex II: ASEAN ATIGA Form D Data Mapped to WCO DM 3.0

| ASEAN ATIGA FORM D Data | WCO ID | Data Model Classes | WCO Dictionary Entry Name |
|---|---|---|---|
| **0-1 Reference Number**<br>TDED 1004: Reference number identifying a specific document. an..35<br>(Min=1, Max=1) | D014 | Declaration | Declaration. Identification. Identifier |
| **1 Goods consigned from (Exporter's business name, address, country)**<br>TDED 3036: Name (and address) of the party consigning the goods as stipulated in the contract by the party ordering the transport (This may be the exporter or seller.) an..35<br>(Min=1, Max=1) | R031 | Exporter | Exporter. Name. Text |
| **2 Goods consigned to (Consignee's name, address, country)**<br>TDED 3132: Name and address of party to which goods are consigned an..512<br>(Min=1, Max= 1) | R037 | Importer | Importer. Name. Text |
| **3-1  Departure date**<br>TDED 2380: The value of a date, a date and time, a time or of a period in a specified representation an..35<br>(Min=1, Max= 1) | 030 | Goods Shipment | Goods Shipment. Departure. Date time |
| **3-2  Vessel's name/aircraft etc.**<br>TDED 8212: name of specific means of transport such as vessel name an..35<br>(Min=1, Max= 1) | T001 | Arrival Transport Means | Arrival Transport Means. Name. Text |
| **3-3 Port of discharge**<br>DED 3224: Name of a location. an..256<br>(Min=1, Max=1) | L012 | Unloading Location | Unloading Location. Name. Text |
| **4 For official use (Declaration Type)**<br>TDED 1001 : Code specifying the name of a document an..3<br>(Min=1, Max=1) | D013 | Declaration | Declaration.Type. Code |
| **5 Item No.**<br>TDED 1050:  To identify a position within a sequence an..10<br>(Min=1, Max=unbounded) | 006 | Commodity | Commodity. Sequence. Numeric |
| **6 Marks and Numbers on Packages**<br>TDED 7102: Free form description of the marks and numbers on a transport unit or package an..512<br>(Min=1, Max= 1) | 142 | Packaging | Packaging. Marks Numbers. Identifier |
| **7-1 Numbers of Packages**<br>TDED 6061:Numeric representation of a quantity value. n..16<br>(Min=1, Max= 1) | 144 | Packaging | Packaging. Quantity. Quantity |
| **7-2 Type of packages**<br>TDED 7064: Description of the type of packaging of an item. an..35<br>(Min=1, Max= 1) | 141 | Packaging | Packaging. Type. Code |

*(continued)*

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**Annex II:** *(Continued)*

| ASEAN ATIGA FORM D Data | WCO ID | Data Model Classes | WCO Dictionary Entry Name |
|---|---|---|---|
| **7-3 Description of goods**<br>TDED 7357: Code specifying a type of goods for Customs, transport or statistical purposes. an.. 35<br>(Min=1, Max=unbounded) | 145 | Classification | Classification. Identification. Identifier |
| **9-1 Gross weight**<br>TDED 6018: Weight (mass) of line item including packaging but excluding the transport equipment n..16<br>(Min=1, Max= 1) | 126 | Goods Measure | Goods Measure. Gross Mass. Measure |
| **9-2 Item Price**<br>TDED 5032: Amount declared for Customs purposes of those goods in a consignment which are subject to the same Customs procedure, and have the same tariff/statistical heading, country information and duty regime an..18<br>(Min=1, Max=unbounded) | 108 | Government Agency Goods Item | Government Agency GoodsItem. Customs Value. Amount |
| **9-3 Payment Currency**<br>TDED 6345: Code specifying a monetary unit or currency.an..3<br>(Min=1, Max=1) | 135 | Currency Exchange | Currency Exchange. Currency Type. Code |
| **10-1 Invoice Number**<br>TDED 1334 Reference number to identify an invoice an.. 35<br>(Min=1, Max=1) | D016 | Invoice | Invoice. Identification. Identifier |
| **10-2 Invoice Date**<br>TDED 2376 Date of issue of an invoice, in figures and words an.. 17<br>(Min=1, Max=1) | D015 | Invoice | Invoice. Issue. Date |
| **11-1 Country of Origin**<br>TDED 3225: Identification of the place in country or country from which the goods were initially despatched to the importing country. an..35<br>(Min=1, Max=1) | L024 | Goods Consigned Place | Goods Consigned Place. Identification. Identifier |
| **11-2 Country of Exportation**<br>TDED 3229: Country subdivision where goods begin their journey to export location an..9<br>(Min=1, Max=1) | 088 | Goods Shipment | Goods Shipment. Exportation Region. Code |
| **12-1 Place of issue of document**<br>TDED 3410: Name of the location where a document was issued and when appropriate, signed or otherwise authenticated. an..256<br>(Min=1, Max=1) | D017 | Additional Document | Additional Document. Authentication Location Name. Text |
| **12-2 Place/location**<br>TDED 3224: Name of a location. an..256<br>(Min=1, Max=1) | D003 | Additional Document | Additional Document. Issue Location. Text |
| **13 C/O Type**<br>TDED 4441: Code specifying the format of free text. an..17<br>(Min=1, Max=1) | 226 | Additional Information | Additional Information. Statement. Code |

## Annex III: ASEAN ATIGA Form D XML Schema from WCO DM 3.0

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet href="GenHTML(vH).xslt" type="text/xsl"?>
<!-- ====================================================================== -->
<!-- ===== ASEAN ATIGA FORM D Schema ===== -->
<!-- ====================================================================== -->
<!--
    WCO Data model V3 « Copyright © 2008 World Customs Organization.  All rights reserved.
    Requests and inquiries concerning translation, reproduction and adaptation rights should be
    addressed to copyright@wcoomd.org ».
-->
<!-- ====================================================================== -->
<xsd:schema xmlns:udt="urn:un:unece:uncefact:data:standard:UnqualifiedDataType:6" xmlns:ds="urn:wco:datamodel:standard:WCO:DS:1"
xmlns:ccts="urn:un:unece:uncefact:documentation:standard:CoreComponentsTechnicalSpecification:2"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.0">
            <!-- ====================================================================== -->
            <!-- ===== Imports ===== -->
            <!-- ====================================================================== -->
  <xsd:import namespace="urn:un:unece:uncefact:data:standard:UnqualifiedDataType:6"
schemaLocation="http://www.unece.org/uncefact/data/standard/UnqualifiedDataType_6p0.xsd"/>
  <xsd:import namespace="urn:wco:datamodel:standard:WCO:DS:1" schemaLocation="..\common\DS_1p0.xsd"/>
  <!-- ====================================================================== -->
  <!-- ===== Root element ===== -->
  <!-- ====================================================================== -->
    <xsd:element name="Declaration">
      <xsd:complexType>
        <xsd:sequence>
        <!--Declaration Date-->
        <xsd:element name="AcceptanceDateTime" type="ds:DeclarationAcceptanceDateTimeType"/>
        <!--Declaration Place-->
        <xsd:element name="DeclarationOfficeID" type="ds:DeclarationDeclarationOfficeIDType"/>
        <!--Declarant's reference number-->
        <xsd:element name="ID" type="ds:DeclarationIdentificationIDType"/>
        <!--Submission Date/Time-->
        <xsd:element name="IssueDateTime" type="ds:DeclarationIssueDateTimeType"/>
        <!--DocumentCode-->
        <xsd:element name="TypeCode" type="ds:DeclarationTypeCodeType"/>
        <xsd:element name="AdditionalDocument">
          <xsd:complexType>
            <xsd:sequence>
            <!--CertificationPlace-->
            <xsd:element name="AuthenticationLocationName" type="ds:AdditionalDocumentAuthenticationLocationNameTextType"/>
            <!--Issued in (Country) Code-->
            <xsd:element name="IssueLocationID" type="ds:AdditionalDocumentIssueLocationIDType"/>
            <!--Issued in (Country) Name-->
            <xsd:element name="IssueLocation" type="ds:AdditionalDocumentIssueLocationTextType" minOccurs="0"/>
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>
        <xsd:element name="AdditionalInformation" minOccurs="0" maxOccurs="unbounded">
          <xsd:complexType>
            <xsd:sequence>
            <!--For Official use-->
            <xsd:element name="Content" type="ds:AdditionalInformationContentTextType" minOccurs="0"/>
            <!--C/O Type-->
            <xsd:element name="StatementCode" type="ds:AdditionalInformationStatementCodeType" minOccurs="0"/>
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>
        <xsd:element name="BorderTransportMeans" minOccurs="0" maxOccurs="unbounded">
          <xsd:complexType>
            <xsd:sequence>
              <!--Transportation Name-->
              <xsd:element name="Name" type="ds:BorderTransportMeansNameTextType" minOccurs="0"/>
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>
        <xsd:element name="Importer" minOccurs="0" maxOccurs="unbounded">
```

```
<xsd:complexType>
  <xsd:sequence>
    <!--Importer name-->
    <xsd:element name="Name" type="ds:ImporterNameTextType" minOccurs="0"/>
    <!--Importer number-->
    <xsd:element name="ID" type="ds:ImporterIdentificationIDType" minOccurs="0"/>
    <xsd:element name="Address" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:sequence>
          <xsd:element name="CityName" type="ds:AddressCityNameTextType" minOccurs="0"/>
          <xsd:element name="CountryCode" type="ds:AddressCountryCodeType" minOccurs="0"/>
          <xsd:element name="CountrySubDivisionName" type="ds:AddressCountrySubDivisionNameTextType" minOccurs="0"/>
          <xsd:element name="PostcodeID" type="ds:AddressPostcodeIDType" minOccurs="0"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>
</xsd:element>
<xsd:element name="Exporter" minOccurs="0" maxOccurs="unbounded">
  <xsd:complexType>
    <xsd:sequence>
      <!--Exporter name-->
      <xsd:element name="Name" type="ds:ExporterNameTextType" minOccurs="0"/>
      <!--Exporter number-->
      <xsd:element name="ID" type="ds:ExporterIdentificationIDType" minOccurs="0"/>
      <xsd:element name="Address" minOccurs="0" maxOccurs="unbounded">
        <xsd:complexType>
          <xsd:sequence>
            <xsd:element name="CityName" type="ds:AddressCityNameTextType" minOccurs="0"/>
            <xsd:element name="CountryCode" type="ds:AddressCountryCodeType" minOccurs="0"/>
            <xsd:element name="CountrySubDivisionName" type="ds:AddressCountrySubDivisionNameTextType" minOccurs="0"/>
            <xsd:element name="PostcodeID" type="ds:AddressPostcodeIDType" minOccurs="0"/>
          </xsd:sequence>
        </xsd:complexType>
      </xsd:element>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
<xsd:element name="GoodsConsignedPlace" minOccurs="0" maxOccurs="unbounded">
  <xsd:complexType>
    <xsd:sequence>
      <!--Exporting Country Name-->
      <xsd:element name="Name" type="ds:ImporterNameTextType" minOccurs="0"/>
      <!--Exporting Country Code-->
      <xsd:element name="ID" type="ds:ImporterIdentificationIDType" minOccurs="0"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
<xsd:element name="UnloadingLocation" minOccurs="0" maxOccurs="unbounded">
  <xsd:complexType>
    <xsd:sequence>
      <!--Port of Discharge Name-->
      <xsd:element name="Name" type="ds:ImporterNameTextType" minOccurs="0"/>
      <!--Port of Discharge Code-->
      <xsd:element name="ID" type="ds:ImporterIdentificationIDType" minOccurs="0"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
<xsd:element name="GoodsShipment" minOccurs="0" maxOccurs="unbounded">
  <xsd:complexType>
    <xsd:sequence>
      <!--DepartureDate-->
      <xsd:element name="DepartureDateTime" type="ds:GoodsShipmentDepartureDateTimeType" minOccurs="0"/>
      <!--Importing Country Code-->
      <xsd:element name="ExportationRegionCode" type="ds:GoodsShipmentExportationRegionCodeType" minOccurs="0"/>
      <xsd:element name="GovernmentAgencyGoodsItem" minOccurs="0" maxOccurs="unbounded">
```

**Annex III:** *(Continued)*

```
<xsd:complexType>
  <xsd:sequence>
    <!--Value(FOB)-->
    <xsd:element name="CustomsValueAmount" type="ds:GovernmentAgencyGoodsItemCustomsValueAmountType" minOccurs="0"/>
    <xsd:element name="GoodsMeasure" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:sequence>
          <!--Gross Weight-->
          <xsd:element name="GrossMassMeasure" type="ds:GoodsMeasureGrossMassMeasureType" minOccurs="0"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="Packaging" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:sequence>
          <!--Marks and Numbers-->
          <xsd:element name="MarksNumbers" type="ds:PackagingMarksNumbersTextType" minOccurs="0"/>
          <!--Type of packages-->
          <xsd:element name="TypeCode" type="ds:PackagingTypeCodeType" minOccurs="0"/>
          <!--Number of packages-->
          <xsd:element name="QuantityQuantity" type="ds:PackagingQuantityQuantityType" minOccurs="0"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="Invoice" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:sequence>
          <!--Invoice Number-->
          <xsd:element name="ID" type="ds:InvoiceIdentificationIDType" minOccurs="0"/>
          <!--Type of packages-->
          <xsd:element name="IssueDate" type="ds:InvoiceIssueDateType" minOccurs="0"/>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
    <xsd:element name="Commodity" minOccurs="0" maxOccurs="unbounded">
      <xsd:complexType>
        <xsd:sequence>
          <!--Item Number-->
          <xsd:element name="SequenceNumeric" type="ds:CommoditySequenceNumericType" minOccurs="0"/>
          <!--Description of Goods-->
          <xsd:element name="Description" type="ds:CommodityDescriptionTextType" minOccurs="0"/>
          <xsd:element name="Classification">
            <xsd:complexType>
              <xsd:sequence>
                <!--Classification Type-->
                <xsd:element name="IdentificationType" type="ds:ClassificationIdentificationTypeCodeType" minOccurs="0"/>
                <!--Description of Goods-->
                <xsd:element name="ID" type="ds:ClassificationIdentificationIDType" minOccurs="0"/>
              </xsd:sequence>
            </xsd:complexType>
          </xsd:element>
        </xsd:sequence>
      </xsd:complexType>
    </xsd:element>
  </xsd:sequence>
</xsd:complexType>
</xsd:element>
</xsd:sequence>
</xsd:complexType>
</xsd:element>
</xsd:schema>
```

## Annex IV: Cases of Data Harmonization

This separate annex, available online, provides examples of cases that illustrate data harmonization process conducted in accordance with the steps described in the Guide.

At the time of publication of this Guide, three cases are available as follows:

1) Annex IV-1: Data Harmonization Example on ASEAN ATIGA Form D

2) Annex IV-2: Country Case – Thai Data Harmonization Case

3) Annex IV-3: Country Case – Korean Data Harmonization Case

The three cases are available for view and download at: http://www.unescap.org/unnext/tools/data_harmonization.asp

More cases will be added on the same webpage as they become available.