Step-by-Step Approach to Data Harmonization and Modeling

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Customs Border Control Training Institute
Cheon-an, Republic of Korea

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United Nations ESCAP
Step-by-step Approach

Step 1: Capture
Step 2: Define
Step 3: Analyze
Step 4: Map (Reconcile)
Step 5: Obtain e-document(s)
Capture business processes and identify documents and basic data requirements
Major Phases of Business Process Analysis

Phase I: Scope setting

1) Define a project scope
2) Develop a detailed plan and secure resources

Phase II: Data collection & process documentation

3) Acquire background information
4) Conduct interviews and document captured data

Phase III: Process analysis & recommendations development

5) Analyze the “as-is” process and identify bottlenecks
6) Develop and propose recommendations
Use Case to Activity Diagram

1. Exporter or Representative
   - Obtain Export Permit
   - Department of Foreign Trade

2. Exporter or Representative
   - Prepare documents for the application of export permit
     - Draft Permit for the Export of Rice (A, 4)
     - Sales Report (P, 3)
     - Evidence of Sales (Purchase Order or Sales Contract)
   - Application for Permission to Export Rice (P, 2)

3. Department of Foreign Trade
   - Verify submitted information
     - Incorrect
     - Correct
   - Sign and authenticate (A, 4)
   - Permit for the Export of Rice (A, 4)

4. Collect (A, 4)
Output: Collection of Documents, Forms and Messages

Sample List of Documents and Forms Captured from Activity Diagrams

1. Proforma Invoice
2. Purchase Order
3. Application for Permission to Export Rice (KP 2)
4. Sales Report (KP 3)
5. Application for the Collection of the Permit for the Export of Rice (A. 3)
6. Permit for the Export of Rice (A. 4)
7. Application for Certificate of Standards of Product (MS 13)
8. Rice Quality Certificate
9. Certificate of Standards of Products (MS 24)
10. Application for Phytosanitary Certificate (PQ 9)
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 of Origin
32. Application for Certificate of Origin
33. Application for Letter of Credit
34. Credit Advice
35. Debit Advice
36. Remittance Advice
Analyze data in each document and **define** the meaning (semantic) of the data and the data formats (syntax).
To identify the exact meaning of the data and extract data type, representation, format, and constraints based on these sources, for example:

- Document/form, with sample filled-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
- Internationally-accepted standard repository (e.g. WCO Data Set, UNTDED) for the semantic of data elements used in international trade
### Ex) Trade Data Elements Directory

**UNTDED – ISO 7372: 2005**

<table>
<thead>
<tr>
<th>Change Ind.</th>
<th>Tag UDD</th>
<th>New Name</th>
<th>Description</th>
<th>repr.</th>
<th>Old Name</th>
<th>Business Term</th>
<th>Notes</th>
<th>Locations, Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Add</strong></td>
<td>1007</td>
<td>Event, Identifier</td>
<td>Reference number identifying an event.</td>
<td>an_.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add</strong></td>
<td>1008</td>
<td>Event, Sequence, Identifier</td>
<td>Sequence number differentiating a specific event amongst others.</td>
<td>n_.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add</strong></td>
<td>1010</td>
<td>Additional Document, Identifier</td>
<td>Identifier of a document providing additional information.</td>
<td>an_.35</td>
<td></td>
<td></td>
<td></td>
<td>SAD: (SAD 44)</td>
</tr>
<tr>
<td><strong>Add</strong></td>
<td>1012</td>
<td>Packing List Document, Item, Sequence, Identifier</td>
<td>Sequence number differentiating a specific packing list item within a packing list.</td>
<td>n_.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Add</strong></td>
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<td>Packing List Document, Identifier</td>
<td>Reference number to identify a packing list.</td>
<td>an_.35</td>
<td></td>
<td>Packing List number</td>
<td>UNLK: an_.17, L04 P 63-80</td>
<td>SAD:</td>
</tr>
<tr>
<td><strong>Cnd</strong></td>
<td>1001</td>
<td>Document, Type, Code</td>
<td>Code specifying the name of a document such as 352 for proforma invoice, 390 for commercial invoice.</td>
<td>an_.3</td>
<td></td>
<td>Document/message name</td>
<td>Document/message code</td>
<td>UNLK: L04, P 41-45</td>
</tr>
<tr>
<td><strong>Cnd</strong></td>
<td>1003</td>
<td>Document, Type, Identifier</td>
<td>Document type identifier such as INVOICE. See also 0085</td>
<td>an_.6</td>
<td></td>
<td>Message name, coded</td>
<td>Message name code</td>
<td>CIMP: (101); a3</td>
</tr>
<tr>
<td><strong>Cnd</strong></td>
<td>1004</td>
<td>Document, Identifier</td>
<td>Reference number identifying a specific document.</td>
<td>an_.35</td>
<td></td>
<td>Document/message number</td>
<td>Document/message number</td>
<td>UNLK: (112) n3 and (114) an6 or (805) n8 and (110) n0 MAR: IMO/FAL 2</td>
</tr>
<tr>
<td><strong>Cnd</strong></td>
<td>1015</td>
<td>Consignment, Carrier Assigned, Identifier</td>
<td>Reference number assigned by a carrier or its agent to identify a specific consignment such as a booking reference number when cargo space is reserved prior to loading.</td>
<td>an_.35</td>
<td></td>
<td>Booking reference number</td>
<td>Reservation number of shipment</td>
<td>CIMP: (117): an_.15 MAR: IMO/FAL 7</td>
</tr>
<tr>
<td><strong>Cnd</strong></td>
<td>1018</td>
<td>Order, Acknowledgement Document, Identifier</td>
<td>Reference number identifying the acknowledgement of an order.</td>
<td>an_.35</td>
<td></td>
<td>Acknowledgement of Order number</td>
<td>Purchase order response number</td>
<td>UNLK: L04, P 63-80</td>
</tr>
</tbody>
</table>
United Nations Trade Data Element Directory (UNTDDED, ISO 7372)

- An internationally accepted standard repository for the semantic of trade data elements used in international trade
- A method to describe information requirements from business perspective (a non-technical description of trade information).
- The definition is syntax-neutral and provides the basis for a later automation of document for paperless trade.
- Defining the data content in terms of the UNTDED makes different trade documents become directly comparable, which helps identify duplication and reduce the number of documents to the strict minimum.
How does UNTDED work?

- Each UNTDED element consists of a data element tag in the form of a four-digit number, a name (informative) and a description (definition).

- The data element may have a reference to a UN-recommended code list.

- For document alignment, it is recommended to use the tag, the dictionary’s old name or the business term and the description of the ISO 7372:2005 release when defining the Box Completion Guideline.

- The format of the UNTDED Revision 2005 (ISO 7372:2005) contains additional fields such as dictionary entry name for core component libraries so as to integrate the requirements of electronic business and paperless trade.

Grouping used in the Trade Data Element Directory (TDED)

**Group 1: (0001-1699)** Documentation, references

**Group 2: (2000-2699)** Dates, times, periods of time

**Group 3: (3000-3699)** Parties, addresses, places, countries

**Group 4: (4000-4699)** Clauses, conditions, terms, instructions

**Group 5: (5000-5699)** Amounts, charges, percentages

**Group 6: (6000-6699)** Measures, identifiers, quantities (other than monetary)

**Group 7: (7000-7699)** Goods and articles: descriptions and identifiers

**Group 8: (8000-8699)** Transport modes, means, and equipments

**Group 9: (9000-9799)** Other data elements (Customs, etc.)

**TDED 3404 Person name**

*Family name and given names of an individual.*
<table>
<thead>
<tr>
<th>Change indic.</th>
<th>Tag</th>
<th>New Name</th>
<th>Description</th>
<th>repr.</th>
<th>Old name</th>
<th>Business Term</th>
<th>Notes</th>
<th>Locations, Bridges</th>
</tr>
</thead>
<tbody>
<tr>
<td>cnd</td>
<td>1000</td>
<td>Document. Type.Name.Text</td>
<td>Free text name of a document such as 'Proforma Invoice', 'Commercial Invoice'</td>
<td>an.35</td>
<td>Document/message name</td>
<td>Document/message name</td>
<td>UNLK: L 02, P 45-80 MAR: IMO/FAL 1-7</td>
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</tr>
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<td>Code specifying the name of a document such as 352 for proforma invoice, 380 for commercial invoice.</td>
<td>an.3</td>
<td>Document/message name, coded</td>
<td>Document/message name code</td>
<td>UNLK: L 04, P 41-45 CIMP: (120): a1 SAD: (SAD 1(first to third subdivision))</td>
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</tr>
<tr>
<td>x</td>
<td>1002</td>
<td>.</td>
<td>Message name</td>
<td>DE to use instead - 1000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cnd</td>
<td>1003</td>
<td>Document. Type.Identifier</td>
<td>Document type identifier such as INVOIC. See also 0065</td>
<td>an.6</td>
<td>Message name, coded</td>
<td>Message name code</td>
<td>CIMP: (101): a3</td>
<td></td>
</tr>
<tr>
<td>cnd</td>
<td>1004</td>
<td>Document. Identifier</td>
<td>Reference number identifying a specific document.</td>
<td>an.35</td>
<td>Document/message number</td>
<td>Document/message number</td>
<td>CIMP: (112) n3 and (114) an 6 or (805) n8 and (118) n8 MAR: IMO/FAL 2 UNLK: an...17 L 04, P 63-80 SAD:</td>
<td></td>
</tr>
<tr>
<td>add</td>
<td>1007</td>
<td>Event. Identifier</td>
<td>Reference number identifying an event.</td>
<td>an.35</td>
<td></td>
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<td>Event. Sequence.Identifier</td>
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<td></td>
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<tr>
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<td>Additional Document. Identifier</td>
<td>Identifier of a document providing additional information.</td>
<td>an.35</td>
<td>Additional document reference</td>
<td>SAD: (SAD 44)</td>
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<tr>
<td>add</td>
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<td>Packing List Document. Item Sequence.Identifier</td>
<td>Sequence number differentiating a specific packing list item within a packing list.</td>
<td>n.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>cndr</td>
<td>1014</td>
<td>Packing List Document. Identifier</td>
<td>Reference number to identify a packing list</td>
<td>an.35</td>
<td>Packing List number</td>
<td>UNLK: an...17, L 04 P 63-80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cndr</td>
<td>1016</td>
<td>Consignment. Carrier Assigned.Identifier</td>
<td>Reference number assigned by a carrier or its agent to identify a specific consignment such as a booking reference number when cargo space is reserved prior to loading.</td>
<td>an.35</td>
<td>Booking reference number</td>
<td>Reservation number of shipment</td>
<td>CIMP: (117): an...15 MAR: IMO/FAL 7 UNLK: an...17 L 04, P 63-80</td>
<td></td>
</tr>
<tr>
<td>cndr</td>
<td>1018</td>
<td>Order Acknowledgement Document. Identifier</td>
<td>Reference number identifying the acknowledgement of an order.</td>
<td>an.35</td>
<td>Acknowledgement of</td>
<td>Purchase order</td>
<td>UNLK: L 04, P 63-80</td>
<td></td>
</tr>
</tbody>
</table>
A Data Dictionary describes in detail the data elements contained in a document, with the following pieces of information:

- Document title
- Document purpose
- Name of document owner
- Identification number for each data element name (e.g. Box Number in the document)
- Data element name from the document to be modeled
- Data element definition in local language and/or English as given by the document owner and/or relevant standards (e.g. WCO Data Set, UNTDED, UN/CEFACT CCL)
- Data format (alpha, numeric) and size (length of a data element, value in terms of digit or characters)
- Constraint on the occurrence of each data element (MinOccurs, MaxOccurs)
- Code lists & subsets of code lists
Example of Document Data Dictionary

**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

<table>
<thead>
<tr>
<th>ASEAN ATIGA FORM D Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>0-1 Reference Number</strong></td>
</tr>
<tr>
<td>TDED 1004: Reference number identifying a specific document. an..35</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>1 Goods consigned from (Exporter’s business name, address, country)</strong></td>
</tr>
<tr>
<td>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</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>2 Goods consigned to (Consignee’s name, address, country)</strong></td>
</tr>
<tr>
<td>TDED 3132: Name and address of party to which goods are consigned an..512</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>3-1 Departure date</strong></td>
</tr>
<tr>
<td>TDED 2380: The value of a date, a date and time, a time or of a period in a specified representation. an..35</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>3-2 Vessel’s name/aircraft etc.</strong></td>
</tr>
<tr>
<td>TDED 8212: Name of a specific means of transport such as the vessel name an..35</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>3-3 Port of discharge</strong></td>
</tr>
<tr>
<td>TDED 3224: Name of a location. an..256</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>4 For official use (Declaration Type)</strong></td>
</tr>
<tr>
<td>TDED 1001: Code specifying the name of a document. an..3</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
<tr>
<td><strong>5 Item No.</strong></td>
</tr>
<tr>
<td>TDED 1050: To identify a position within a sequence an..10</td>
</tr>
<tr>
<td>(Min=1, Max=1)</td>
</tr>
</tbody>
</table>
### Data Dictionary

#### ASEAN ATIGA FORM D Data

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
</tr>
</thead>
</table>
| 0-1      | Reference Number  
TDED 1004: Reference number identifying a specific document. an..35 (Min=1, Max=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 (Min=1, Max=1) |
| 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) |
| 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) |
| 4        | For official use (Declaration Type)  
TDED 1001: Code specifying the name of a document. an..3 (Min=1, Max=1) |
| 5 Item No. | Item No.  
TDED 1050: To identify a position within a sequence an..10 (Min=1, Max=1) |
Analyze data elements across various documents and organize them in a comparable manner.
To organize data specifications from different documents in a comparable manner for consistent mapping of data elements to a data model in the next step

- **Document categorization** according to the type of trade documents that they belong to, for example:
  - **Category 1**: documents related to commercial transaction and payment.
  - **Category 2**: documents for transport and official control that provide information of a single consignment (e.g. customs declaration)
  - **Category 3**: documents of transport and official control that provide information of multiple consignments (e.g. manifest)

- **Data dictionaries compilation** according to document categories/families
Document Categorization
Example of Document Categorization based on UNLK

UNLK Document Families

Commercial Transaction Document Family
(e.g. Quotation, Order, Invoice, etc.)

Transport & Related Services Document Family
(e.g. Bill of Lading, Cargo Manifest, Insurance Contract, etc.)

Official Controls Document Family
(e.g. Goods Declarations, Export/Import Licenses, Certificate of Origin, etc.)

Payment Document Family (e.g. Letter of Credit, Documentary Credit, etc.)

<table>
<thead>
<tr>
<th>Process</th>
<th>UNLK Document Family</th>
<th>Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buy</td>
<td>Commercial Transaction</td>
<td>Proforma Invoice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Purchase Order</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial Invoice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Packing List</td>
</tr>
<tr>
<td></td>
<td>Buy</td>
<td>Forwarding and Cargo Handling</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td>Single Consignment</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td>Multiple Consignments</td>
</tr>
<tr>
<td></td>
<td>Ship</td>
<td>Multiple Consignments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bill of Lading</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booking Request Form – Border Crossing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booking Confirmation – Border Crossing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booking Request Form – Inland Transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booking Confirmation – Inland Transport</td>
</tr>
<tr>
<td></td>
<td>Insurance</td>
<td>Cargo Insurance Application Form</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Outward Container List</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Official Controls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Certificate of Origin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rice Quality Certificate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Certificate of Standards of Products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application for Phytosanitary Certificate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application for Certificate of Origin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Export Declaration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Letter of Credit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Credit Advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Debit Advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remittance Advice</td>
</tr>
</tbody>
</table>
### Data Dictionary Compilation

Sample Template of Document Data Dictionary Compilation

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASEAN ATIGA FORM D</strong></td>
<td>A Certificate of Origin certifies expressly that the goods to which the certificate relates originate in a specific country. Issuing Authorities, Thailand</td>
<td></td>
</tr>
<tr>
<td><strong>Permit for the Export of Rice (A. 4)</strong></td>
<td>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</td>
<td></td>
</tr>
<tr>
<td><strong>Certificate of Standards of Products (MS. 24)</strong></td>
<td>Certificate of Standards of Products (MS. 24) certifies that the rice to be exported has the quality set by importer. Board of Trade of Thailand</td>
<td></td>
</tr>
<tr>
<td><strong>11 Place of departure</strong></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td><strong>20 Place of departure</strong></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td><strong>11-2 Country of Exportation</strong></td>
<td>TDED 3229: Country subdivision time of the departure of the goods item original consignor an..2 (Min=1, Max=1)</td>
<td></td>
</tr>
<tr>
<td><strong>5 Destination country</strong></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td><strong>21 Country of destination of goods</strong></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td><strong>5 Item Number</strong></td>
<td>TDED 1050: Number indicating the position in a sequence n..5 (Min = 1, MAX = unbounded)</td>
<td></td>
</tr>
<tr>
<td><strong>12 Line item</strong></td>
<td>TDED 1082: An identifier differentiating an individual line item from within a series an..6 (Min = 1, Max = unbounded)</td>
<td></td>
</tr>
<tr>
<td><strong>9-2 Item Price</strong></td>
<td>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..16,2 (Min = 1, Max = unbounded)</td>
<td></td>
</tr>
<tr>
<td><strong>17 Price (FOB)</strong></td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td><strong>6 Marks and numbers on packages</strong></td>
<td>TDED 7102: Freeform description of the marks and numbers on a transport unit or package an..512 (Min=1, Max= unbounded)</td>
<td></td>
</tr>
<tr>
<td><strong>18 Marks and numbers on packages</strong></td>
<td>TDED 7102: Marks and numbers identifying individual packages an..512 (Min = 1, Max = unbounded)</td>
<td></td>
</tr>
</tbody>
</table>
Map data elements to a Reference Data Model

Step 4

Map (Reconcile)
To map the data elements in the compiled Data Dictionary with the semantically equivalent data element in Reference Data Model (example here is WCO DM).

- The WCO Data Model describes the same data with the detailed structure and precision required for automated information processing.

- The corresponding data element in the WCO Data Model is identified with the WCO ID, an alphanumerical uniquely identifier of the data element in the Data Model.

- The WCO ID should be included in the compiled Data Dictionary.
Mapping Process (1)

WCO Data Model 3.0 with Link to interactive Data Set

Click the green icon to open the Excel file
“WCO Data Model Version 3.0 – The Interactive Data Set”
**Mapping Process (2)**

WCO Interactive Data Set with UNTDED UID and WCO ID

<table>
<thead>
<tr>
<th>WCO ID</th>
<th>Name</th>
<th>Definition</th>
<th>Data Model Classes</th>
<th>Import</th>
<th>Conveyance</th>
<th>Transit</th>
<th>Response</th>
<th>Format</th>
<th>Code Remarks</th>
<th>UID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>Description of goods</td>
<td>Plain language description of the nature of a goods item sufficient to identify it for customs, statistical or transport purposes.</td>
<td>Commodity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>14.512</td>
<td></td>
<td>7002</td>
<td>Good Item Description: Text</td>
</tr>
<tr>
<td>258</td>
<td>Commodity name</td>
<td>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.</td>
<td>Commodity</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>14.35</td>
<td></td>
<td>7002</td>
<td>Good Item Description: Text</td>
</tr>
</tbody>
</table>

- “UID” column identifies the UNTDED tag of the data element
- “WCO ID” column identifies the corresponding WCO ID.
Different Mapping Cases to Deal With

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

- One TDED Data Element maps to exactly one WCO Data Element
- One TDED Data Element maps to more than one WCO Data Elements
- One TDED Data Element does not have a direct mapping to a WCO Data Model
One TDED Data Element maps to exactly one WCO Data Element

For example, the data element in box “Marks and numbers on packages” of the CoO, in the Data Dictionary Table below, is mapped to “TDED 7102”

<table>
<thead>
<tr>
<th>Data Element Name</th>
<th>Data Element Definition</th>
<th>Format</th>
<th>MinOccur</th>
<th>MaxOccur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exporter (name and address)</td>
<td>TDED 3336: 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.)</td>
<td>an..256</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Consignee (name and address including country)</td>
<td>TDED 3132: Name and address of party to which goods are consigned</td>
<td>an..256</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Marks and numbers on packages</td>
<td>TDED 7102: Marks and numbers identifying individual packages</td>
<td>an..512</td>
<td>1</td>
<td>unbounded</td>
</tr>
</tbody>
</table>

Search the column “UID” with a TDED tag “7102” to obtain one single WCO Data Element and find the corresponding “WCO ID 142” from the WCO Interactive Data Set.
One TDED Data Element maps to more than one WCO Data Element

<table>
<thead>
<tr>
<th>WCO ID</th>
<th>Name</th>
<th>Definition</th>
<th>Data Model Classes</th>
<th>Import</th>
<th>Export</th>
<th>Conveyance</th>
<th>Transit</th>
<th>Response</th>
<th>Format</th>
<th>UID</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>137</td>
<td>Description of goods</td>
<td>Plain language description of the nature of a goods item sufficient to identify it for customs, statistical or transport purposes.</td>
<td>Commodity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>an. 512</td>
<td>7002</td>
<td>Goods Item. Description. Text</td>
</tr>
<tr>
<td>258</td>
<td>Commodity name</td>
<td>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.</td>
<td>Commodity</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>an. 35</td>
<td>7002</td>
<td>Goods Item. Description. Text</td>
</tr>
</tbody>
</table>

- In the WCO Data Model one TDED element can be mapped to several WCO ID’s.

- A data modeler needs to analyse how the data element is used in the trade document and decide which of the two mappings provides the best match.
One TDED Data Element does not have a direct mapping to a WCO Data Element

For the data element that cannot be directly mapped to the WCO DM, all related data elements of the WCO DM 3.0 are mapped to the generic TDED data element instead.
### Data Dictionary with Mapping to WCO Data Model

**Example of Data Dictionary of Certificate of Origin (CoO) Mapped to WCO Data Model 3.0**

<table>
<thead>
<tr>
<th>ASEAN ATIGA FORM D Data</th>
<th>WCO ID</th>
<th>Data model Classes</th>
<th>WCO Dictionary Entry Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 Reference Number</td>
<td>D014</td>
<td>Declaration</td>
<td>Declaration, Identification, Identifier</td>
</tr>
<tr>
<td>TDED 1004: Reference number identifying a specific document. an..35 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Goods consigned from (Exporter's business name, address, country)</td>
<td>R031</td>
<td>Exporter</td>
<td>Exporter. Name. Text</td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Goods consigned to (Consignee's name, address, country)</td>
<td>R037</td>
<td>Importer</td>
<td>Importer. Name. Text</td>
</tr>
<tr>
<td>TDED 3132: Name and address of party to which goods are consigned an..256 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-1 Departure date</td>
<td>030</td>
<td>GoodsShipment</td>
<td>GoodsShipment. Departure. Datetime</td>
</tr>
<tr>
<td>TDED 2380: Date and optionally time of the departure of the goods from original consignor. an..35 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-2 Vessel's name/aircraft etc.</td>
<td>T001</td>
<td>ArrivalTransport Means</td>
<td>ArrivalTransportMeans. Name. Text</td>
</tr>
<tr>
<td>TDED 0212: name of specific means of transport such as vessel name an..35 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-3 Port of discharge</td>
<td>L012</td>
<td>UnloadingLocation</td>
<td>UnloadingLocation. Name. Text</td>
</tr>
<tr>
<td>DED 3224: Name of a location an..256 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 For official use (Declaration Type)</td>
<td>D013</td>
<td>Declaration</td>
<td>Declaration.Type. Code</td>
</tr>
<tr>
<td>TDED 1001 : Code specifying the name of a document. an..3 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Item No.</td>
<td>006</td>
<td>Commodity</td>
<td>Commodity. Sequence. Numeric</td>
</tr>
<tr>
<td>TDED 1050: Number indicating the position in a sequence n..10 (Min=1, Max=1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 5

Obtain the structure of the **electronic document**

Obtain e-document(s)
- Depending on business requirements, specific syntax can be applied in obtaining the structure of electronic document such as XML and EDI.

- Obtaining the structure of an electronic document demands technical capacity in available syntaxes and relevant technical standards.

- Illustration is given to make readers become aware of how to obtain the structure of electronic document using XML syntax, in particular packages available in WCO DM 3.0.
Customizing WCO DM XML Schema to obtain the structure of electronic document

- To map the data elements of the WCO Data Model to XML structures to develop the XML Schemas for the national trade documents

- To identify those data elements in the WCO Schemas that are actually used in the national trade documents and to remove those data elements that are not used in the national context from the Schema
What is XML Schema?

- 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 electronic format and can be used directly for paperless trade.
- WCO XML Schemas are **generic** because they can support the data requirements of several trade documents.
- By eliminating all data elements that are not used in the national trade document from the generic Schema, a **specific Schema** is generated that exactly matches the data requirements of the national document.
- The XML Schemas provided with the WCO Data Model 3.0 include all data elements for a set of top level business processes.
XML Schema (Example)

```xml
- <xsd:element name="TransportContractCrossBorder">
  - <xsd:complexType>
    - <xsd:sequence>
      - <xsd:element name="TransportContractCrossBorderConsignement">
        - <xsd:complexType>
          - <xsd:sequence>
            - <xsd:element name="ImporterReferencedParty">
              - <xsd:complexType>
                - <xsd:sequence>
                  - <xsd:element name="Name" type="udt:TextType" />
                </xsd:sequence>
              </xsd:complexType>
            </xsd:element>
          - <xsd:element name="BaseportOfUnloadingReferencedLocation">
            - <xsd:complexType>
              - <xsd:sequence>
                - <xsd:element name="Name" type="udt:TextType" />
              </xsd:sequence>
            </xsd:complexType>
          </xsd:element>
        - <xsd:element name="TransportContractCrossBorderDocument">
          - <xsd:complexType>
            - <xsd:sequence>
              - <xsd:element name="ID" type="udt:IDType" />
              - <xsd:element name="Name" type="udt:TextType" />
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>
      - <xsd:element name="AssociatedCrossBorderDocument" type="ram:CrossBorderDocumentType" maxOccurs="2" />
    </xsd:sequence>
  </xsd:complexType>
</xsd:element>
```
To obtain the specific Schema for electronic document

Select the appropriate WCO Schema

• For each document in the Data Dictionary, the data modeler needs to identify the WCO Schema that meets most closely the data requirements of this trade document.

Customise the WCO Schema by removing unused data elements

① List the data elements used in national trade documents onto the Data Dictionary.
② Search for each data element in the Schema using the “Dictionary Entry Name” and then mark this data element in the Schema.
③ When all data elements of the Data Dictionary are marked in the Schema then the unmarked data elements of the Schema are removed.
④ Remove all data requirements that are not specified in the national trade document from the Schema.
Example of XML Schema of “Exporter”

WCO DEN “Exporter. Name. Text” is associated with XML Tag “NameText” of Object Class “Exporter”

<table>
<thead>
<tr>
<th>ASEAN ATIGA FORM D Data</th>
<th>WCO ID</th>
<th>Data model Classes</th>
<th>WCO Dictionary Entry Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods consigned from (Exporter’s business name, address, country)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>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)</td>
<td>R031</td>
<td>Exporter</td>
<td>Exporter. Name. Text</td>
</tr>
</tbody>
</table>

```xml
<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>
```
Marking elements to remain in the XML Schema

```xml
<element name="AcceptanceDateTime" type="xs:dateTime">
  <documentation>
    AcceptanceDateTime is a date and time of when the document was accepted as being in accordance with the AcceptanceDateTimeType.
  </documentation>
</element>

<element name="CancellationDateTime" type="xs:dateTime">
  <documentation>
    CancellationDateTime is a date and time of when the document was cancelled as being in accordance with the CancellationDateTimeType.
  </documentation>
</element>
```
## Steps and Activities

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>Capture business process &amp; identify documents &amp; basic data requirements</td>
<td>Provide a precise definition for the data elements</td>
<td>Analyze data elements across various documents</td>
<td>Obtain a data model</td>
<td>Obtain structure of the electronic document</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Business Process Analysis (optional) Collect a list of documents &amp; basic data requirements</td>
<td>Analyze each document to extract data definition, type, format &amp; constraints</td>
<td>Organize the analyzed data elements in a comparable way</td>
<td>Map the data elements to Reference Data Model (e.g. WCO DM, CCL, TDED)</td>
<td>Generate electronic documents</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>Collection of documents, forms and messages.</td>
<td>Document Data Dictionary for each document</td>
<td>Document Data Dictionary compilation for each document family</td>
<td>Data Dictionary with mapping to Reference Data Model</td>
<td>Electronic Document(s)</td>
</tr>
</tbody>
</table>
# Tools for Development of Electronic Documents

<table>
<thead>
<tr>
<th>Steps</th>
<th>Suggested Tools</th>
</tr>
</thead>
</table>
| **Step 1**: Capture business processes and identify documents and basic data requirements | • UMM (UN/CEFACT Modeling Methodology)  
• UML (Unified Modeling Language)  
• UNNEXT BPA Guide |
| **Step 2**: Analyze data in each document and define the semantic of the data and the data formats | • UNTDED (United Nations Trade Data Elements Directory)  
• CCTS (UN/CEFACT Core Component Technical Specification)  
• UNNEXT DH Guide |
| **Step 3**: Analyze data elements across various documents and organize them in a comparable manner | • UNLK (United Nations Layout Key)  
• UNTDED  
• UNNEXT DH Guide |
| **Step 4**: Map data elements to a Reference Data Model | • UN Core Component Library  
• WCO Data Model  
• UNNEXT DH Guide |
| **Step 5**: Obtain the structure of electronic document | • UN XML NDR, EDIFACT MIGs  
• WCO EDIFACT MIG/XML Schemas |
In Summary

- The stepwise approach for development of electronic documents establishes semantic rules for development of specifications for electronic messages and documents.

- Steps 1, 2, and 3 achieve the development of a simplified, standardised and harmonised data set for cross border trade.

- Steps 4 and 5 achieve the mapping of the data set to a Reference Data Model, data modeling and data structure for B2G and G2G data exchange in cross border trade.

- The specifications of electronic documents enable information sharing, integration, and exchange among stakeholders of the international supply chain.

- The results provide a basis for paperless trade and use of electronic messages in the Single Window system.
Practical Recommendations

1) Gaining support for data harmonization

Technical nature of data harmonization and its multi-stakeholder involvement

Support for data harmonization should be gained from policy makers with decision-making power

Institutional Mechanism: Arrange an institutional unit to manage a data harmonization program

Stakeholders: Identify main stakeholders, their roles, objectives and concerns for their active involvement

Regional/Int’l Initiatives: Pay due attention to regional/ int’l initiatives which develop regulations & standards affecting trade documents, subsequently influencing DH initiatives
2) Coordinating the requirements of national data harmonization with regional and international partners

- Develop a strategy for active involvement in international initiatives to create the links between national projects and int’l developments.
- Establish a joint working group to coordinate & communicate regularly with relevant int’l partners.
- Decide on a national standard data set that will be utilized in any international trade protocols.

Inter-agency coordination

Interaction/Alignment

National Data Harmonization Projects

Government Agencies

Ports

Bank/Insurance

Logistics Service Providers

International DH Initiatives
3) Iterative and incremental approach to data harmonization

One-run harmonization of data is not enough to cover documentary requirements of the international supply chain for SW implementation.
4) Criteria for selecting data standards

Comprehensiveness
Select a data model that provides generic semantic rules yet sufficiently contextualizes documentary requirements of all stakeholders in the international supply chain.

Compliance with int’l standards
Select a data model that promote semantic interoperability in compliance with relevant international standards for electronic data exchange.

Stability
Select a data model that is built upon on the stable version of standards.
5) Maintenance of outputs from data harmonization projects

- Keep baselines of the project outputs by using a platform of national registry and repository
- Facilitate adoption of the project outputs for continuous implementation

- Monitor changes in and maintain data harmonization baselines
- Publicize and promote implementation of new baselines
Thank you