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Recommendations and standards:

Support to capacity building and technical cooperation

Training Material on the Use of International Standards

Submitted by the secretariat for information

Summary

This training material was prepared in the framework of the UNDA project “Evidence-based trade facilitation measures for economies in transition.” It aims to group together and explain the recommendations and standards available through the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT). This material concentrates on the use of international standards, what constitutes an international standard and how they can be best implemented.

Document ECE/TRADE/C/CEFACT/2021/INF.6 is submitted by the secretariat to the twenty-seventh session of the Plenary for information.

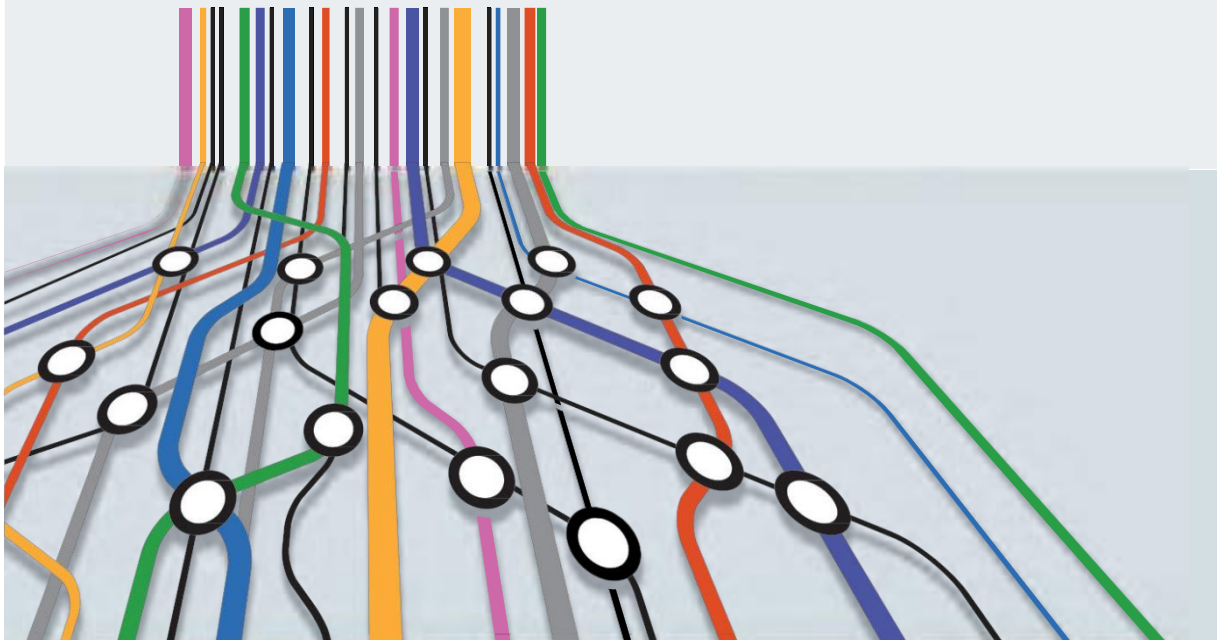
1. It is commonly agreed that data exchange is facilitated by the use of international standards. The World Trade Organization's Trade Facilitation Agreement has integrated this principle in its article 10.3. However, there are not often explanations of exactly what is meant by "use of international standards", how to achieve this or the benefits it can produce.
2. Drafted by the United Nations Economic Commission for Europe (UNECE) Trade Facilitation Section, this training manual aims to provide guidance on this issue. It reviews the different types of standards, how they can be used, how they are developed and their benefits. It groups together and explains the recommendations and standards available through the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) as well as relevant material from other organizations. The manual consists of five sections targeting policymakers, project managers and government experts involved in electronic data exchange.
3. The UNECE hopes that this training manual will intensify the efforts to implement the Trade Facilitation Agreement and contribute to streamlining border processes. It will therefore bring benefits to governments through increased revenue collection and fraud control, to businesses through increased competitiveness and to consumers through lower prices.
4. The training material is presented annexed to this Plenary document in the format which it is intended to be used.

Annex

**UNITED NATIONS
TRADE**



**International Standards
Training Material**



Training Manual



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INTRODUCTION

This training document is a consolidation of best practices found in various recommendations and publications and from the practical experiences of United Nations Economic Commission for Europe (UNECE) and United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) experts. The purpose is to present this material in a single document with an aim to showcase the use of international standards for formalities and documentation requirements in trade, especially in relation to dematerialization.

This training material touches on all aspects of standards management but is not intended to replace any of the documents used to develop this training material.

This document aims to describe the different elements of international trade facilitation standards, in accordance with Article 10.3 on “Use of International Standards” in the Trade Facilitation Agreement (TFA) of the World Trade Organization (WTO).

1. Standards

The first chapter describes the types of standards associated with international trade, with a specific focus on standards for information sharing and processes. This reflects the overarching article of the WTO TFA, Article 10 on “Formalities Connected with Importation, Exportation and Transit”.

2. History

The second chapter summarizes how trade-related standards have emerged and been developed to date.

3. Establishment and endorsement of standards by a recognized body

The third chapter examines the development and adoption of standards by recognized global standards development organizations (SDO).

4. Deployment of standards

The fourth chapter expands on the governance, legislation and bilateral and multilateral agreements related to the use of international standards.

5. Key standards

The last chapter summarizes important trade-related standards and their impact on international trade.

1. Background

1.1 What is a standard?

The International Organization for Standardization (ISO) compares a standard to a “formula that describes the best way of doing something.”¹ An international standard is usually about bringing together experts in a given area who work together to develop a standardized process or document. The larger the expert base, and the more points of view the expert base will represent, the more robust the resulting standard will be.

¹ See ISO website: <https://www.iso.org/standards.html>.

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In the overall domain of international trade, standards can be established in three different areas: (1) the traded product, (2) the associated information and (3) the processes and procedures. This document summarizes the elements related to the standards for products but will focus the training mostly on standards related to paperless trading (i.e. the information and the processes).

1.1.1 Product standards

Technical and phytosanitary standards are designed to ensure safety, compatibility and consistency of trade in relevant goods. If a product meets a standard, this usually means that it has passed tests that demonstrate it complies with certain safety and quality requirements. It also means that it is compatible with related products and infrastructure. For example, the plug of an electrical item must fit into the local power sockets, or a piece of paper should be the correct size for standard printers.

For traded products, standards define a required or agreed level of quality and performance. Such standards have an important role in international trade, allowing for a fair playing field for competition where everyone has to meet the same criteria, while also protecting the safety and wellbeing of the public. These standards also protect business, as incidents caused by the sale of defective or unsafe goods can have a disastrous impact on consumers and entire supply chains, including those of the suppliers, wholesalers and retailers who sell products that are standards conformant. Many scandals have occurred as a result of mislabelled or unsafe goods, such as the 2013 scandal in Europe where several brands of frozen meals were found to have been using horsemeat in products labelled as containing only beef.

Standards support economic development in three ways: (1) ensuring consumer safety, (2) providing technology transfer opportunities and (3) creating greater opportunities for cooperation and coordination across borders as well as between corporate entities.

Standards for products have two potential effects regarding trade. On the one hand, they can foster business by opening new markets and broadening the customer base for producers. On the other hand, they can reduce opportunities for business by becoming a barrier to international trade. Possible barriers include increased costs caused by either (1) using standards that exceed the requirements for meeting regulatory objectives or (2) using similar but different requirements implemented by different parties to meet the same objectives (thus forcing suppliers to comply with multiple, similar but different standards, regulations and/or tests/certifications). These non-tariff barriers represent a global and regional challenge to collaboration. Rule-makers need to work on enhancing regulatory coherence to avoid adding costs to trade created by these barriers.

In brief, the use of international standards for products is supposed to support regulatory harmonization and help avoid the waste of resources that can result from additional testing or other duplicative procedures that occur when regulators develop their own solutions. Unfortunately, from a trade facilitation perspective, the misuse of such standards may potentially turn them into barriers to trade, though such issues are beyond the scope of this training.

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1.1.2 Information standards

In parallel, there are international trade facilitation standards that are developed and adopted with the objective of facilitating the movement of goods through harmonization of the flow of information about these goods. In this sense, they should be perceived differently from product standards that require compliance with specific regulations meant to protect society, the economy and the environment (such as phytosanitary, veterinary, or technical standards).

Information standards are the way to unambiguously describe information, to make it recognizable by all those who are familiar with the standard. A parallel can be drawn with a dictionary, which is a standard that describes what words mean and how they can be spelled in different languages.

As we will see in the brief history section (Section 2), a good way to standardize trade information is to develop specific forms that are unanimously recognized. As soon as two partners exchange information, they need to mutually agree on the structure of the data. For example, both parties need to agree on the weights and measures in order to accurately agree on the quantities to be exchanged and the relevant payments. This is true even more so for electronic data exchange; the information must be unambiguously understood by both the sender and receiver of the information, as well as by anyone who might reuse the data, to ensure that everyone understands the same thing in the same way.

Commonly used codes are perfect examples of information standards. UN/CEFACT maintains a number of these through its recommendations², such as types of transport, currency, packaging or locations³. UN/CEFACT also maintains a good number of codes directly in its electronic messages in the United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT), including types of documents, party roles and organization types. The international commercial terms (INCOTERMS)⁴ from the International Chamber of Commerce (ICC) are also common.

Today, the electronic exchange of information is everywhere and is performed in many different environments and sectors using dozens of open or proprietary protocols, messages and file formats. Two building blocks are required to exchange data between digital applications: common data elements with standardized definitions (semantics, i.e. a common vocabulary); and a syntax which allows for the identification of data (equivalent to grammar in spoken languages).

Some examples of semantic standards (data) include the following:

- UN/EDIFACT - the only global standard for electronic data interchange (EDI) comprising message exchange formats and data dictionaries (also endorsed by ISO as ISO 9735)⁵

² UNECE code list recommendations, available at <http://www.unece.org/unecefact/codelistrecs.html>.

³ For more information on location codes, see <http://www.unece.org/cefact/locode/welcome.html>

⁴ ICC Incoterms website: <https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-2020>; the Incoterms are also republished in UNECE Recommendation No. 5.

⁵ See <https://unece.org/trade/unecefact/introducing-unedifact>

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- UNTDED - the United Nations Trade Data Elements Directory (also published as ISO 7372)⁶
- Code lists
- Core Components Technical Specification (CCTS)
- Core Component Library (CCL)

Some examples of syntax standards include the following:

- UN/EDIFACT (which is also a structured message exchange syntax)
- UN/CEFACT XML schema
- XML schema in general
- JSON data exchange format

1.1.3 Procedural standards

A considerable number of obstacles to the free flow of goods and services exist. These obstacles result in unnecessary extra costs and complications to international transactions, thereby preventing countries and enterprises from fully benefiting from international trade. Procedural standards and international best practices aim to facilitate and harmonize trade transactions from the initial commercial documents to the payment measures, official controls and transportation of goods.

These standards can take the form of norms, conventions, forms, guidelines, or recommendations.

Specific examples of those procedural standards are (1) the Buy-Ship-Pay reference model, developed by UN/CEFACT, that describes the main processes and parties in the international supply chain and the relationship between the high-level data entities of the involved international sales and transport contracts and (2) the Framework of Standards to Secure and Facilitate Trade (SAFE), developed by the World Customs Organization (WCO) to enhance security and facilitation in global trade.

Another category of standards does exist, voluntary sustainability standards (VSS), but these are out of scope of this training. See United Nations Forum on Sustainability Standards (UNFSS).

1.2 Compulsory/mandatory or voluntary standards

Most standards are voluntary in the sense that they are offered for adoption by international organizations, government agencies, industry or individuals without being mandated by law. Some standards become mandatory when they are adopted by regulators as legal requirements in particular domains. In general, the standards that aim to safeguard human health, personal and property safety and the standards incorporated by laws and administrative regulations are mandatory standards, while other standards remain voluntary.

Trade agreements set down rules to cover trade in goods and services between countries or among several parties. Some of these rules relate to tariffs or quotas in place between negotiating partners, and others relate to the quality, safety or other characteristics of the products or services being traded. A key WTO agreement is the Technical Barriers to Trade (TBT) agreement which aims to ensure that technical

⁶ See www.unece.org/cefact/untded-iso7372

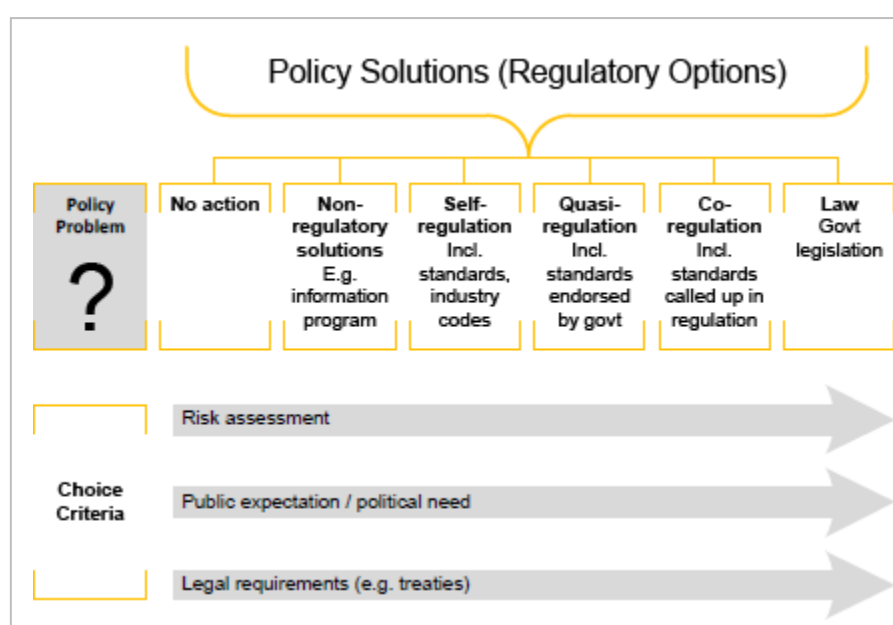
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regulations, standards and conformity assessment procedures, which governments might use to describe the characteristics of products being traded, do not create unnecessary technical barriers to trade from a trade facilitation perspective.

Legislators and authorities have long acknowledged that making use of standards is often more cost effective and expedient than classical legislative tools. In fact, to regulate economic and productive activities without making use of standards is now the exception, rather than the rule and, in a number of fields, it is simply unimaginable. Thus, the question is no longer whether to use standards in regulations, but how best to use them.

There are several options in the utilization of standards for regulation (see Fig.1):

Figure 1: The role standards play in the policymaking context, as a contribution to better regulation. Source: UNECE



All too often, governments and their regulatory authorities only take into consideration the options of either incorporation (of the text of the standard into the text of the regulation) or exclusive reference. In both cases, the standard becomes part of the legislation and, as such, compulsory.

Figure 1 demonstrates that a standard is compulsory only in the last level: government legislation, with an increase in policy up to that level. Co-regulation can in certain cases be a more cost effective and expedient method for addressing certain policy objectives than the classical legislative tools. Standardization by independent bodies is an example of a well-recognized co-regulation instrument.

1.3 The reasons and benefits behind standardization

“Without international standards there would be far less international trade, far less global prosperity, far fewer markets for exporters, and far less variety for consumers. Most goods and many services traded are affected in one way or another by standards. Indeed, it is

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often when standards 'fail' that we notice them. A failure to meet standards can stop trade in a product or service altogether." WTO Deputy Director-General Alan Wolff, 2018

One of the best innovations in global trade is the intermodal standardized container which supported global trade expansion following the standardization of container sizes in 1961⁷. Now modern supply chains must adapt to ever-shortened production lifecycles, evolving consumer tastes and rapid technological developments. Modern commerce is equally no longer an exchange between two parties but rather an extended collaboration between critical interdependent partners, executed over vast geographic expanses, time zones and borders.

Without standardized electronic messages in the supply chain, these developments would be difficult. For parties to exchange and reuse fully electronic messages, all information needs to be clearly defined and unambiguous, both from a semantic and syntactical perspective. Trading partners wanting to exchange data will need to agree on the meaning of each individual data element to ensure that they all understand and interpret the information in the same way. This is equally true for governments and any other parties that may use or transmit this data. If the exchange is limited to two parties, a bilateral data dictionary is sufficient. However, as soon as there are multiple parties, or if the information may be reused in other contexts, a standardized data dictionary is useful.

Any information that can be codified, should be codified to avoid confusion. For example, in English alone, palletized packaging material can be described as slab, board, honeycomb slate and so on, before even considering differences between languages. Humans might understand that each of these means palletized or stacked-on-pallet transport structures, but a computer, unless it has been programmed to recognize all the variations, will not necessarily understand that these are synonymous terms. However, if "palletized" is indicated using a code such as "PX" (from UNECE Recommendation No. 21), there is no ambiguity.

1.4 WTO Trade Facilitation Agreement (TFA) Article 10.3

International standards play an important role in trade governance, in large part due to WTO agreements such as the Trade Facilitation Agreement (TFA) and the Technical Barriers in Trade (TBT) Agreement. Similar language is used in free trade agreements (FTAs) and regional trade agreements (RTAs).

1.4.1 Background on article 10.3: Use of International Standards

The TFA Art. 10.3 (Use of International Standards) contains three sub-bullets and an additional comment:

- 3.1 *Members are encouraged to use relevant international standards or parts thereof as a basis for their import, export, or transit formalities and procedures, except as otherwise provided for in this Agreement.***

⁷ For more information, see <http://www.worldshipping.org/about-the-industry/history-of-containerization/the-birth-of-intermodalism>

3.2 *Members are encouraged to take part, within the limits of their resources, in the preparation and periodic review of relevant international standards by appropriate international organizations.*

3.3 *The Committee shall develop procedures for the sharing by Members of relevant information, and best practices, on the implementation of international standards, as appropriate.*

“The Committee may also invite relevant international organizations to discuss their work on international standards. As appropriate, the Committee may identify specific standards that are of particular value to Members.”⁸

The main observations to be taken from the formulation of the article include the following:

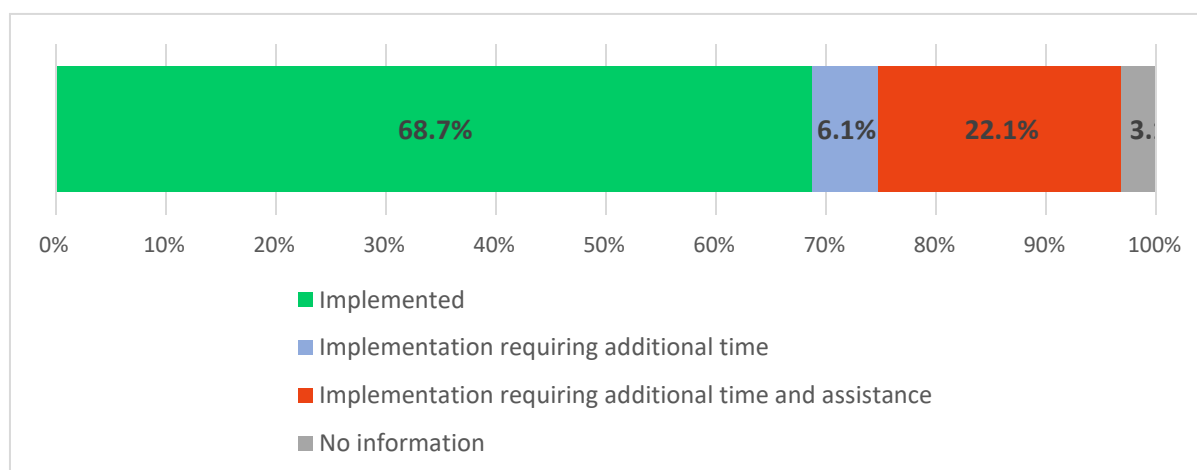
- International standards have a key role in trade facilitation.
- Neither the TFA nor its article 10.3 provide a definition of “relevant international standards”, much less a list of “appropriate international organizations”. It is the responsibility of the implementer to identify the appropriate standards and organizations. The vision is that as more countries implement international standards as the basis for their trade procedures (vs. use additional, local, unique or partially accepted standards and provisions), the simpler the process for clearance of goods will become globally. Any deviation from an international standard will make the clearance process longer and/or more complex and, as a result, will increase the compliance cost and reduce trade facilitation.
- Article 10.3 is a best endeavour measure. It only encourages WTO Members to make an effort to use and participate in the development of international standards by appropriate international organizations as a basis for their importation, exportation or transit formalities and procedures.
- The relevant economies should join and/or support the “appropriate international organizations” to develop and periodically review the standards.
- In the process of negotiating the WTO Trade Facilitation Agreement, experts suggested including examples of international trade facilitation standards such as UN/EDIFACT. However, negotiators finally arrived at the decision to not go into the details and to leave a general and best endeavour text, allowing countries and experts to work further on the implementation and definition of international trade facilitation standards.

1.4.2 Implementation

Figure 2: TFA Art.10.3 Use of International standards: rate of implementation (as of August 2020). Source: WTO TFA database.

⁸World Trade Organization Trade Facilitation Agreement, available at https://www.wto.org/english/docs_e/legal_e/tfa-nov14_e.htm.

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The rate of implementation of article 10.3 is in the first half of the “implemented” articles⁹. However, the free interpretation of “international standards” and the non-binding character of this provision leave open questions on the accuracy of this data.

1.5 Paperless trading

When goods and services cross borders in international trade, information needs to be passed between relevant parties, whether private companies or public bodies, including suppliers, logistics providers, customs, regulatory agencies, sellers and buyers. Paperless trade refers to the digitalization of these information flows, including making available and enabling the exchange of electronic trade-related data and documents. Less formally, one can think of this as cross-border trade transactions using electronic data in lieu of paper-based documents.

At first glance, the task of moving from paper-based to paperless administration of trade may seem relatively straightforward. However, because of the need to coordinate electronically across borders, the impetus for international cooperation rises once trade is rendered paperless. Moreover, the transition needs more than a mechanical switch to electronic exchange of information. Processes and procedures need to be analysed and reengineered, and there is a need to develop and implement a whole system of new standards for the digital exchange of information. Governments use a variety of arrangements involving United Nations agencies, standards-setting organizations, as well as trade agreements to establish the governance structures necessary for paperless trading.

1.6 Types of paperless trading

Moving from the fixed paper-based form to paperless trading can be done in several ways:

1. The first and most important action for trade facilitation is not to dematerialize or digitalize a document, but to remove from the process those documents and data which are not required.
2. One other way is simply to take a visual snapshot of a paper document, either a scanned or a PDF version.

⁹ Median of the rate of “implemented” status of the TFA articles is 67.25 per cent. See <https://tfadatabase.org/implementation/progress-by-measure>.

3. Information can also be exchanged in email systems, where the information has to be rekeyed or copied and pasted between different applications.
4. Another possibility is to use an internet web portal where individual data elements can be keyed in; this is known as a data trader interface (DTI).
5. Paperless transactions can finally be conducted seamlessly between computer systems using fully electronic messages known as electronic data interchange (EDI), with formats including UN/EDIFACT, XML, JSON and other web services.

1.7 Challenges

Paperless trading relies on domestic rules, the legal validity of electronic documents, electronic signatures (where these are applied) and other data-regulation requirements.

Disparate institutions at the multilateral and regional levels are involved in the creation of these international technical standards. Because of the division of responsibilities within government agencies, some trade policymakers will not necessarily be aware of the work of other officials within their own government when establishing these technical standards, even though the creation of such standards will inevitably impact traders.

Given the above challenges, it is hardly surprising that paperless trade is often seen as a tech-driven process; but this is only partially true. Implementation requires, first and foremost, a high-level political consensus, policy frameworks, supporting laws and legislation and an institutional setup. A policy framework may define targets, implementing strategies and detail the necessary allocation of resources, while enabling legal structures involves creating or revising laws and statutes, implementing decrees, regulations and contractual provisions such as for the terms of use or the provision of electronic Single Window systems or e-port community systems. A good analogy can be drawn here with autonomous vehicles. If the technology continues to evolve, it stands to reason that the leading obstacle to a switch to autonomous vehicles in the medium term will be the lack of common standards, incentives and governance, not the technology.

The electronic exchange of information cannot operate efficiently without common standards, and over the years progress has been made to establish different standards based on specific industries, regions or technologies.

In addition, there is a general lack of knowledge and awareness of existing standards and their use. One result of this is that large potential user groups sometimes start new standards initiatives which duplicate existing standards. As a result, raising awareness among potential users of the existence of standards and their benefits is a constant challenge.

Fixed-length EDI standards are supposed to be unambiguous, but there is a tendency among some users to make modifications to better fit their internal needs. Such modifications are understandable as business evolves; nevertheless, making small changes, without working collaboratively within the standards process to modify the existing standards, results in the development of isolated “standards” user communities who cannot easily exchange electronic messages between one another even though the “standards” they use are based on the same work. The negative effect of this approach can be traced beyond EDI messages. There is, therefore, a need to raise awareness about the importance of remaining aligned with existing standards and of updating those

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standards with increased information and semantic content that can be used by all stakeholders.

Regarding XML messages, the benefits obtained through the flexibility of this syntax (message structure) have created other challenges. Many companies and administrations have created their own XML messages and bridges to link with the solutions of other entities; this results in the never-ending updating of these links. Computer experts can testify that this is not a difficult task, but is it really the vocation of companies or administrations to dedicate resources to this non-substantial task? Many of these XML messages are based on a pure electronic equivalent of a paper document, without simplification and without including the semantic context (i.e. the context that gives the data a precise meaning). This lack of context can result in messages that function well in a narrow context between a small number of parties, but whose data may not be directly usable with other messages, even for the same “content”, and even within the same entity. For example, a “date/time of arrival” used in a contract may not be the same as a maritime shipping document (arrival in port), a customs document (arrival at border) or a commercial document (arrival at warehouse or destination).

Two ways have been identified to respond to this challenge:

1. Collaborative development of a common data “dictionary” avoids reinventing data definitions and matching/modifying definitions between entities every time a new connection is established.

This calls for a common, standardized library of semantics (definitions) that allow for the use of unambiguous, clear and defined standardized terms and codes. The largest and most complete library of this kind is the UN/CEFACT Core Components Library (CCL). At the same time, the development of such a library is a “never-ending task” because, as more and more users come on board, more data elements and codes need to be defined and/or updated.

2. In the future, machine learning and artificial intelligence may, at least in some cases, allow a receiving IT system to understand the exact semantic meaning of messages and their data based on the context. However, the technology still needs to be developed in order to do this cost effectively and the levels of accuracy required would be difficult to attain, at least with current technology.

QUIZ

- 1) WHICH ARE THE THREE TYPES OF STANDARDS THAT ARE USED IN INTERNATIONAL TRADE?
- 2) CAN YOU NAME TWO POLICIES THAT CAN BE USED TO INCLUDE STANDARDS WITHOUT MAKING THEM MANDATORY?
- 3) WHAT IS THE WTO TFA DEFINITION OF “INTERNATIONAL STANDARDS”?
- 4) IS ARTICLE 10.3 ON THE USE OF INTERNATIONAL STANDARDS BINDING? PLEASE EXPLAIN.
- 5) PLEASE LIST THE FIVE STEPS FOR PAPERLESS TRADING.
- 6) PLEASE IDENTIFY AT LEAST TWO CHALLENGES IN HAVING STANDARDS IN PAPERLESS TRADING.

Main sources for this session:

- ISO/IEC Guide 2:2004 Standardization and related activities — General vocabulary
- UNECE, *Nexus: Sustainable Mobility and Smart Connectivity* (forthcoming)
- UNECE, *Reference to Standards* (ECE/TRADE/418) (2014)
- UN/CEFACT, *Recommendation No. 18: Facilitation Measures Related to International Trade Procedures* (TRADE/CEFACT/2001/18)
- UN/CEFACT, *White Paper on Paperless Trade*, v. 1 (ECE/TRADE/C/CEFACT/2018/6)
- IEC, ISO and ITU, “World Standard Cooperation: International standards and trade agreements” (2018)

2. Brief history

International standards have emerged for different facets of paperless trade.

Efforts to improve cross-border exchange of trade information date back more than 50 years. The *United Nations Layout Key for Trade Documents* (UNLK) was developed in the 1960s to standardize and structure the representation of information on physical trade documents. The first version was developed by the Swedish private sector in the framework of the Nordic Council to facilitate the task of regulatory agents and business partners in quickly identifying where relevant information was situated in various trade and transport forms. The value of this approach for increasing the efficiency of official controls and the trade transaction in general was soon recognized by experts and policymakers in various countries, so the concept was developed into a United Nations recommendation for the facilitation of international trade procedures.

The standard provides for the following:

- Design: identifies paper size, margins, spacing and pitch of characters, data fields (depth of field, the number of lines and the number of characters in each line)
- Data: identifies 18 data fields and defines the nature of the individual data elements
- Location: identifies the specific locations of the data fields and coded information on the document
- Flexibility: allows for specific requirements within a “free disposal” area

These layout rules allow for the creation of Master Documents. Subsequently, all documents derived from these Masters are based on the principle of the same data appearing in the same place on all forms. Information in clear text or coded format can be entered (written, typed or generated from an electronic application) using the appropriate data fields and data elements.

The UNLK was quickly accompanied by a data dictionary so that all parties would consistently understand the meaning of the same elements. The birth of the United Nations Trade Data Element Directory (UNTDDED) was the first essential step towards electronic messages.

Each identified data element in the directory has been given the following:

- A data element name
- A description of the concept to explain the agreed meaning and to help determine the content of the information (data value) to be provided with the data elements
- A specification of the character representation of the data value, with indication of space available (in number of characters) and location in aligned forms, and of field lengths based on the original box sizes of the UNLK

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Table 1: UNTDED Examples

Tag UID	New Name	Description	Repr*
2001	Date.Date.Date Time	To specify a calendar day, expressed by the combination of year, month and day (YYMMDD or CCYYMMDD)	an..19**
3017	Document.Release Location.Identifier	To identify a location where a document e.g. Bill of Lading will be or has been released	an..35**

* character representation, space available and location of the data entry

** “an” stands for alphabetic and numeric characters; the number indicates the maximum number of available character positions

The availability of a data dictionary and the use of code lists combined with an exponential growth in the use of computers led to the creation of standardized messages for data exchange. The United Nations Electronic Data Interchange for Administration, Commerce and Transport (UN/EDIFACT) was a pioneering instrument in this area, effectively replacing key paper documents from the mid-1980s onwards. Similar initiatives took place regionally. UN/EDIFACT was the dominant messaging syntax throughout the 1990s and remains the most widely used single standard for data exchange—especially since it is freely available and is regularly updated. While official statistics are hard to come by, sectoral estimates, such as those by the maritime industry, indicate that about 100,000 UN/EDIFACT messages are exchanged per hour according to the Shipping Management Data Group (SMDG).

UN/EDIFACT messages cover all aspects of the international supply chain. For example, in the transport sector, UN/EDIFACT covers both contractual messages such as forwarding and consolidation (IFCSUM), booking (IFTMBF), consignment advice (IFTMCA), multimodal status report (IFTSTA), and operational messages such as bay plan/stowage plan (BAPLIE), vessel call (CALINF), and container gate-in/gate-out (CODECO). These messages allow traders to book transport, receive updates on the status of their delivery, declare where containers are on a ship, declare when a ship is to call at a port, communicate when a container arrives or leaves a customs-controlled area, just to give some examples.

Even so, over the past two decades an increasing number of exchanges use XML. This EDI syntax provides higher flexibility in the structure, length and format, often making it more attractive. However, there is no single, centrally maintained XML version. There could potentially be as many XML languages as business partners. Other technical disadvantages include larger data files. UN/CEFACT does offer a standardized XML, as do some ISO committees, the World Customs Organization (WCO), the International Air Transport Association (IATA) and others. Technology is evolving further, notably with the development of Java Script Object Notation (JSON) application programming interfaces (APIs) and blockchain technology. This only makes the use of underlying semantic standards, such as the UNTDED and the Core Components Library ever more important as a common denominator between sectors and technologies.

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The use of electronic invoices merits particular attention. The European Union has decided that all public institutions must accept and may require electronic invoices, as part of a wider drive to decrease the use of paper.¹⁰ Two standards should be used to ensure interoperability, one of which is the UN/CEFACT Cross Industry Invoice (CII). All public institutions—from elementary schools to garbage collection, from town halls to ministries—will be obliged to accept the CII as one of the official standards for the

submission of electronic invoices. Other countries are also seriously studying implementation of the CII.

The CII is accompanied by a series of messages, beginning with the term cross industry, which aim to cover all commercial procedures for a range of domain needs from agriculture to automotive and industrial services. The cross-industry family of messages cover invoice, ordering, catalogue, quotation, delivery, remittance and other documents and areas.

These have been consolidated into a UN/CEFACT Supply Chain Reference Data Model. This Reference Data Model provides a subset of the Core Component Library which includes all commercial procedures; this facilitates the use of this semantic library as it removes all elements which are not pertinent to commercial procedures and it also enables a process-driven approach instead of a document-driven approach to supply chain information exchanges. Such Reference Data Models also exist for transport and logistics and others are being developed.

More recently, companies are adopting Java Script Object Notation (JSON) which is typically shorter than its XML counterpart but equally flexible. JSON is often used for internet web development and is comprised of smaller sized messages which are used to exchange snippets of information. It is often an inquiry and response, such as “is there space on the ship – yes there is”; “how much will it cost – it will cost XXX”. These exchanges are usually not based on a traditional document, but when compiled together, the information can provide similar or the same information. UN/CEFACT is developing a standard methodology to express its e-business standards as a JSON syntax.

A third level of standardization is necessary for dematerialization: the technological infrastructure. Building upon the semantic base of data to clearly understand the information and on the syntax of message exchange to be able to read the information in a consistent way, it is also necessary to use technologies in a harmonized way in order to ensure the consistent quality of the exchanges. At the time of writing, the following technologies should be considered:

- **Telecommunication:** These networks allow the spread of high-speed broadband and enhanced mobile networks (4G and 5G).
- **Big data:** This approach to data allows for the real-time collection and processing of large quantities of data from disparate sources with the goal of reusing it to perform analysis or to process the information.

¹⁰ See European Union Directive 2014/55/EU on electronic invoicing in public procurement. This directive has been obligatory since mid-2019.

- **Cloud:** This technology allows for the remote storage of data and applications accessed via network connections, thus reducing the requirements for local ICT infrastructure investments. The cloud can optimize data storage when mutualized, providing extensible storage capacity, usually with a corresponding financial model.
- **Internet of things (IoT):** IoT is the interconnection, via the Internet, of computing devices embedded in everyday objects, enabling them to send and receive data. Innovation in the form of miniaturization—particularly of sensors and data communications (e.g. RFID chips) and in low-power consumption devices—has supported the rapid development of IoT. Increased use of IoT devices will come as 5G networks are rolled out, with the ability to handle more signals and do so at higher speeds. UN/CEFACT has developed guidance material on the use of IoT devices to create “smart containers” which can communicate with the rest of the supply chain. A further guidance document is being prepared on the subject for other uses of IoT in trade and transport.
- **Artificial intelligence (AI):** AI is a self-teaching system (often referred to as deep machine learning) that can learn from experience. AI systems require large volumes of data to “learn from”, data which IoT networks and other Internet sources can supply. Some AI applications that can be foreseen in trade are operating and regulatory risk analyses as well as the solving of complex routing and sequencing problems.
- **Decentralized ledgers (blockchain technology):** One of the main benefits of using blockchain technology for trade is the ability to have trustworthy copies of electronic documents, i.e. electronic information where one can be confident that it has not been modified since its creation. Blockchain technology implies that all the stakeholders will have access to the same chain; however, often in this type of exchange, each stakeholder may want to use a different chain, obliging their partners to either join that chain or convert it to another chain. This would, in turn, create complications for interoperability at both the semantic and syntax level, but also at the security level, as each blockchain may not have the same or equivalent level of trustworthiness. Some stakeholders may not be on any chain at all. Furthermore, the collaborative exchange of information that can be achieved using blockchains can be achieved through other methods that do not include the security level inherent in a blockchain. The roll-out of this technology therefore requires an economy of scale, and we are just starting to see the concrete use cases in trade and transport.
- **Data pipeline:** The concept of a data pipeline is an innovative method in which data is captured at its source where it is provided once and then reused multiple times throughout the supply chain. Normally, once the information has been communicated into the pipeline, it is not changed, and the expected outcome is improved data quality. The pipeline data exchange structure makes it possible for the data elements to accommodate any mode of transport and subsequently be used by multiple cross-border agencies, avoiding the need to resubmit data to each agency. UN/CEFACT has created the first international e-business standard on this principle.

QUIZ

- 1) WHAT WAS A KEY FACILITATION TOOL BASED ON STANDARDIZATION BEFORE DIGITALIZATION?
- 2) WHICH DOCUMENT IS REQUIRED BY ALL PUBLIC INSTITUTIONS IN THE EUROPEAN UNION IN ELECTRONIC FORMAT?
- 3) WHICH TECHNOLOGY DEVELOPMENT WILL HAVE THE MOST IMPACT FOR TRADE FACILITATION, THROUGH STANDARDIZATION?
- 4) WHAT ARE THE MAIN CHALLENGES FOR THE DEVELOPMENT OF BLOCKCHAIN TECHNOLOGY IN INTERNATIONAL TRADE?
- 5) WHAT IS THE TECHNOLOGY DEVELOPMENT WHICH TARGETS THE SINGLE SUBMISSION OF DATA ALONG THE ENTIRE TRADE PROCESS?

Main sources for this session:

- UNECE, *Recommendation No. 1: United Nations Layout Key for Trade Documents* (ECE/TRADE/432) (2017)
- UN/CEFACT, *Trade Data Elements Directory (TDED) UNTDED 2005 ISO 7372:2005*, vol. 1 (ECE/TRADE/363)
- UN/CEFACT, *White Paper on Data Pipeline Concept for Improving Data Quality in the Supply Chain* (ECE/TRADE/C/CEFACT/2018/8)
- UN/CEFACT, *White Paper on Smart Containers* (ECE/TRADE/446)
- UN/CEFACT, *White Paper Overview of Blockchain for Trade* (ECE/TRADE/C/CEFACT/2019/9/Rev.1)
- UNECE, *Nexus: Sustainable Mobility and Smart Connectivity* (forthcoming)
- UNECE, Advisory Group on Advanced Technologies *Artificial Intelligence Demystified* (forthcoming)

3. Main standards development organizations involved in international trade

International standards development organizations (SDOs) play a key role for international trade. The most important of them are listed in Table 2. Regional organizations and economic unions as well as sectorial organizations have also developed trade facilitation standards in their geographic or sectorial perimeters.

For example, at the regional level the following standards exist:

- In the Eurasian Economic Union (EAEU), a single data model has been developed to support diverse types of interstate information exchanges (S2S¹¹, G2G, B2G, B2B), with eighty common processes identified. In the future, the coverage of the this data model will be expanded in order to (a) extend the list of interstate (cross-border) e-services which have the highest priority for implementation, and (b) harmonize B2G interaction procedures and the documents used by these procedures.¹²
- In the European Union (EU), the issuance and validation of digital IDs for businesses and consumers is implemented in line with European Union eIDAS Regulation¹³. This provides access across the EU to online services and business transactions where the use of secure and legally recognized electronic identification is required. Another example is the directive on e-invoicing, which requires all purchases within the public sector (B2G) to be electronically invoiced (e-invoicing) in a standardized structured data format that provides for the automatic reading of the data by computer systems.

Sectorial SDOs also have a key role in trade facilitation standardization. These include the Food and Agriculture Organization (FAO) and its standards, which define, for example, the data elements in the sanitary and phytosanitary (SPS) certificates. Standardization work in this area includes key initiatives for the transition to electronic certificate formats, laboratory test results and certificates for the tracking and tracing of animal products. These are being transformed into standardized messages, based on the requirements of such instruments as the International Plant Protection Convention (IPPC)¹⁴, which is recognized by the WTO as the relevant standard-setting norm for plant health. The IPPC Secretariat, under FAO, encourages its members to harmonize their sanitary and phytosanitary measures based on the IPPC international standards; the electronic version of this is based on the UN/CEFACT eCert standard.

There are numerous other sectorial SDOs, especially those covering product standards—notably, the International Electrotechnical Commission (IEC) and the International Telecommunication Union (ITU).

¹¹ Server-to-server (S2S)

¹² Eurasian Economic Union, *Facts and Figures: Library of Eurasian Integration* (2018). Available at http://www.eurasiancommission.org/ru/Documents/2797_1_EEK_%D0%A6%D0%98%D0%A4%D0%A0_%D0%B0%D0%BD%D0%B3%D0%BB_sait_rasv.pdf.

¹³ Regulation established by the EU on 23 July 2014. See <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0910&from=EN>.

¹⁴ For more information, see <https://www.ippc.int/en/ephyto/>.

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The objective of Table 2 is to give an overview of the main international SDOs involved in trade by listing how they develop standards, who can become members, which entities can participate in the development of those standards, how those standards are being approved, and whether they are freely available or not.

Table 2: International trade facilitation standards development organizations

SDO	Type of organization	Scope of work (objective)	Membership framework	Standard development (which entity can participate in the development)	Standard approval (which entity approves the standard)	Standard availability (how to access the standard)
UN/CEFACT United Nations Centre for Trade Facilitation and Electronic Business www.unece.org/cefact.html	Inter-governmental body	Develop international standards as well as United Nations trade facilitation recommendations, technical specifications and guidance material.	Each United Nations Member State can participate.	Experts (from the public and private sectors) nominated by their governments or intergovernmental organizations. Participation is free of charge.	UN/CEFACT Plenary consisting of Heads of Delegations of United Nations Member States and accredited organizations.	Freely available
CIT International Rail Transport Committee www.cit-rail.org	Non-governmental organization	Help railway undertakings, implement international transport law, standardize contractual relationships and create legal certainty to save members money and support their business.	Any company or association of companies which operates international rail services or makes use of CIT products and services.	Expert working groups	CIT Committees	For members
FIATA International Federation of Freight Forwarders Associations www.fiata.com	Non-governmental organization	Represent service providers who operate in trade logistics and supply chain management.	1. Organizations representing the forwarding sector of a country and/or a region. 2. Forwarding and logistic companies	Members' working group	General Assembly	FIATA documents and forms are distributed by FIATA member associations to their member firms.

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SDO	Type of organization	Scope of work (objective)	Membership framework	Standard development (which entity can participate in the development)	Standard approval (which entity approves the standard)	Standard availability (how to access the standard)
FAO Food and Agriculture Organization www.fao.org	United Nations specialized agency	Achieve food security for all and make sure that people have regular access to enough high-quality food to lead active, healthy lives.	Any UN member State or regional economic integration organization	Independent experts and member State experts	All FAO members.	Freely available
GS1 Global Standards 1	Non-governmental organization	Develop and maintain global standards for businesses across different industries to uniquely identify, accurately capture and share information about products, locations, assets, etc., with the goal to streamline business processes	Paid tiered membership open to any company or organization – through a local GS1 member organization	Global Standards Management Process (GSMP) work groups consisting of voting members (end users & solution providers) and non-voting members (GS1 Global Office offering subject matter expertise and facilitation to the work groups; and non-voting GSMP members)	Voting members	For members
IATA International Air Transport Association www.iata.org	Non-governmental organization	Represent the airline industry, with members covering some 290 airlines and comprising 82% of total air traffic	Airlines operating scheduled and non-scheduled air services that maintain an IATA Operational Safety Audit (IOSA) registration	Through councils, committees and working groups with IATA members, and potential partners (depending on the topic)	Working groups	For sale
ICAO International Civil Aviation Organization https://www.icao.int	United Nations specialized agency	Safety; air navigation capacity and efficiency; security and facilitation; economic development of air transport; environmental protection	193 member States	Technical and non-technical review bodies, closely associated with ICAO (working groups, task forces, committees, panels, etc.), and State and industry subject matter experts.	Air Navigation Commission and ICAO Council (comprised of 36 member States elected by the Assembly)	Freely available

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SDO	Type of organization	Scope of work (objective)	Membership framework	Standard development (which entity can participate in the development)	Standard approval (which entity approves the standard)	Standard availability (how to access the standard)
ICC International Chamber of Commerce iccwbo.org/	Non-governmental organization	Promote international trade and investment as vehicles for inclusive growth and prosperity.	Membership directly to ICC for pay. Membership through a local national committee for pay.	Business experts	ICC internal commission	For sale
IMO International Maritime Organization www.imo.org	United Nations specialized agency	Responsible for safe, secure and efficient shipping and the prevention of pollution from ships	Each United Nations Member State can participate	Members States	Member States sign, ratify, accept, approve or access treaties and conventions.	Freely available
ISO International Organization for Standardization www.iso.org	Non-governmental organization	Develop international standards	National standards bodies (one member per country). Each committee of ISO is managed separately and a national standards body must pay a membership fee for each committee in which it participates.	Members from national standard bodies, based on their membership category within each committee. Some national standards bodies require experts to be paying members in order to participate.	National standards bodies that have become a member of the committee may vote on that committee's outputs.	For sale
OASIS Organization for the Advancement of Structured Information Standards https://www.oasis-open.org/	Non-governmental organization	The development, convergence, and adoption of open standards for cybersecurity, blockchain technology, the internet of things (IoT), emergency management, cloud computing, legal data exchange, energy, content technologies and other areas.	Tiered paid membership for large, multinational organizations or a single-person consultancy.	Technical committee, open project and technical advisory groups to the ISO	Technical committee (comprised of either (a) OASIS Individual Members, (b) employees or designees of OASIS Organizational Members, and (c) such other persons as may be designated by the OASIS Board of Directors)	Freely available

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SDO	Type of organization	Scope of work (objective)	Membership framework	Standard development (which entity can participate in the development)	Standard approval (which entity approves the standard)	Standard availability (how to access the standard)
OSJD Organisation for Co-Operation Between Railways www.osjd.org	Inter-governmental organization	Improve and develop the international railway transport of passengers and goods, increasing their competitiveness in the Eurasian region, strengthening the regulatory framework and achieving greater efficiency in the operation of the railway transport	29 member States	Working bodies, including members and other OSJD participants (observers, affiliated enterprises, international organizations)	Commission	Freely available
WCO World Custom Organization www.wcoomd.org	Inter-governmental organization	Develop international standards, foster cooperation and build capacity to facilitate legitimate trade, secure fair revenue collection and protect society, provide leadership, guidance and support to customs administrations.	Customs administrations	Each member administration may nominate delegates; others may join as observers only	WCO members (customs administrations only)	All standards available to members (customs administrations free of charge). The WCO data model is available to others for pay.

QUIZ

- 1) WHAT TYPE OF ORGANIZATION CAN AN SDO BE?
- 2) DO SDOs DEFINE WHETHER THEIR STANDARDS ARE MANDATORY OR NOT?
- 3) CAN ANYONE PARTICIPATE IN THE DEVELOPMENT OF ANY STANDARD?
- 4) WHY DO SOME STANDARDS NEED TO BE PURCHASED?
- 5) WHICH ADMINISTRATIONS ARE REPRESENTED INTERNATIONALLY BY THE WCO?

Main sources for this session:

- UNECE, *Nexus: Sustainable Mobility and Smart Connectivity* (forthcoming)
- tfig.unece.org, and the respective SDO websites

4. Establishing the governance and/or legal basis

As per its definition, a standard is **established by consensus and approved by a recognized body**. This chapter reviews the challenges to implementation. A standard is usually developed as non-binding; it is suggested as a best practice to be used. However, legislation may opt to specifically cite a standard, rendering it binding for the user community.

Standards are developed for long-term use. Likewise, legislation is created for long-term use, whereas technology advances at a faster rate. It is therefore a challenge to make technology standards that coincide with legislation. If a legislation chooses to promote a single technological standard, by the time it has finished its approval process, the technology may have already evolved and the legislation becomes outdated.

There are two ways to address this issue. The easiest way is for the legislation to outline the desired outcome without specifying the technology to be used. For example, when seeking to improve the trustworthiness of data exchange, the legislation could specify key attributes that require the technology to

- ensure that the information has not been tampered with (modified) after it is sent;
- identify without ambiguity the sender (person and or machine) of the information; and
- confirm the authority of the sender of the information to engage in the activity; etc.

Such a list could be established with a technology in mind, but only the general aspects of the desired outcome would be described. In this way, if and when the technology evolves, it will be possible to change the solution without having to necessarily change the legislation.

The second way to address this issue is to reference technology-neutral standards. As described earlier, there are standards for the processes, standards for the semantic data to be exchanged, standards for the syntax message exchange and standards for the technological solutions. Legislators may choose to promulgate standards for the processes and the semantics, leaving the implementor free to choose the syntax and technologies to be used. Of course, this depends on the type of legislation; this type of solution can work for something like an electronic invoice. The UN/CEFACT Cross Industry Invoice (CII) is a case in point; it is a standard for the process and semantics. UN/CEFACT does publish an XML example of this standard, but this is one possible representation of the standard process and data semantics which could eventually evolve over time.

That being said, there may be specific reasons for legislators to specifically reference technological standards. The main advantage is to save time and money both for government agencies and the general public. Using a freely available standard that has been established by a recognized standards body representing the general user community reduces the development needs and assists with the uptake of stakeholders. A further advantage is the clarity in data exchange that a binding standard can provide. The administrations and/or user community would not need to translate the data from one data exchange protocol to another – the base semantics and syntax would be standard and readable by anyone.

International trade takes place in a multilingual environment, touching legislation of different countries and economic regions and involving many different, independent parties. Trade documents, in both paper and electronic format, are frequently used to exchange and record information in trade transactions. Simplification and standardization of these documents is a key step in facilitating the smooth exchange of information and the cross-border exchange of goods. As presented in UN/CEFACT *Recommendation No. 34: Data Simplification and Standardization for International Trade*, there is an identified iterative process for capturing, defining, analysing, and reconciling government information requirements, and then mapping this simplified data to international standards. The objective is to eliminate redundancies and duplication by defining one standard set of data and messages so that traders and transport operators can meet all regulatory agencies' information requirements related to import, export, and transit.

4.1 Different types of standard references used by legislators

4.1.1 Direct references to standards

A specific standard is directly quoted within a legal text. There are two types of direct references: the dated direct reference and the undated direct reference. By way of a direct reference, in many cases, a standard is made mandatory (binding). Thus, depending on the level of the referenced standard (national, regional, international), barriers to trade may potentially be created from a trade facilitation perspective. Moreover, direct references may require regular adaptations of the legislative act in order to remain in line with technical development depending on the type of standard that was cited (process, semantic, syntax or technological).

The dated reference

A standard may be updated over time and may evolve, and that can result in the standard having a version number and/or a date of publication. When the legislation references both the standard and its version number/date, it is a dated reference (e.g. the UN/CEFACT eCERT standard, version 5.1 of 2010).

The major advantage of a direct, dated reference is its legal certainty. The legislator is the 'master of the procedure' in autonomously choosing exactly the technical solution to be applied, and the addressee of the legal act knows exactly which technical solution to apply in order to comply with the legislation. In addition, the imposed technical solution is clearly referenced in the legal act itself. Nevertheless, there are disadvantages to such a method. As mentioned above, every time a standard is updated, either for technical or procedural reasons, the legislation using that standard will also have to follow if it is to remain aligned. This requires complicated and time-consuming legislative procedures, especially if the right to adapt the legal act is not delegated by the primary legislator to the administrative authority (e.g. commission).

Undated reference

In the case of an undated reference, the legislator only quotes the name of the standard without referring to the exact version or date. Compared to the dated reference, this method is certainly more flexible. In the case of a revision of a referenced standard, the legal act itself does not need to be adapted. The reference still corresponds to the standard.

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The undated reference also has its disadvantages. The legislator is no longer the direct master of the standard to be used; this role is played by the standards development organization (SDO) which means that the standard can evolve, perhaps in ways that the legislator did not anticipate. This can only be viable if there is an obligation within the SDO to ensure full backwards compatibility. For example, if at the time of making an undated binding reference, the eCert standard is at version 5.0, and a few years later a version 6.0 is released, at that point any organism using version 5.0 must be able to communicate and understand the version 6.0 standard.

4.1.2 Indirect references to standards

Unlike direct references, indirect references to standards are generally made when the legislator intends to allow or promote their voluntary use (non-binding) and barriers to trade are avoided. Moreover, indirect references may allow the technical development to be followed more easily. In this case, a revision of the relevant standard does not require a corresponding adaptation of the basic legal act.

In this case, the legislator clearly defines the political objectives by defining in detail which essential requirements need to be met to comply with the legislation. No references to specific standards are made in the legislation. The stakeholders creating solutions must then comply with the legislation by fulfilling the list of requirements/attributes. The main advantage here is that the legislation itself can be timeless and does not need to be updated if technologies evolve.

There are drawbacks to indirect references. Stakeholders may create solutions that are not directly compatible with the solutions of the government or other stakeholders; this would mean that conversion bridges would need to be established between solutions—and the more solutions are involved, the more technical expertise will be necessary to correctly understand the data. For this reason, an organism may need to invest more in such conversions than on its core activities. Legislators may have less influence over the final outcome, and the resulting solutions may not correspond with the original expectations.

4.2 *Implementation of international standards in paperless trading*

The implementation of international standards in paperless trading is less straightforward than for product-standards compliance where a regulator can define the product's technical specifications based on its local jurisdiction geography and identify the best standard(s) for its compliance.

The main challenge for paperless trading is that the data exchange is usually commercial in nature between two private-sector stakeholders. There are of course regulatory declarations which must be performed with government agencies, but most data will originate in these B2B transactions, whereas product compliance is a business-to-government (B2G) process. Collaboration with different stakeholders, including with those in the private sector, is mandatory to optimize the standardization of paperless trading.

One barrier in using standards for the electronic exchange of information is the cost in time and money required for the initial setup, including the need to modify existing legacy

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systems. This is heightened by the need for all parties participating in the exchange to align to the same standard and make similar investments. As a result, the principle drivers for the use of standards are very large users (like an automotive company or a retail chain) or groups of users (such as an industry association) or governments who dictate the use of one or more selected standards across their supply chains and in other activities. Examples include the European Union directive on electronic invoicing¹⁵, the use of GS1 EANCOM in the retail sector, or the use of the WCO data model by customs administrations. These actions then create “communities” of users with a volume of data exchange that is large enough to create significant benefits, albeit restricted by their corresponding scope.

In an increasingly economically interdependent world, the importance of an improved legal framework for the facilitation of international trade and investment is widely acknowledged.

The electronic verification of the identity or credentials of any entity is a challenge from a legal standpoint, especially when that verification crosses borders. Model legislation, guidance documents and recommendations exist on this topic, including the Organisation for Economic Co-operation and Development (OECD) Recommendation and Guidance on Electronic Authentication¹⁶ as well as the United Nations Commission on International Trade Law (UNCITRAL) Model law on Electronic Signatures¹⁷, its Model law on Electronic Transferable Records¹⁸ and the United Nations Convention on the Use of Electronic Communications in International Contracts (which has only 12 signatories).¹⁹ In addition, the UNECE has developed Recommendation No. 14 on Authentication of Trade Documents²⁰. At the same time, there has been limited implementation and acceptance of the legal validity of electronic information of extra-territorial origin (i.e. from outside the jurisdiction of the entity which needs to recognize the information). Existing agreements have been primarily negotiated on a bilateral level, but some are multilateral with a limited geographic scope.

One example of a multilateral initiative in the European Union (EU) is the issuance and validation of digital IDs for businesses and consumers, which has been implemented in line with Regulation N°910/2014 on “electronic identification and trust services for electronic transactions in the internal market” (eIDAS Regulation)²¹. This provides access across the EU to online services and business transactions where the use of secure and legally recognized electronic identification is required.

¹⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0055&locale=en>

¹⁶ <http://www.oecd.org/internet/ieconomy/38921342.pdf>

¹⁷ <https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/ml-elecsig-e.pdf>

¹⁸ https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/mletr_ebook_e.pdf

¹⁹ https://uncitral.un.org/en/texts/ecommerce/conventions/electronic_communications

²⁰ http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec14/ECE_TRADE_C_CEFAC_T_2014_6E_Rec_14.pdf

²¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014R0910&from=EN>

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Another sectorial multilateral initiative is the IATA e-AWB: the electronic Air Waybill (e-AWB).²² This became the default contract of carriage for all air cargo shipments on enabled trade lanes on 1 January 2019. IATA introduced e-AWB in 2010 with the objective to enhance the digitalization of the air cargo supply chain.

These are the six steps to ensure the success of an e-AWB implementation:

1. Join the Multilateral e-AWB Agreement
2. Ensure your technology supports e-AWB
3. Ensure high-quality electronic messages
4. Ensure business processes are set up
5. Roll out e-AWB
6. Report e-AWB shipments

The e-AWB adoption challenges were as follows:

- **Regulatory constraints:** e-AWB is not possible in all airports and all trade lanes due to regulatory limitations.
- **Lack of harmonization:** e-AWB procedures are not harmonized between freight forwarders, airlines and ground handling agents in key airports where e-AWB is live. Moreover, there is no evidence that steps are taken to harmonize the e-AWB to other standards.
- **Technology limitation:**
 - Many of the MSME forwarders do not have the technical capability/EDI-enabled systems to enable them to transmit shipment data to airlines.
 - Some large forwarders face the same issue; their local branches are the result of MSME forwarder acquisition and their IT systems have not been aligned with the rest of the company.
- **Complex process:** There is a perceived complexity to implement e-AWB for forwarders dealing with multiple airlines.
- **Maturity threshold:** Some markets have reached a certain level of maturity where major actors (airlines/freight forwarders) have already achieved their biggest potential.

The **IATA Multilateral e-AWB Agreement** (IATA Resolution 672) provides a single standard e-AWB agreement that airlines and freight forwarders can sign once with IATA and start doing e-AWB with all other parties to the Agreement. By signing the Agreement with IATA, freight forwarders and airlines effectively enter into e-AWB agreements with each other (i.e. enabling them to execute contracts for the carriage of air cargo shipments by electronic means, in lieu of paper AWBs). The agreement does not amend the Air Waybill conditions of contract.

To overcome these challenges, IATA performed supporting activities:

- Expanded the number of trade lanes where e-freight and e-AWB was possible and continued the government-supported air e-freight initiatives in key locations
- Harmonized e-AWB procedures in key airports across forwarders airlines/GHA by developing an e-AWB Global Standard Operating Procedure (SOP)
- Provided implementation guidance and materials by developing an implementation playbook to support the adoption of e-AWB
- Coordinated efforts of industry in key e-airports
 - Strengthened the e-AWB penetration rate in the existing eAWB360 airports
 - Deployed eAWB360 initiatives at additional airports (in particular in Europe)

²² This is governed by IATA Resolution 600a "The Air Waybill" and 600b "Air Waybill Conditions of Contract". The Electronic Air Waybill Resolution 672 (MeA) removes the requirement for a paper Air Waybill.

QUIZ

- 1) WHAT REFERENCE IS USED WHEN THE LEGISLATOR INTENDS TO ALLOW OR PROMOTE THE VOLUNTARY USE OF STANDARDS?
- 2) WHAT IS THE KEY REQUIREMENT TO ALIGN STAKEHOLDERS ON A PAPERLESS TRADING STANDARD?
- 3) WHAT IS THE COMMON PROCESS TO STANDARDIZE PAPERLESS TRADING?
- 4) WHAT IS THE KEY BARRIER FOR THE ELECTRONIC EXCHANGE OF INFORMATION (PAPERLESS TRADING)?
- 5) PLEASE NAME ONE EXAMPLE OF A MULTILATERAL STANDARD THAT IS CURRENTLY USED FOR PAPERLESS TRADING.

Main sources for this session:

- UNECE, *Nexus: Sustainable Mobility and Smart Connectivity* (forthcoming)
- UNECE, *Reference to Standards* (ECE/TRADE/418) (2014)
- UN/CEFACT, *Recommendation No. 34: Data simplification and standardization for international trade* (ECE/TRADE/400)
- UN/CEFACT, *Recommendation No.35: Establishing a Legal Framework for an International Trade Single Window* (ECE/TRADE/401)
- European Commission, *Methods of referencing standards in legislation with an emphasis on European legislation* (Brussels, 2002)
- UN/CEFACT, *Recommendation No.19: Code for Modes of Transport* (2001)
- Sauv, David, *e-AWB Implementation Playbook*, (IATA, October 2019)
- tfig.unece.org

5. Implementing paperless standards – collaboration and data harmonization

5.1 Starting from documents

The implementation of international trade facilitation standards started with the harmonization of traditional information and document exchange before moving to paperless trading. It all started in 1963, when member States of the United Nations Economic Commission for Europe (UNECE) reached an international agreement on the layout of documents used in international trade with the adoption of the UNECE Layout Key, which became the basis for UNECE Recommendation No.1: United Nations Layout Key (UNLK).

The UNLK has since provided governments, organizations and the business community with a basic standard with which to align the design of documents for use in international trade and transport. This has led to a major improvement in the standardization of trade documents in many countries throughout the world. Most international organizations have redesigned their relevant documents based on the UNLK. Private companies have also historically opted for the UNLK design for “one run” reproduction techniques, but also to ensure the information in the documents is easy to understand. This has significantly reduced time and cost of managing paperwork related to moving goods in trade.

5.2 Moving to digital documents

5.2.1 An example of widely used certificates—Agri-food certificates

Trade in agricultural products is highly regulated by governments to protect human, animal and plant health. The importing authority sets standards for products crossing their borders and requires certificates subject to international trade principles. These principles are set by authorities such as the WTO and FAO and are also dictated by specific border-protection issues and bilateral arrangements. Certification requirements depend on agreed market access conditions and may change in response to disease outbreaks, environmental issues and consumer-driven concerns.

Several countries are transitioning to electronic certificate formats for sanitary and phytosanitary (SPS) certificates, laboratory test results and certificates for the tracking and tracing of animal products. These are being transformed into standardized messages, as is the case with the IPPC²³, which is recognized by the WTO as the relevant standard-setting body for plant health and encourages its members to harmonize their sanitary and phytosanitary measures based on the IPPC international standards²⁴. The IPPC launched an important initiative in 2017 to develop a “trusted third party” system to support the government to government (G2G) exchange of sanitary (human and animal health) and phytosanitary (plant health) electronic certificates (which implement the UN/CEFACT eCert standard). The objective of this initiative is to reduce the resources required by countries to develop the electronic tools necessary to produce and receive electronic certificates and to negotiate agreements with trading partners. This system allows SPS certificates to be exchanged, downloaded, or viewed directly on the web. Ten countries

²³ The FAO International Plant Protection Convention (IPPC). See <https://www.ippc.int/en/ephyto/>.

²⁴ UNECE contributes to this by developing standard messages for the simplification and automation of trade in agriculture and fishery products such as the standard for the electronic sanitary and phytosanitary certificate (eCERT), electronic management and exchange of laboratory messages (eLAB), and tracking and tracing animal and products (TT). The eCERT standard is recommended by IPPC for electronic certificates.

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have participated in a successful pilot to exchange electronic certificates using this system²⁵ and the “Global ePhyto Hub” system is now operational.²⁶

In parallel, in the Eurasian Economic Union, the electronic veterinary certification systems of Russia and Belarus were harmonized in 2018 as a first step in tracking the movement of livestock products “from field to counter” in the Union in an effort to reduce the amount of illegal food on the market.

5.3 Data elements

The United Nations Trade Data Element Directory (UNTDDED) is a directory comprising a set of data elements intended to facilitate an open interchange of data in international trade. These data elements were originally developed based on aligned UNLK documents and provide not only data element names but their definition and proposed format (format is based on the size of the box which was on the original UNLK document).

5.4 Data models

5.4.1 The UN/CEFACT Core Component Library (UN/CCL)

The UN/CEFACT Core Component Library (UN/CCL) is a library of business semantics in a data model which is harmonized, audited and published twice annually by UN/CEFACT. The library is essentially a collection of data elements (core components) both generally and within their business context. These are the basis of both data exchange and constructed documents. Each core component provides the data element name, semantic definition and proposed format (often based on the UNTDED); they also provide the relationship to other elements in the library, notably in which business context it is reused. Each element is harmonized with all existing elements within the UN/CEFACT International Supply Chain Reference Model, which outlines all activities in the international supply chain on a Buy-Ship-Pay model.

5.4.2 The Core Components Technical Specification (CCTS)

The Core Components Technical Specification (CCTS) is an object-oriented data modelling methodology that is uniquely suited to modelling semantics for use as the basis of data exchanges between external trading partners. It is the basis for the development and maintenance of the UN/CEFACT Core Component Library and can be used to develop similar data sets of standardized information. The CCTS has two key aspects:

- It establishes the underlying foundation set of cross-domain classes (in other words, it foresees the reuse of data between business processes).
- It establishes the naming convention (which is used to create the unambiguous core component names and the underlying hierarchy of data necessary to ensure uniqueness in the overarching international supply chain exchange of data).

²⁵ Report of the IPPC ePhyto hub pilot (16 April 2018), available at https://www.ippc.int/static/media/files/publication/en/2018/05/IPPC_ePhyto_hub_pilot_report_FINAL.pdf.

²⁶ For more information, see <http://www.fao.org/3/ca2696en/CA2696EN.pdf>.

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The Core Components user community consists of businesspeople, business document modellers and business data modellers from different organizations that require interoperability of business information. This interoperability covers both interactive and batch exchanges of business data between applications using Internet and web-based information exchanges, as well as traditional Electronic Data Interchange (EDI) systems.

5.4.3 The WCO Data Model

The WCO Data Model is an initiative of the World Customs Organization to simplify and standardize data requirements for customs and other cross-border regulatory agencies. This model is designed to provide a complete set of data and data structures for customs and related agencies. The model can be used to develop messages incorporating export, import and transit operations, particularly relating to customs procedures and eventually a Single Window project.

5.4.4 Data pipelines

The Casandra project and other projects supported by the European Union, have been working on the concept of “data pipelines”, led by United Kingdom and Dutch customs agencies and experts. The concept of a data pipeline is an innovative method in which data is captured at its source where it is provided only once and then reused multiple times throughout the supply chain. Normally, once the information has been communicated into the pipeline, it is not changed; therefore, the expected outcome is improved data quality. The pipeline data exchange structure makes it possible for the data elements to accommodate information exchange any mode of transport and subsequently be used by multiple cross-border agencies, avoiding the need to resubmit data for each agency. UN/CEFACT has created the first international e-business standard on this principle.

Several United Kingdom IT software providers have adopted this approach to offer value added services to their clients. The pipeline, which was originally meant to provide more accuracy of data sent to government authorities, is also being used to improve supply chain transparency. Large retail companies execute hundreds of orders and receive many containers of goods daily. Until now, opening a container was much like opening a present—not certain of what was inside. The pipeline approach allows several larger retailers to directly link the goods ordered to the container and have better visibility of when it will arrive. The data captured at the source also allows importers to verify shipments before they actually leave the supplier, helping to avoid errors in supply and packing.

Shipping lines also benefit from the data pipeline approach. Information can be lost between the steps of traditional paper-driven processes. This may affect the bay plan in such areas as temperature requirements or actual weight. Putting a heavy container on the upper decks of a ship may cause it to capsize, while putting goods that require special attention because of temperature on lower decks may cause accidents like shipments catching fire. The pipeline approach has already enabled several such cases to be identified and avoided.

5.5 Syntax

Information exchange in business-to-business transactions has been facilitated through electronic data interchange (EDI) since the 1980s. The only global EDI standard, UN/EDIFACT, has helped translate the paper document environment into electronic messages having a defined and limited number of characters. This has allowed for the direct transfer of structured business data between computers by electronic means (i.e. the paperless transfer of business "documentation").

UN/EDIFACT remains advantageous for large, highly standardized data transmissions because the formatting syntax creates smaller files with less overhead than newer technologies, so it places less stress on storage and transmission resources. The most common documents exchanged via UN/EDIFACT comprise data exchanges within the transport and logistics environment (bills of lading, inventory, shipping, bay plans, status requests), the retail environment (purchase orders, invoices, payments) and the regulatory environment (customs, port authorities).

From the late 1990s, another EDI syntax, the extensible markup language (XML), became increasingly implemented. XML opened new possibilities because of its flexible message structure, the definition of which is carried within the message itself. These message structures can also be used to generate human readable (paper or on-screen) information. The use of this "heavier" data structure was made possible by new technology for increased data storage and faster transmission.

5.6 Code lists

5.6.1 UN/CEFACT code list recommendations

Codified information is an integral part of data exchange in international business, whether in paper documents or through electronic data exchange. The UNECE, through UN/CEFACT, develops, maintains and publishes free of charge a number of code lists used extensively in business transactions. The following is the list of code list recommendations.

- Rec. 3 – Code for the Representation of Names of Countries
- Rec. 5 – Abbreviations of INCOTERMS
- Rec. 7 – Numerical Representation of Dates, Time and Periods of Time
- Rec. 9 – Alphabetic Code for the Representation of Currencies
- Rec. 10 – Codes for the Identification of Ships
- Rec. 16 – LOCODE Code for Trade and Transport Locations
- Rec. 17 – Payment Abbreviations for Terms of Payment
- Rec. 19 – Code for Modes of Transport
- Rec. 20 – Codes for Units of Measure Used in International Trade
- Rec. 21 – Codes for Passengers, Types of Cargo, Packages and Packaging Materials (with Complementary Codes for Package Names)
- Rec. 23 – Freight Cost Code (FCC)
- Rec. 24 – Trade and Transport Status Codes
- Rec. 28 – Codes for Types of Means of Transport

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UN/CEFACT also develops and maintains multiple code lists, integrated within the UN/EDIFACT standard. These include codes for things like types of documents, types of actions, message function, party function, price type, etc.). Like their recommendation counterparts, these are available free of charge on the UN/CEFACT website.

It is also possible to request additions or backwards-compatible modifications to these code lists.

UN/LOCODE is specified in UNECE Recommendation No. 16 as a five-character code to identify locations in a unique and unambiguous way. It provides a coded representation for the names of ports, airports, inland clearance depots, inland freight terminals, and other transport-related locations and trade-related locations that are used for the movement of goods.

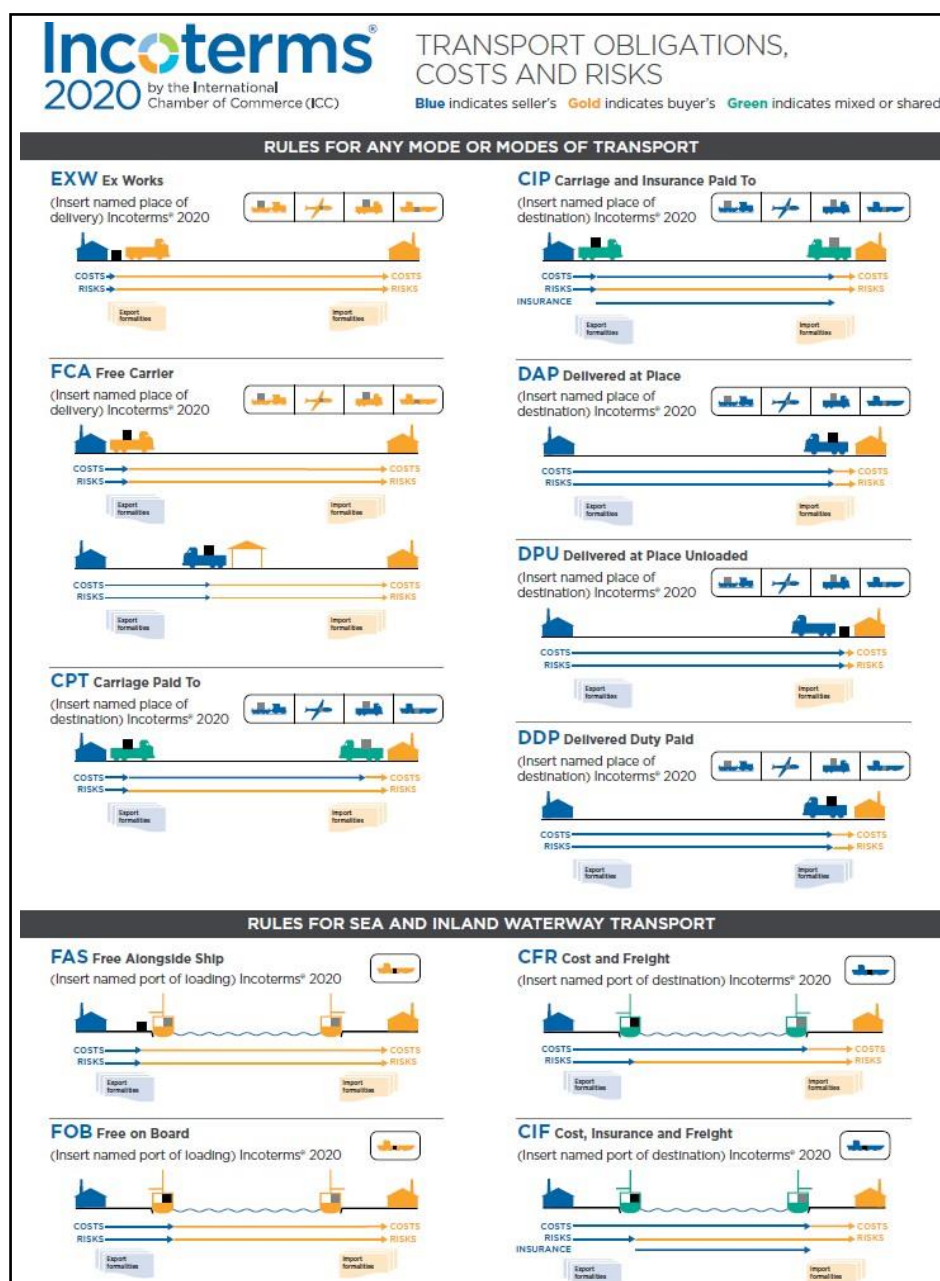
UN/LOCODE is used extensively throughout the world by the international trade community. Since its first release in 1981, entries have increased from 8,000 to over 100,000 today, including locations in 249 countries, territories and special areas. It is mandatory to use UN/LOCODE for customs declarations and clearance in many countries. Some examples of standards and organizations that have adopted the use of UN/LOCODE are UN/EDIFACT, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the International Maritime Organization (IMO), and the WCO.

5.6.2 International Chamber of Commerce (ICC) Incoterms

The Incoterms rules establish eleven three-letter trade terms used in nearly every international transaction worldwide.

The Incoterms rules describe the following:

- *Obligations*: Who does what between seller and buyer (e.g. who organizes carriage or insurance of the goods or who obtains shipping documents and export or import licences)
- *Risk*: Where and when the seller “delivers” the goods (where risk transfers from seller to buyer)
- *Costs*: Which party is responsible for which costs (for example transport, packaging, loading or unloading costs, and checking or security-related costs)



Incoterms 2020 (CII)

5.6.3 World Customs Organization Harmonized Systems (HS)

The Harmonized Commodity Description and Coding System, generally referred to as the Harmonized System or simply the "HS", is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). The HS is governed by "The International Convention on the Harmonized Commodity Description and Coding System", which was adopted in June 1983 and entered into force January 1988.

The objective of the HS Convention is to facilitate trade and information exchange by harmonizing the description, classification and coding of goods in international trade. The HS is used for customs tariffs and the collection of external trade statistics. It is also extensively used by governments, international organizations and the private sector for many other purposes, such as internal taxes, trade policies, monitoring of controlled goods, rules of origin, freight tariffs, transport statistics, price monitoring, quota controls, compilation of national accounts, and economic research and analysis.

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The HS is a nomenclature for the coding, description and classification of goods/products in international trade. It consists of over 5,000 commodity groups which are structured into 21 Sections (Sections I to XXI), 97 Chapters (1 to 97), four-digit headings and six-digit subheadings. Chapters 98 and 99 are for national use only. The HS harmonizes the codification of commodities within this six-digit scheme. Most customs administrations extend this code to ten or more-digit commodity coding system, with the first six digits being the HS code. These extensions usually define applicable regulations and duties/taxes. To achieve uniform classification of goods in the HS, it also contains section, chapter and subheading notes and general interpretative rules. The official interpretation of the HS is given in the explanatory notes (5 volumes in English and French) published by the WCO.

The HS is binding to WCO contracting parties. The HS Convention and any disputes are administered by the WCO HS Committee. The HS Committee also prepares amendments, updating the HS every 5 to 6 years. The latest HS edition now in force is the 2017 edition.

5.7 Legal agreement

5.7.1 International Maritime Organization FAL

For international shipping to thrive, a unified, global approach to facilitation is vital. This is the purpose of the international treaty called the FAL Convention.

Members of the International Maritime Organization (IMO) adopted in 1965 the Convention of Facilitation of International Maritime Traffic, the so-called FAL Convention. As of 31 October 2015, 115 of the currently 171 members of the IMO have acceded to the FAL Convention. With this convention, members aimed to facilitate maritime transport by simplifying and minimizing the formalities, data requirements and procedures associated with arrival, stay and departure of ships engaged in international voyage.

To this end the annex to the FAL Convention contains standards and recommended practices on formalities, documentary requirements and procedures to be applied on arrival, during the stay, and on departure, for the ships, their crews, passengers, baggage, and cargo. It restricts the number of declarations that public authorities can require to nine. These standardized forms include, inter alia, the IMO General Declaration, the Cargo Declaration, the Crew and Passenger Lists, and the Dangerous Goods Declaration.

5.7.2 Single Window

The Single Window principle is developed in a separate training material. One of the key aspects, as outlined in its definition, is the use of standardized information and documents. The use of international standards is therefore key to optimizing processes nationally and promoting interoperability beyond national borders.

An example of a successful Single Window deployment, based on harmonization and standardization of data to be exchanged, is Canada. As the face of the Canadian government at the border, the Canada Border Services Agency (CBSA) administers more than 90 acts, regulations and international agreements on behalf of other government department partners. Its activities are carried out at approximately 1,200 service points across Canada and in several international locations. These border services include the

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verification and collection of forms, permits and licences related to regulated commercial goods, the inspection and detention of goods, and the collection of commercial import statistics.

Canada – U.S. trade rules require the trade community to spend a significant amount of time completing paperwork. For example, when bringing a refrigerator into Canada from the U.S., nine separate government departments are involved, of which three require submission of paper forms prior to the entry of the goods. The Canadian Single Window Initiative has significantly reduced this paperwork burden by developing a Single Window programme and an associated electronic system that enables importers to electronically submit to CBSA all information and documents (licences, permits and other documents) required to comply with government regulations (customs and other departments). The CBSA then transmits this pre-arrival information internally to those departments that regulate the goods. The various government departments then review and make decisions based on this information and traders receive border-related decisions electronically prior to the arrival of the goods at the border. This makes the import process easier for businesses and enables government agencies to effectively administer regulations.

The Canadian Single Window Initiative has delivered three high-level business outcomes for the CBSA:

- (A) **Improved electronic data** submissions that
 - a. allow for the electronic assessment of regulatory compliance;
 - b. are aligned with international data standards; and
 - c. enable timely border-related decisions.
- (B) **Improved information requirements** for imports that
 - a. are aligned with the U.S.;
 - b. have redundant information requests eliminated;
 - c. are based upon consultations with the importing community; and
 - d. are limited to what is essential for regulatory compliance and transactional border-related decisions.
- (C) **Improved business processes** that
 - a. eliminate redundant processes between government departments;
 - b. enable future risk assessment and inspections; and
 - c. eliminate paper-based processes.

It took four years (from 2013 to 2017) to connect the Single Window to ten government agencies in addition to the CBSA. In May 2019, the volume of transactions in the Canadian Single Window system reached 1,146,382 monthly declarations.

QUIZ

- 1) WHAT IS UNECE RECOMMENDATION NO. 1?
- 2) WHAT IS THE ACRONYM FOR DIRECT EXCHANGE OF INFORMATION BETWEEN DIFFERENT COUNTRIES ADMINISTRATION?
- 3) PLEASE LIST AT LEAST THREE CODE LISTS MAINTAINED BY UN/CEFACT.
- 4) FOR WHICH INCOTERMS DOES THE SELLER TRANSFER RISK BEFORE THE TRANSPORT CYCLE EVEN STARTS?
- 5) UP TO HOW MANY DIGITS DOES THE HS USE TO HARMONIZE THE CODIFICATION OF COMMODITIES INTERNATIONALLY?

Main sources for this session:

- UNECE, *Nexus: Sustainable Mobility and Smart Connectivity* (forthcoming)
- UN/CEFACT, *Recommendation No. 1: United Nations Layout Key for Trade Documents Recommended Practice & Guidelines* (ECE/TRADE/432) (also published as ISO 6422-1:2010)
- UN/CEFACT, *Trade Data Elements Directory (TDED) UNTDED 2005 ISO 7372:2005*, vol. 1 (ECE/TRADE/363)
- ICC, *Introduction to Incoterms® 2020*
- UN/CEFACT, *White Paper: Paperless Trade v.1*, (ECE/TRADE/C/CEFACT/2018/6)
- fig.unece.org