Implementing UN/CEFACT e-Business Standards

in Agricultural Trade

A handbook for policymakers and project managers

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Implementing UN/CEFACT e-Business standards in Agricultural Trade

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This handbook has been designed as guidance for the implementation of electronic business standards. The information contained within the handbook is meant to provide an introduction and an overview, rather than putting its focus on being precise to the detail. This handbook is provided as is and readers are solely responsible for any proposals, briefing or other documents based on this handbook.

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Acknowledgements

1   Glossary

APEC	Asia-Pacific Economic Cooperation
ASW	ASEAN Single Window
BPA	Business Process Analysis
CCFICS	Codex Committee on Food Import and Export Inspection and Certification Systems
CCL	Core Component Library
CLAP	Central Licence & Authorization Provider
CODEX	A collection of international food safety standards
CSV format	Comma Separated Values format
EDIFACT	United nations/Electronic Data Interchange for Administration, Commerce and Transport
EPIX	Electronic Permit Information eXchange
ERS	Electronic Reporting System
FADA	Fishing Authorization Delivering Authority
FAO	The Food and Agriculture Organization of the United Nations
FLAP	Fishing License Authorization & Permit
FMCs	Fisheries Monitoring Centre (flag state)
G2B2B2G	Government to business to business to government
G2G	Government to government
GS1	Global Standard One, a standardization body
ICT	Information and Communication Technology
IPPC	International Plan Protection Convention
MSC	Marine Stewardship Council
NAFO	North Atlantic Fishery Organization
NPPO	National Plant Protection Organisation
NSW	National Single Window
PKI	Public key infrastructure
RASFF	Rapid Alert System for Food and Feed
SA	Scientific Authority
SAD	Single Administrative Document
SDG	Sustainable Development Goals
SMTP	Simple Mail Transfer Protocol
SOAP	Simple Object Access Protocol
SPS	Sanitary and Phytosanitary
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
UNEP	United Nations Environment Programme
UNNExT	United Nations Network of Experts for Paperless Trade and Transport in Asia and the Pacific
URL	Unified Resource Locator
VMS	Vessel Monitoring System
WCMC	World Conversation Monitoring Centre
WCO	World Customs Organization
WHO	World Health Organization
WSDL	Web Service Definition Language
WTO	World Trade Organization
XML	Extensible Markup Language

2   Foreword

In a survey among small and medium enterprises in Germany, it was found that after adoption of electronic business (e-Business) standards 43% of the enterprises experienced a decrease their total costs and 63% of the entreprises were able to decrease their process costs (Institut der deutschen Wirtschaft Köln, 2012). Most of the small and medium enterprises involved in the survey concluded that the adoption of e-Business standards:

- Expedited business processes;
- Enhanced data quality;
- Increased employee satisfaction;
- Saved time and reduced costs.

Furthermore, companies concluded that the adoption of e-Business standards contributed positively to their data, quality and process management and had a positive impact on their market position.

On the public side, the United Nations e-Government Survey 2014 concluded that the implementation of electronic standards in the communication between private sector, public administration and trade partners "can provide significant opportunities to transform public administration into an instrument of sustainable development. Effective collaboration among agencies across all levels of government is essential, as it is with non-governmental actors, to ensure good governance and good development outcomes. Information and Communication Technology (ICT) has also proven to be an effective platform for facilitating knowledge sharing, skills development, transfer of innovative e-government solutions and capacity-building for sustainable development among countries. E-government can generate important benefits in the form of new employment, better health and education" (UN/DESA, 2014).

This handbook presents a general framework for the implementation of e-Business standards in the agrifood sector. It specifically looks at four e-Business standards developed by UN/CEFACT in the areas of:

- Electronic phytosanitary certificates;
- Electronic reporting of sustainable fishery management;
- Electronic exchange of laboratory analysis results;
- Management and exchange for certificates for trade in CITES controlled species.

The handbook also briefly highlights two emerging and important e-Business areas:

- Electronic notification of food and feed safety issues;
- Traceability in agriculture supply chains.

The electronic business solutions in each of these areas have their own set of benefits. In general, however, electronic standards contribute to a sustainable agrifood sector and therefore to the national economy as they help to:

- Share information and knowledge;
- Ensure public health;
- Ensure sustainability of resource exploitation and production;
- Ensure legality of production;
- Limit fraud and illegal activities;

- Reduce cost and waste;
- Facilitate trade.

By providing this handbook, the authors hope to facilitate the process of adoption of the outlined e-Business standards by providing easily adaptable material for the formulation of implementation projects.

3   Introduction

3.1   Scope and Objectives

This handbook intends to provide the reader with a basic understanding of the process of implementing electronic business processes in four areas:

- Electronic management and exchange of sanitary and phytosanitary certificates; (Section 6);
- Electronic management and exchange of fishery information (Section 7);
- Electronic management and exchange of laboratory analysis information(Section 8);
- Electronic management and exchange of CITES permits/certificates (Section 9).

These standards have been developed by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), a global standardisation body for the exchange of electronic business information. The development of new e-Business standards for the agrifood sector continues and therefore, this Handbook also provides an overview of two emerging UN/CEFACT standards on electronic notifications for a Rapid Alert System for Food and Feed (Section 10.1) and on animal traceability (Section 10.2).

Objectives of this handbook are to:
- Increase understanding in four important areas of implementing electronic message exchange in agricultural trade, taking into account the specific situation of developing countries;
- Provide arguments and material for a briefing of key decision makers;
- Provide a structure for drafting of a project document for the implementation of the standards using the logframe method;
- Discuss the strengths and weaknesses, opportunities and threats of implementing these e-Business areas.

This handbook seeks to be practical. It has been developed by experts and project managers with practical experience in the implementation of these standards in their own countries. For each of the aforementioned e-Business areas, the business case has been laid out developed and scope explained. As far as possible, concrete guidance, based on real implementation cases, is given. The Handbook also provides proposals for implementation paths based on the needs and capabilities of developing countries. Cost estimates for some of the implementation path examples have been provided where information was available. This guidance is intended to provide a general orientation of costs and implementation paths. However, in practice the cost and implementation will also depend strongly on the level of existing ICT infrastructure, the scope of the projects, implementation details and expectations of users.

3.2   Target audience

The target audience for this Handbook is decision makers and project managers in Ministries and technical cooperation agencies that initiate, plan and implement programmes for the improvement of agriculture trade. The Handbook intends to help the project managers and decision makers in developing two outputs:

1. Briefings to top level national decision makers outlining the opportunities and strategies for improvement of national agrifood sector through implementation of one or more of the abovementioned e-Business standards;
2. A high level project document (logframe) with a detailed approach on how to implement the e-Business standard. The logframe approach is used to help countries build their project proposals according to international standards of donor organisation.

Project managers can use the Handbook as reference material when compiling ministerial briefings, project descriptions, terms of reference or funding proposals for donor organisations. **Section 4** is likely to be the most helpful for drafting general briefings, especially during the project proposal stage. Project Managers should carefully consider **Section 5,** as it discusses a generic implementation process and the essential feasibility study that adapts the implementation process to local needs and realities.

3.3   Structure of the handbook

Section 4 provides a general introduction to e-Business standards and their contribution to the sustainable development agenda and discusses typical problems in the agrifood sector of developing countries that can be improved by e-Business standards. This section discusses the need for e-Business standards and introduces UN/CEFACT as a global standardisation body. The section also provides a short overview of the main opportunities presented by the e-Business standards as well as some of the pre-requisites for their implementation.

Section 5 discusses the commonalities for implementation of e-Business standards in developing countries. While the specifics for each e-Business standard are discussed in the respective chapters, there are a number of common steps that are required for a successful implementation of any e-Business standard. Section 5 discusses these steps in detail. An important early step in the project implementation is a feasibility study, which will take into consideration the local reality and provide the data needed to adapt the generic implementation process. The objectives of such a feasibility study are discussed in detail.

Sections 6-9 introduce four specific e-Business areas that can be implemented using the UN/CEFACT standards.

Section	Area	UN/CEFACT standard
6	Electronic sanitary and phytosanitary certificates	eCERT
7	Fishery information management	FLUX
8	Electronic laboratory analysis information	eLAB
9	Electronic CITES permission management	eCITES

Each section will introduce e-Business standard, the specific stakeholders and details of the implementation process of the e-Business area (and how this might differ to the generic process). Each section will discuss the business case for implementation that particular e-Business standard. The sections will also discuss the relevance for developing countries and provide details of implementation experiences. Each section also includes SWOT analysis, outlining the strengths, weaknesses, opportunities and threats, for implementation of the e-Business area. References for further reading are provided.

Section 10 discusses two highly relevant UN/CEFACT standards, which are currently under development, namely the exchange of rapid alert data for food and feed; and the animal traceability standard.

Annex I in Section 12 provides an overview of Business Process Analysis, which is an essential methodology for understanding the existing processes and procedures before commencing with the implementation e-Business processes.

4   Electronic business and agricultural trade

At Rio+20 in June 2012, the world's governments agreed to create a new set of Sustainable Development Goals (SDGs) to replace the Millennium Development Goals (MDGs) after 2015.

The agricultural sector is well-placed to contribute to this new "post-2015" development agenda given its potential to contribute to increased food security, poverty alleviation and reduced child mortality through better nutrition.

The SDGs emphasize the importance of agriculture and the need to reinvigorate farming worldwide by supporting farmers, extending knowledge sharing and increasing investments in research, technology and market infrastructure. This will catalyse innovation and empower farmers.

Farming First, a coalition of 180 organisations representing farmers, scientists, engineers, industry and agricultural development organisations, formulated the role for those involved in agriculture to achieve the SDGs mentioned above by focussing on five key messages pointing out that (i) investments in agriculture have no parallel in promoting human development and sustainable growth; (ii) farmers in the developing world can become as productive as those in the developed world; (iii) knowledge sharing and the delivery of accessible, quality extension services in farm management and marketing is essential, (iv) agriculture requires supportive frameworks for investment in infrastructure and inclusive markets and (v) food waste and food loss need to be addressed (Farming First, 2015).

The Sustainable Development Goals

1. End poverty in all its forms everywhere

2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

3. Ensure healthy lives and promote wellbeing for all at all ages

4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

5. Achieve gender equality and empower all women and girls

6. Ensure availability and sustainable management of water and sanitation for all

7. Ensure access to affordable, reliable, sustainable and modern energy for all

8. Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all

9. Build resilient infrastructure, promote inclusive and sustainable industrialisation, and foster innovation

10. Reduce inequality within and among countries

11. Make cities and human settlements inclusive, safe, resilient and sustainable

12. Ensure sustainable consumption and production patterns

13. Take urgent action to combat climate change and its impacts (taking note of agreements made by the UNFCCC forum)

14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss

16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

17. Strengthen the means of implementation and revitalise the global partnership for sustainable development

Source: United Nations, 2015

e-Business standards contribute to sustainable agriculture by:

- Improving the sharing of information and knowledge;
- Ensuring public health;
- Ensuring sustainability of production;
- Ensuring legality of production;
- Limiting fraud and illegal activities;
- Reducing waste;
- Facilitating trade.

In order to exchange information effectively, the information must be standardised and the rules for gathering, exchanging and accessing the information must be precisely defined. In addition, there is a need to harmonise the meaning (semantic) and the structure (syntax) in which information is made available.

Harmonising standards at a global level requires the input of an established body that has the capability of bringing together different stakeholders with vested interests to the meeting table where common ground can be found.

UN/CEFACT, an intergovernmental body of the United Nations Economic Commission of Europe (UNECE) has a mandate to harmonise and develop global standards for information exchange (UNECE, 2015). In the United Nations system, it is the focal point for trade facilitation recommendations and electronic business standards, covering both commercial and government business processes that can foster growth in international trade and related services.

- UN/CEFACT encourages close collaboration between governments and private businesses to secure the interoperability of the exchange of information between the public and private sector. UN/CEFACT has developed standards such as:
- The UN Layout Key for Trade Documents, the global standard for the layout of trade documents;
- UN/EDIFACT, the international standard for electronic data interchange;
- Numerous trade facilitation recommendations;
- The Core Component Library, containing syntax-neutral and technology-independent building blocks that can be used for data modelling and electronic documents;
- UNECE recommendation on establishing of Single Windows.

Standards by UN/CEFACT have been endorsed by governments and intergovernmental organisations world-wide, such as the World Trade Organization (WTO), the World Customs Organization (WCO), the Food and Agriculture Organization of the United Nations (FAO) among others. UN/CEFACT standards are developed in an open and inclusive process and are made available at no charge from the UN/CEFACT website.[1]

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[1] http://www.unece.org/cefact.html

5 General considerations about the implementation of e-Business standards for agricultural trade

In the implementation of e-Business standards, there are a number of steps, which are common to all the standards covered in this Handbook. In Figure 5.1 we summarise what can be characterised as good practice for the implementation process of any of the messages included in this handbook.

Figure 5.1. Common steps in the implementation process of e-Business solutions

Developing a brief for key decision makers and securing funding for feasibility study

⬇

Conducting Feasibility study

⬇

Obtaining buy-in from key stakeholders

⬇

Securing funding for pilot

⬇

Specification of pilot

⬇

Implementation of the pilot

⬇

Evaluation of the pilot and changes to specification

⬇

Elaboration of rollout plan

⬇

Rollout
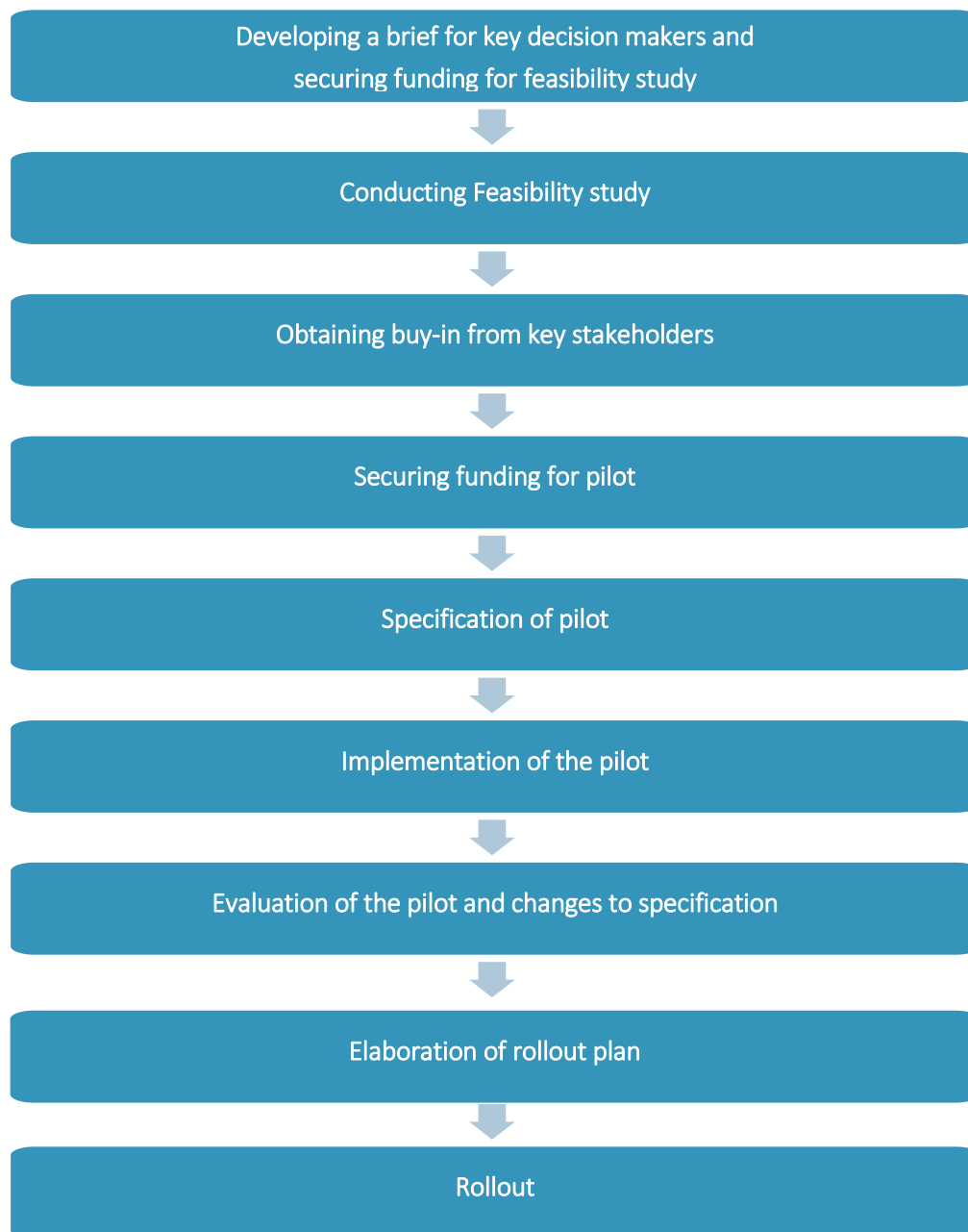
5.1 Creation of a brief for decision makers and securing of funding for feasibility study

The key to successful implementation of e-Business solutions, in any area, is 'buy-in' and support from key policymakers and decision-makers.

Some key steps towards obtaining buy-in include:

- Fostering initial motivation through a clear and focused briefing to the decision-makers, highlighting the benefits, costs and risks of implementing the e-Business solutions. The aim of the briefing is to obtain a green light and funding for a feasibility study
- Conducting a feasibility study, which puts a potential project into the national context and takes into consideration the existing ICT infrastructure and willingness of stakeholders to implement the e-Business solution. The main result of the feasibility study should be a general solution layout with an associated socio-economic cost benefit analysis and a concrete implementation proposal for a pilot project. The aim of the feasibility study is to obtain green light, in order to search for funding for a pilot project.
- Review of the pilot project implementation to assess the findings of the initial cost-benefit analysis and the feedback received from the stakeholders that participated in the pilot project.

The results of the pilot project should be clear enough to make a decision on whether or not to conduct a complete rollout. Funding sources will have to be identified.

5.2 Feasibility study

The aim of the feasibility study is to assess the e-Business area in the local context; make a high-level design for a national implementation; conduct a socio-economic cost benefit analysis and design a pilot project, which is significant enough to confirm the cost-benefit analysis. The feasibility study should be carried out by professionals with the support of international organisations. International organisations are especially well-suited to provide perspective and external experience. However, national expertise must be incorporated to avoid designing solutions that are not adapted to the realities of processes and procedures in the country.

The feasibility study should include a stakeholder analysis of the e-Business standard area under consideration. It is good practice to differentiate between core stakeholders (those who are directly involved); enablers (those who are necessary, but not directly involved) and spectators (those whose tacit buy-in might be important, but who do not participate directly in the decision-making process). It is essential to involve core stakeholders in the feasibility study, both in the design of the system to be implemented as well as a source for data related to the socio-economic cost-benefit analysis.

The feasibility study should include the following components:

- **Needs assessment:** A study of the needs in the country in the area to which the e-Business standard will be applied. The needs assessment should already identify key benefits of a potential solution.

- **Business process analysis:** The current processes and procedures in the selected area should be investigated using standard tools, such as Business Process Analysis (BPA). (For an introduction to BPA, see Annex I).
- **Process simplification:** Based on the BPA findings, the processes should be simplified before the implementation of electronic processes can begin. This requires buy-in from the private and public sector.
- **Stakeholder consultation:** Based on the stakeholder analysis, a value analysis for each core stakeholder should be conducted. This analysis must come up with unique selling points for each core stakeholders. Stakeholder consultation events should be conducted, in order to obtain feedback and test the unique selling points of the proposed project. Questionnaires, choice models[2] and Willingness-to-Accept[3]/Willingness-to-Pay[4] experiments are also good tools, which can be utilized in a stakeholder consultation.
- **Legal reform:** Legal support for the implementation of new technologies and business processes may be required. A framework needs to be implemented that safeguards the confidentiality of data, makes electronic documents equivalent to physical documents and regulates what is considered to be the 'original' document. The feasibility study should assess the country's readiness for the development of a legal framework for implementation of the e-Business solution.

5.3 Obtaining buy-in from key stakeholders

If the feasibility study concludes that implementation is feasible, the next step is to obtain buy-in from key stakeholders to support a pilot implementation. The buy-in should be achieved on the basis of the value proposition developed in the feasibility study.

It is also good practice to establish a Steering Committee or similar body for later stages in the process. The Steering Committee can act as an interim management organisation of the e-Business standard implementation before that is transferred to its final public or private owner. Participation and buy-in of the private sector is as essential as buy-in from the public sector.

5.4 Securing funding for pilot

Before a national rollout, it is good practice to conduct a pilot implementation of the e-Business standard.

The objective of the pilot is to:
- Test the e-Business solution under realistic conditions;
- Obtain data for an improved cost-benefit analysis;
- Test the buy-in of stakeholders.

A pilot project should have the following characteristics:

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[2] Where interviewees are presented with different options and have to state a preference (often expressed economically as a "premium" over a standard price)
[3] Where interviewees are asked to estimate a price for which they would be willing to provide a product or service
[4] Where interviewees are asked to estimate a price for which they would be willing to purchase a product or service

- Be limited in scope, including only the essential items. However, the pilot should also be significant enough to provide an indication of the overall viability of the e-Business solution and validate the cost-benefit analysis;
- Include the right number of actors. Whilst, the project managers will need to the test the system under realistic conditions, there should be limits to the numbers of actors that receive early access to the e-Business process;
- Use of easily accessible implementation sites. Furthermore, it is often considered good practice to limit the geographic scope of pilot project;
- Pilot projects should be time-bound, in order to prevent users from relying on a preliminary solution;
- Demonstrate the value proposition of the implementing the final full-scale e-Business solution.

5.5   Specification and implementation of pilot project

The scope and functionality of the pilot project must be specified in detail, in order to secure the appropriate funding. The implementation strategy should ensure that the pilot project's functionality is implemented step-by-step with the option for improvement along the development path.

A good model for planning and implementing the pilot project is the "spiral model". The spiral model has four phases: Planning, Risk Analysis, Engineering and Evaluation. A project repeatedly passes through these phases in iterations (called 'spirals' in this model). The essential aspect of this model is that the specifications of the system are improved over the iterations of the project based on feedback from the users of the system.

Figure 5.2. The Spiral Model
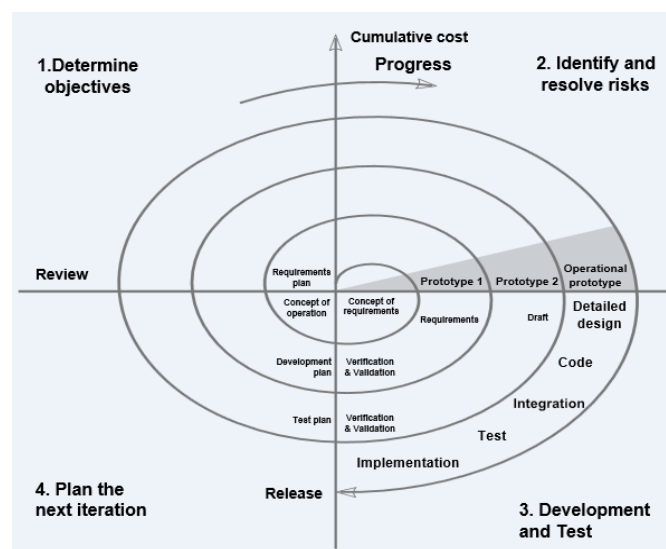
Source: https://en.wikipedia.org/wiki/Spiral_model

5.6   Implementation of the pilot

The next phase is the actual implementation of the pilot.

5.7   Evaluation of the pilot and changes to specification

It is good practice to carry out interviews to (a) validate the value proposition, (b) assess the solution, (c) capture suggestions for further improvements and (d) discuss the financial sustainability (in case there are cost implications). Choice experiments and analyses of Willingness-to-Pay or Willingness-to-Accept are typical socio-economic tools to assess the costs and benefits of a service offering.

In order to conduct a proper socio-economic cost-benefit analysis, it is important to capture the baseline situation before the project pilot commences. Based on interviews with stakeholders, the socio-economic cost-benefit analysis and general information about the pilot, a

recommendation should be made to policymakers on whether or not to proceed with a full-scale rollout. If the decision is positive, the specification of the full-scale rollout version must be drafted and agreed to by decision makers. Ideally this decision-making process would involve key stakeholders.

5.8 Elaboration of rollout plan

It is important to develop a plan for the full-scale rollout. This plan should contain at least the following elements:

- A resource plan, i.e. a plan of all required resources, including human, financial, technical, etc.;
- A staggered rollout plan, this can, for example, be based on geographical location, if applicable;
- A training plan for stakeholders (Government officials and private sector participants);
- A dissemination plan for the private sector and the general public, where applicable;
- A support plan, i.e. a plan of all resources required to support users in the initial stages of usage;
- A governance transition plan, in case the full system will transition e.g. from the Steering Committee to a private or public entity.

The rollout plan together with the final specification of the full version can then be used to secure funds for the full-scale rollout.

5.9 Rollout

In the final step, the full-scale rollout plan is executed with close monitoring of the resources being used, in order to stay within the resource plan. It is good practice to provide a two-tiered helpdesk and support system via email and phone. Support and helpdesk requests should be analysed regularly and provided to the e-Business development team, in order to improve the specification of the system and increase its acceptability. It is also good practice to conduct another socio-economic cost-benefit analysis after 12 or 18 months of full operation, in order to gauge the real impact of the e-Business system and justify potential further investment in the system.

5.10 Specific implementation processes

Each of the e-Business areas described below have distinct specific implementation processes and aspects, which will need to be embedded in the generic process described above. The specific implementation processes are described in the corresponding sections below (i.e. Section 6.3 for eCERT, Section 7.3 for FLUX, Section 8.3 for eLAB and Section 9.3 for eCITES). These specifics should form the basis of the system design, which can be included in the briefing to key policymakers and in the feasibility study.

6 Electronic management and exchange of sanitary and phytosanitary certificates

6.1 Introduction

As trade and travel have expanded significantly in the past 50 years, the movement of products with potential health risks has also increased. Risks to animal life or health may come from the entry, establishment or spread of pests, diseases, disease-carrying organisms or disease-causing organisms, additives, contaminants (including veterinary drug residues, toxins and other extraneous matter). Risks to plant life or health may arise from the entry, establishment or spread of pests (including weeds), diseases, disease-carrying organisms or disease-causing organisms. Sanitary (human and animal health) and phytosanitary (plant health) measures (also known as SPS measures) attempt to mitigate such risks. SPS measures typically apply to trade in, or movement of, animal-based and plant-based products within or between countries.

> ### Historic importance of plant diseases and pests
>
> Over the centuries, diseases and pests have had major economic and social impact world-wide. The Irish famine 1846-1850 was a result of potato blight and took more than 1m lives (The American Phytopathological Society, n.d.). The chestnut blight introduced in the US in 1904 virtually eliminated chestnut trees from North America. The US congress established plant quarantine laws in 1912 as a direct result of severe disease loss from imported plant material (Clement & Karasevicz, 2004). The plant louse Phylloxera was introduced to Europe from Californian vines in the 1850s. About 1 million hectares of vineyards in France alone were destroyed (Soleas, et al., 1997).

Figure 6.1. Main players in sanitary and phyto-sanitary certificates
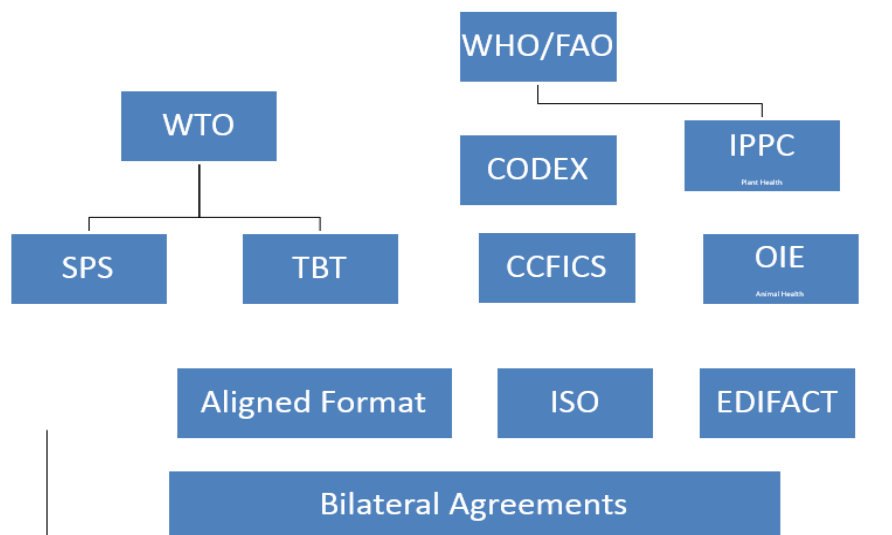
Source: (Pavlovic, 2012)

The regulatory framework that governs international trade comes under the umbrella of the World Trade Organization (WTO). Through agreements WTO members operate a non-discriminatory trading system, which spells out their rights and obligations. Each member receives a guarantee that its exports will be treated fairly and consistently by trading partners and at the same time each WTO member promises to do the same for imports into its own

market. The system gives developing countries some flexibility in implementing their commitments.

The fundamental requirement of the WTO is that traded agricultural products are safe and do not pose risks to human, animal and plant health. Countries impose regulations to ensure food safety and prevent the introduction or distribution of diseases and pests through trade, to protect human and animal health (sanitary measures) and plant health (phytosanitary measures).

The WTO Agreement on the Application of Sanitary and Phytosanitary Measures or 'SPS Agreement' requires that governments apply food safety, animal health and plant health measures without creating unnecessary obstacles to trade.[5] The SPS Agreement allows countries to set their own measures to protect their economy or environment from damage caused by the entry, establishment or spread of pests. Governments are encouraged to use international standards, guidelines and recommendations when developing SPS measures. The SPS Agreement states that measures should be science-based and not used for trade protection. It requires that sanitary and phytosanitary measures be based on an assessment of the risk to plant health, taking into account risk assessment techniques developed by the relevant international standard setting body, and that the measures be technically justified.

A phytosanitary certificate is an official document issued by the national plant protection organization of the exporting country and transmitted to the plant protection organization of the importing country. The phytosanitary certificate certifies that the plants or plant products covered by the certificate have been inspected according to appropriate procedures and are considered to be free from quarantine pests and practically free from other injurious pests. Furthermore, the phytosanitary certificate attests that the traded goods conform to the current phytosanitary regulations of the importing country. The phytosanitary certificate facilitates trade, but it is not a trade document

The WTO recognises the International Plant Protection Convention (IPPC) as the relevant standard-setting body for plant health, and encourages its WTO members to harmonize their sanitary and phytosanitary measures based on the IPPC's international standards. The global standard that the IPPC recommends for electronic certificates is the UN/CEFACT standard eCERT.

For animal health, the WTO SPS agreement recognises the World Organisation for Animal Health (OIE) as the international standards-setting organisation for animal health and diseases that are transmissible to humans. The OIE establishes recommendations and guidelines for the regulation of trade in animals and products of animal origin (OIE, 1998). For international food standards, the WTO SPS agreement recognises Codex Alimentarius, which was established by the FAO and the World Health Organisation in the early 1960s to develop the harmonisation of international food standards to protect consumer health and promote fair practices in food trade.

eCERT is an electronic certification system using the Extensible Mark-up Language (XML) to transmit data for agricultural products. The system allows for information to be exchanged electronically from government to government or 'G2G' for sanitary (human and animal health)

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[5] For an overview see (Stanley, 2010)

and phytosanitary (plant health) certificates. This system can allow SPS certificates to be downloaded or viewed directly on the web.

Electronic SPS certification was initiated by New Zealand, resulting in the launch of an internal traceability and verification system in 1999 and the export module in 2000. New Zealand, Australia, USA and the Netherlands were early adopters of electronic SPS certificates. It soon became apparent that that standardisation via UN/CEFACT was essential for the success of electronic SPS certificates. eCERT was released as a UN/CEFACT standard in 2008.

Both New Zealand and Australia have opted to implement eCERT product by product, instead of implementing it immediately for all traded foods. The scope of products that are covered in New Zealand by the Animal Products eCERT (AP eCERT) and ePhyto for export, include plant products (seeds, living and dried plants), seafood, game, poultry, eggs, pet food, bee products, hides, wool and skins, and dairy products. Products can be living, fresh or frozen.[6] Both New Zealand and Australia exchange certificates with 15 countries and the EU for a variety of products. China launched its eCERT system in 2010 and has over 40 countries and 300 officials using the system. A number of other countries, including Canada, Kenya, the Republic of Korea, Vietnam, Hong Kong, Singapore, use some form of electronic certification and/or the infrastructure of trade partners to file or review e-SPS certificates.[7]

Electronic SPS certificates have received recognition from the IPPC in the form of the IPSM No 12 e-Phyto certificate. E-SPS certificates have also been considered by the APEC Electronic Commerce Steering Group (ECSG), the Pan Asian e-commerce Alliance, CODEX/CCFICS (CAC/GL 38-2001), and the ASEAN Single Window effort (ASW). ASEAN has decided to implement a further five messages into the specification of the ASW, one of which is the electronic SPS certificate. The work is currently being carried out by the Agricultural Workgroup.

A typical process related to a sanitary or phytosanitary certificate is depicted in Figure 6.2. The process is complex and can be time-consuming, particularly when implemented with paper-based documents, as the transport and processing time of such documents can be significant.

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[6] (Canadian Food Inspection Agency, 2015). http://www.foodsafety.govt.nz/industry/general/
[7] see also (Lopez, 2014)

Figure 6.2. Typical processes involved in the SPS certificate workflow
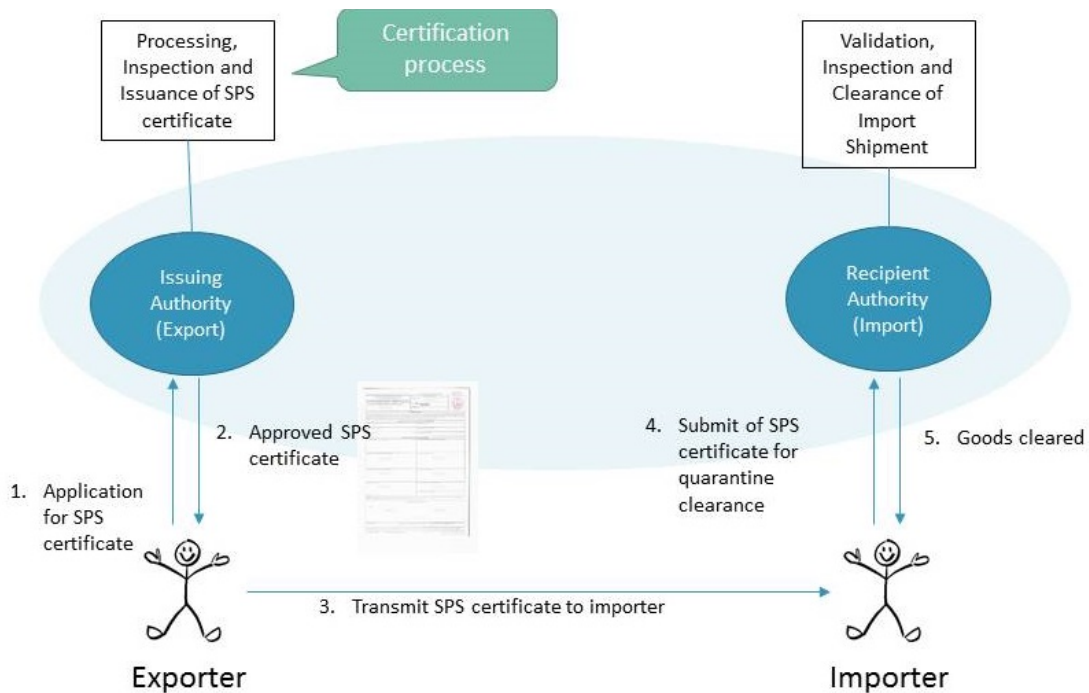
Source: (Lopez, 2015)

Paper-based SPS certificates have other significant drawbacks, as shown in Figure 6.3. The drawbacks stem from the fact that (a) paper documents are easy to forge; (b) less easy to generate and process as compared to electronic certificates; and (c) more error prone due to input errors, copy errors or issues with readability. In addition, issuance and maintenance of the forms is costlier. Since the structure and layout of SPS certificates is the result of bilateral negotiations, there are many different SPS forms used by the countries and the maintenance of such forms in different languages can become very cumbersome.

Figure 6.3. Comparison of paper-based and electronic SPS certificates

	Paper-based certificate	Electronic certificate
Integrity	• No guarantee a certificate is valid • Difficult to consolidate • More scope for irregular behaviour	• Electronically secured certificates • Cross-checking in real time • Single national register of certificates
Efficiency	• Difficult to maintain and update in different languages • Slower processing time • No automated validation	• Faster processing through pre-validation • Single view of all relevant information • Simple maintenance of forms
Security	• Higher risk of forgery and manipulation • Higher risk of import control failures • More difficult to identify patterns of fraud/misuse	• Very difficult to forge • Online verification for third parties incl. importing nations • Searchable database with all certificates
Time	• More time to prepare • Longer time to export • More time to process	• Computer-assisted application preparation • Faster processing cuts export time • Faster management through real time status

6.2   How an electronic SPS Certificate system works

The following describes the functionality of a fully electronic SPS certificate management system with electronic exchange between trading nations. For partial projects (e.g. imports only or exports only) the project proposal should take into consideration only the relevant procedures.

The main stakeholders are:

IMPORTS

- Ministry of Agriculture/Ministry of trade for the SPS agreements;
- Competent authority/National Plant Protection Organisation (NPPO) of the exporting country;
- [Border Control of the exporting country];[8]
- Border Control of the importing country;
- [Exporters];
- Importers.

EXPORTS

- Ministry of Agriculture/Ministry of trade for the SPS agreements;
- Competent authority/NPPO;
- [Border Control officials of the exporting country];[8]
- Exporters;
- [Border Control officials of the importing country];
- [Competent authority of the importing country];
- [Importers].

For the establishment of in-country electronic SPS certificate management, there are four phases of implementation required to realise the maximum benefit of the eCERT program.

Phase 1 includes the exchange of electronic SPS certificate with the exporting/importing country; Phase 2 is the development of electronic SPS certificate management system; Phase 3 entails the integration of electronic SPS certificates into border clearance process; and Phase 4 is the development of in-country e-business processes. Note that eCERT can be used for Phase 1 alone by the exchange of e-certificates between the competent authorities of the importing and exporting countries, where all other in-country processes remain paper-based.

For exporting countries, the exchange of electronic SPS certificates with other nations (Phase 1) requires the Ministry of Agriculture/Trade to negotiate a bilateral agreements with Border Control officials and/or the Competent Authority of the importing country. This would include agreement of the message transmission methodology and its details. In the development of electronic SPS certificate management system (Phase 2) the competent authorities and the exporters are the key stakeholders. The integration of electronic SPS certificate systems with border control systems (Phase 3) requires close collaboration between border control officials. In order to reap the full efficiency and cost reduction benefits of an electronic SPS systems, it

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[8] Square brackets indicate parties that do not necessarily play a role in the process.

requires that all the relevant paper-based processes are modernized and made electronic (Phase 4), including the application, inspection and issuance of certificates.

For importing countries, the phases are similar, though the actors and processes are different and independent of the export process. Furthermore, for importing countries, contact needs to

Figure 6.4. Example of an integration of eSPS certificate management system with eCustoms II: Documentary check
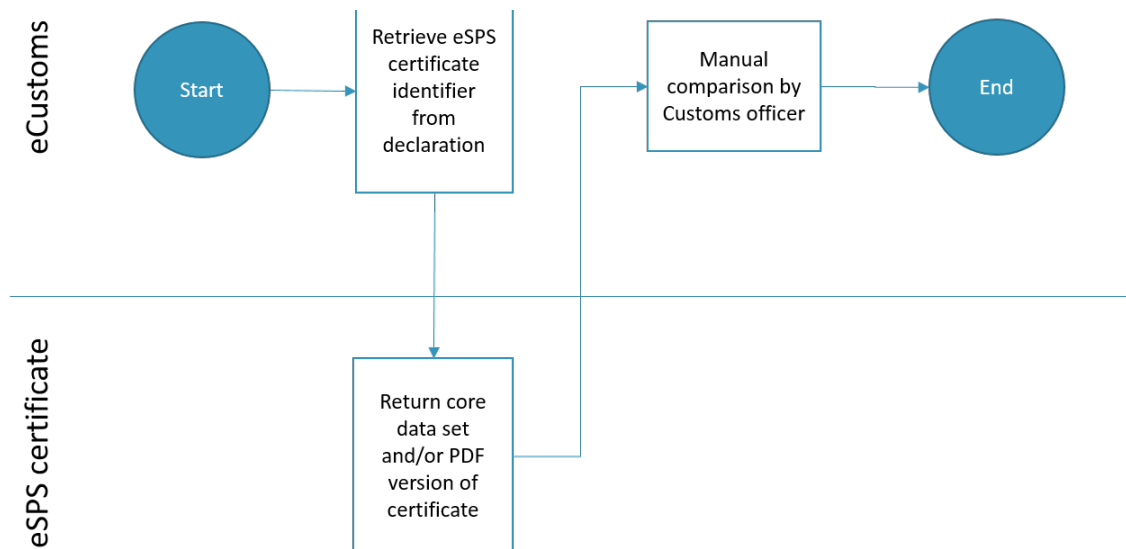
be established with the exporting countries to achieve agreement on the message transmission methodology and the mode of collaboration between importers and their competent authorities. When implementing electronic management and exchange of sanitary and phytosanitary certificates, three main phases should be identified, see Figure 6.9.

6.2.1   Phase 1: Exchange of electronic SPS certificate with the exporting/importing country

In order to exchange SPS certificates electronically between trading countries, firstly the certificate data needs to be converted into an electronic form. Only after this has been achieved can the certificate then be exchanged. The technical basis of the electronic exchange is the eCERT standard of UN/CEFACT (UN/CEFACT, 2008); see Section 6.7 for more details. The eCERT standard is internationally recognised.[9]

Three models are being discussed on to transmit the eCERT messages:

Bilateral Government-to-Government: eCERT messages in this model are exchanged directly from government bodies to government bodies via their National Single Windows, eCustoms or more frequently their electronic SPS certificate management systems. This approach has been used for example by New Zealand, Australia and the Netherlands with their trading partners.

Single Hub Model: This model is currently under discussion in the context of the ePhyto project of the IPPC (IPPC, 2013). *"A single point (hub) system is a multilateral approach. It establishes*

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[9] Please note that eCERT is not available as an UN/EDIFACT (the United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport) standard message

common transmission/retrieval requirements that all participating NPPOs accept. An exporting NPPO can send an ePhyto certificate via a secured system to the importing country's mailbox, upon which the hub notifies the importing country that it has an ePhyto certificate in its box, and the importing country can then retrieve the ePhyto certificate. This option eliminates the need for multiple bilateral access agreements and enables all countries (NPPOs) that adopt the hub protocols to exchange data with one another" (BCI, 2014). The hub concept as presented by IPPC raises some concerns, as

- The hub is for phytosanitary certificates only, i.e. a country would potentially have to subscribe to more than one such hub, separately for phytosanitary and sanitary certificates;
- Most countries only trade with a limited number of other countries;
- SPS agreements are bilateral agreements, potentially resulting in different mandatory information elements;
- There is no easy path from the hub concept to a National Single Window.

Bilateral Government to Business to Business to Government (G2B2B2G) Model: This model has been proposed to ASEAN by the Pan-Asian eCommerce Alliance (PAA). It relies on a private business to business exchange at the centre of the process; see Figure 6.5.

Figure 6.5. The G2B2B2G model of exchange of eSPS certificates. ISP
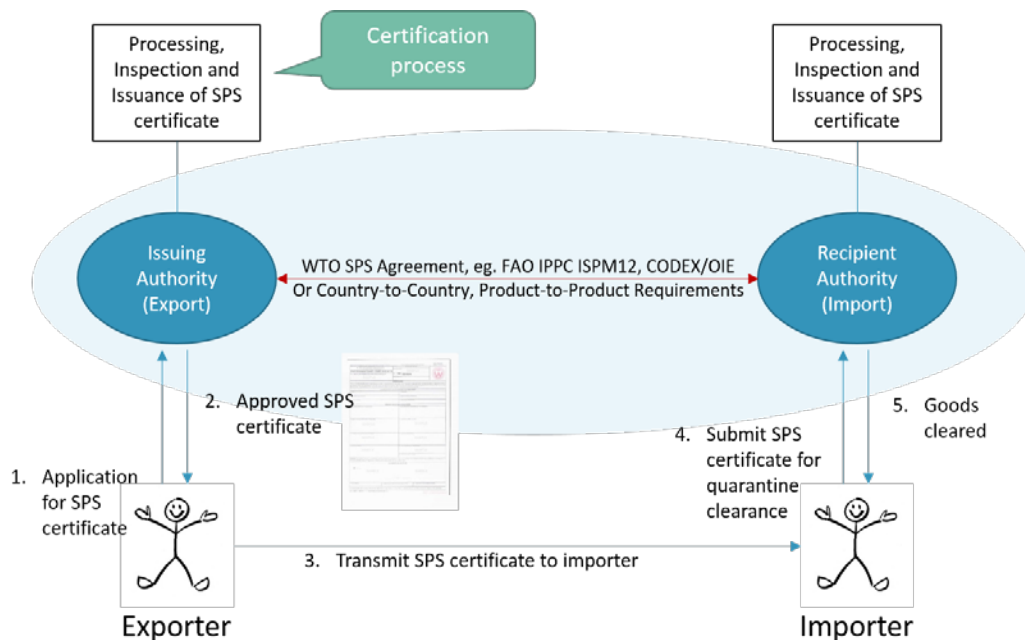
The chosen model adopted for implementation should be suitable and adaptable to the local situation. Furthermore, this choice of model should be determined as a result of the feasibility study described in Section 5.2. The key questions to answer when using any of the above models are:

1. How can the importing authority verify the credentials of the certificate by the original issuing authority?
2. Even if the certificate is deemed valid, how can the importing authority verify that the eCERT is valid and associated with a particular consignment?
3. How can the issuing authority in the exporting country be sure that its certificates are not misused by wrong parties or for wrong consignment?

Messages are preferably exchanged using web services via the Simple Object Access Protocol (SOAP). Although there are no standard descriptions of the corresponding SOAP services (the so-called WSDLs, Web Services Description Languages), web services have been established as a standard technology when integrating electronic message exchange systems. The lack of standardisation of WSDLs requires technical coordination work between implementing parties (Neimanis, 2014).

The exchange via secure SMTP (Simple Mail Transfer Protocol, a standard for e-mail transmission) requires a secure email server, a receiving email address where messages can be monitored and automatically retrieved, and electronic certificates for secure identification of the source and potentially encryption of the message. The use of SMTP for e-Business system integration should be used only if the technical capacity to implement web services is not available.

6.2.2   Phase 2: Electronic SPS certificate management system

This step consists of implementing the information systems necessary to capture applications from exporters for SPS certificates electronically and to manage such applications. This allows (a) an exporter to submit an application for an SPS certificate online; (b) officials to schedule and carry out inspections and post their results online and (c) for the issuance and management certificates electronically (and in print versions, where necessary).

Typically, this would include the following modules:

Figure 6.6 Typical modules of an electronic SPS application system

Apply	Manage	Issue
ePayment		
User/exporter registration	Registration of inspectors and other relevant personnel	Secure issuance of certificates
Filing of applications	Scheduling of inspections	Secure printing of certificate (where necessary)
Status of application	Recording of inspection results	
Communication exporter/authority		
Interfaces to other e-Business systems		

Apply Module

The Apply set of modules allow users/exporters to register themselves in the system, which is a pre-requisite for application for an SPS certificate. Registration is required for:

- Individuals authorised to file an application on behalf of a company;
- Exporting companies;
- Product handling sites (packing houses, processing facilities or any other place where goods will be inspected before reaching the border control process).

Registration will typically require identification documents (national identification document of named users, company/business identification forms, relevant certifications, registration with export nations) to be uploaded onto the system for inspection by the relevant officials.

Ideally identification of individuals and entities will use digital certificates, if these are available in the country concerned and the necessary public key infrastructure (PKI)[10] is in place. For example, the Philippines has implemented PKI as an essential component of their e-Government Master Plan and the Integrated Government Philipines (iGovPhil) Project (Republic of the Philippines, 2015).

The process will also typically require payment of a fee, which can ideally be paid online. Electronic payments in their simplest form require an upload of a scanned payment slip/bank transfer slip. More sophisticated solutions provide users with bank transfer options using secure transfer codes, online payment services, such as PayPal[11] and credit card payment.[12]

Export applicants as well as upstream partners, growers, food processors and others can file an application for an SPS certificate or provide upstream information. This requires classification of products (animal origin/plant origin) and maintenance of a list of products for which SPS certificates can be issued depending on the destination country. Requirements for the issuance of an SPS certificate will vary with the importing nation and this should be reflected in the application form.

The Apply set of modules should allow applicants to see the status of their application and receive relevant communications from the authority, such as additional documentation requirements or the date and time of the physical inspection for the issuance of the certificate.

Manage Module:

The Manage part of the system addresses the internal management of the certification process within the Competent Authority. It will typically manage the identities of officers and other relevant personnel with the Competent Authority, in order to associate each application process with the responsible officials.

The system will provide officers with a list of open applications for their consideration. The association of officers with applications can be done by product classification and geography. Once the initial documental check is in order, an inspection has to be scheduled (note that inspections can be scheduled earlier during the planning of the first registration event during

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[10] 'A public key infrastructure (PKI) is a set of roles, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificate and manage public-key encryption'. https://en.wikipedia.org/wiki/Public_key_infrastructure Hence, a PKI can help to facilitate the secure transfer of electronic information.

[11] https://www.paypal.com/webapps/mpp/government-payments

[12] For guidelines on ePayment see (The World Bank, 2015; Government Finance Officers Association, 2015) and for an example implementation in India, see (Government of India, 2015)

the export process). Ideally, the system will assist by providing an efficient schedule to field inspectors by optimising schedules with respect to inspection locations. Inspectors should have the possibility to upload inspection results and/or evidence (photos or possibly video) onto the system, in addition to their verdict.

Issue Module:

In the Issue set of modules, a certificate is issued based on the inspection result. Ideally, certificates are stored in the XML[13] format compatible with the UN/CEFACT standard. Certificates can then be rendered using language dependent stylesheets (expressed in XSL).[14] Certificates should be uniquely identified; it is also good practice to provide a hash code [15] as a means to secure the certificate against transmission errors and fraud (Simon, et al., 2001).

Until certificates are exchanged exclusively in electronic format with the importing nations, printed copies of the certificates need to be generated securely. Many nations employ security paper for this process and designate points where certificates can be printed. This requires proper distribution of security paper to the points of printing. Some countries like Australia, distribute security paper free of charge to registered businesses, other countries print the certificate in secure locations.

Access to information in an electronic SPS certificate
In an electronic document not all information needs to be made available to every party that receives the document. Instead information can be made selectively available to the parties that require the information using encryption techniques (Lehr, 2013).

> **SECURE VERIFICATION**
>
> It is good practice to (additionally) print a secure verification code on the goods related to the certificate, ideally as an URL in the form of a QR code; see below. Such codes can be easily scanned using mobile phones or suitable barcode scanners and used in verification, e.g. at the border. Border inspectors or anybody else involved in the verification of SPS requirements can scan the code and – if properly identified – access information about the validity and the details of the certificate.

Information elements of an electronic SPS certificate
Table 6.1 provides a list of suggested information elements, which may be provided when the certificate is accessed remotely. The left hand column represents the user accessing the information. The information elements in the right column are data elements (field headings) of the IPPC model SPS form available for viewing as ISPM12.[16]

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[13] EXtensible Markup Language
[14] EXtensible Stylesheet Language
[15] Result of a function mapping variable length data to a fixed length code
[16] ftp://ftp.fao.org/docrep/fao/009/a0450e/a0450e.pdf

Table 6.1. Examples of information elements shown by dependence of access level.

Access	Available information
Public	Validity of certificate (valid/non-valid)
	Certificate reference number
	Issue date
	Exporting country
	Country of origin
	Issuing competent authority
	Exporter
	Product
	Gross weight [with unit]
	Net weight [with unit]
	Place of origin
Registered trader	Premises
	Place of destination
	Official or commercial remark/comment
	Consignor
	Consignee
	Departure date
	Storage/transport temperature
Relevant officials of importing country	Import country
	Receiving competent authority
	Local issuing competent authority
	Re-export country
	Transit countries
	Origin location
	Place of origin

Note: The table is to be read hierarchically. Any information elements available to the general public for example, will also be available to the registered trader. All information elements available to the trader will in turn also be available to officials of the importing country tasked with certificate validation.

This recognises three different roles for information related to the electronic SPS certificate. In order to maximise the usefulness of the electronic SPS in assuring legality and food safety, basic information should be available without requiring authentication. Importers should be able to access additional information provided they have registered themselves in the system of the exporting nation. Requirements for exporting products depend on the type of product that you are exporting and therefore the certificate should contain the relevant information for that product. Exporting nations such as New Zealand offer requirement guidelines to exporters which you can see on the government sponsored food safety site.[17]

Finally, relevant government officials tasked with the validation of the certificate information should get additional information for internal risk management.

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[17] http://www.foodsafety.govt.nz/industry/exporting/e-cert/

Access to electronic SPS certificates through a web browser

The simplest method of accessing an electronic SPS certificate is through the remote system of the exporting nation, for example through a web browser or local service to collect all import notifications and e-certificates. For this the exporting nation will only have to provide credentials to officers of the importing nation, no integration of systems is necessary. This 'web view' of the electronic SPS certificate is a precursor to the later integration in Phase 3, which entails the integration of e-SPS into border clearance processes. It allows for the validation of the certificate reference. Furthermore, it provides basic information for validation at the first or second border (depending whether the import process has one or two steps). For importing nations this should be combined with a system showing all electronic SPS certificates in transit, ideally ordered by time, product, product type (frozen/fresh) and the risk category. Officials would see all electronic SPS certificates destined for their country. This allows for pre-clearance of goods and the speeding up of the import process and risk management of goods scheduled for arrival.

Using the electronic SPS certificates in risk management

If the implementing country has laws and regulations to use risk-based border inspections for products of animal or plant origin, the availability of a web view of electronic SPS certificates can allow for the verification efforts to be directed to the shipments requiring most attention. Typically, risk categories, which are determined by the product being imported and the history of the originating country and exporter, are assigned to a percentage of shipments that will be physically inspected.

Table 6.2. Example of risk categories and percentage of physical inspections from Abu Dhabi

Risk Category	Red Channel	Yellow Channel	Green Channel
High Risk Foods	80-100%	0-10%	0-10%
Medium Risk Foods	15-25%	15-25%	50-70%
Low Risk Food	5-10%	0-5%	85-90%

Source: (Abu Dhabi Food Control Authority, 2008)

Table 6.2 shows an example of how risk categories and inspection coverage can be combined. Each shipment can be classified by risk category based on:
- Product risk;
- Environment and origin risk;
- Establishment risk;
- Production process risk.

The risk category is then randomly associated with a 'channel' where channels represent a set of health related procedures in the following manner:
a) Green Channel: Health Documentation Review.
b) Yellow Channel: Health Documentation Review and Cargo Examination.
c) Red Channel: Health Documentation Review, Cargo Examination, Sample Collection and Laboratory Analysis.

Each combination of risk category and channel then receives a percentage of inspections. Individual shipments are inspected according to the channel/risk category combination. More information on risk-based food inspections is available in the *Risk-Based Food Inspection Manual* (FAO, 2008). Note that the related processes and measurements can vary from importing to exporting countries; however, the underlying theory of risk management applies. Also note that risk management processes for imports and exports differ.

6.2.3   Phase 3: Integration of electronic SPS certificates into border clearance process

While Phase 2 looks mainly at the relationship between exporter and the Competent Authority for sanitary and phytosanitary certificates, Phase 3 looks at integration of the electronic SPS certificate in border clearance processes of the exporting nation.

Depending on the availability of resources, border clearance processes can use a web-view system or directly access/exchange electronic SPS certificates using the electronic border control management system. While a web-view is a good first step, it is much more efficient for the border clearance processes to control the information directly. Table 6.3 provides an overview of which strategies might be employed based on the status and prospects of electronic border control implementation in the country. If border control processes are manual and/or buy-in from border control officials is weak, allowing officers access to the electronic SPS certificates as part of the documental check could be a suggested approach.

Table 6.3. Suggested course of action for the integration of electronic SPS certificates depending on the status of electronic border control procedures

Status	Web view	Integration
Paper-based border control procedures	🟥	
eCustoms system implemented	🟥	🟥
NSW implemented		🟥

If, on the other hand, there is an eCustoms system and resources available for integration, a feasibility study should be conducted to assess the possibilities for direct integration of the electronic SPS certificate management system into the eCustoms system. The specifics of the integration process will depend on the available systems and resources to interface them. If the country has already implemented a National Single Window based on the WCO data model (WCO, 2009), it would be good practice to electronically exchange information with the eCustoms system, see Table 6.3.

It is important to review in detail the integrated process flow and confirm responsibilities with existing laws and regulations of the country and international treaties. One possibility is that Customs receives the electronic SPS certificate directly to the eCustoms system after the NPPO or SPS agency has accepted the certificate and released the consignment. As Customs then has access to the original certificate, normal border clearance processes can be followed, such as the checking of taxes and verification of brand. If all conditions are met then the consignment can be released. If this is not feasible, then Customs can check the SPS certificate in the electronic SPS certificate management system.

An example of an integrated process between an eCustoms system is shown in Figure 6.7.[18] In this example, exporters apply for an SPS certificate with the electronic SPS certificate management system and subsequently for export certification with the eCustoms system.

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[18] Adapted from (Lehr, 2014)

In the pre-validation process the exporter lodges an export customs declaration with the eCustoms system. Under the column for supporting documents in the customs declaration form, the exporter enters the identification number of the (electronic) SPS certificate (if the SPS certificate is a mandatory document required by the national tariff for export of this commodity). The eCustoms system then contacts the electronic SPS certificate management system providing a core set of data taken from the Customs export declaration form that would typically include the SPS identifier, the product identification, an identification of the exporter and a destination country. The electronic SPS certificate system verifies the provided information against the information stored in the electronic SPS database and provides a status update.

Figure 6.7. Example of an integration of eSPS certificate management system with eCustoms I: Pre-validation checks
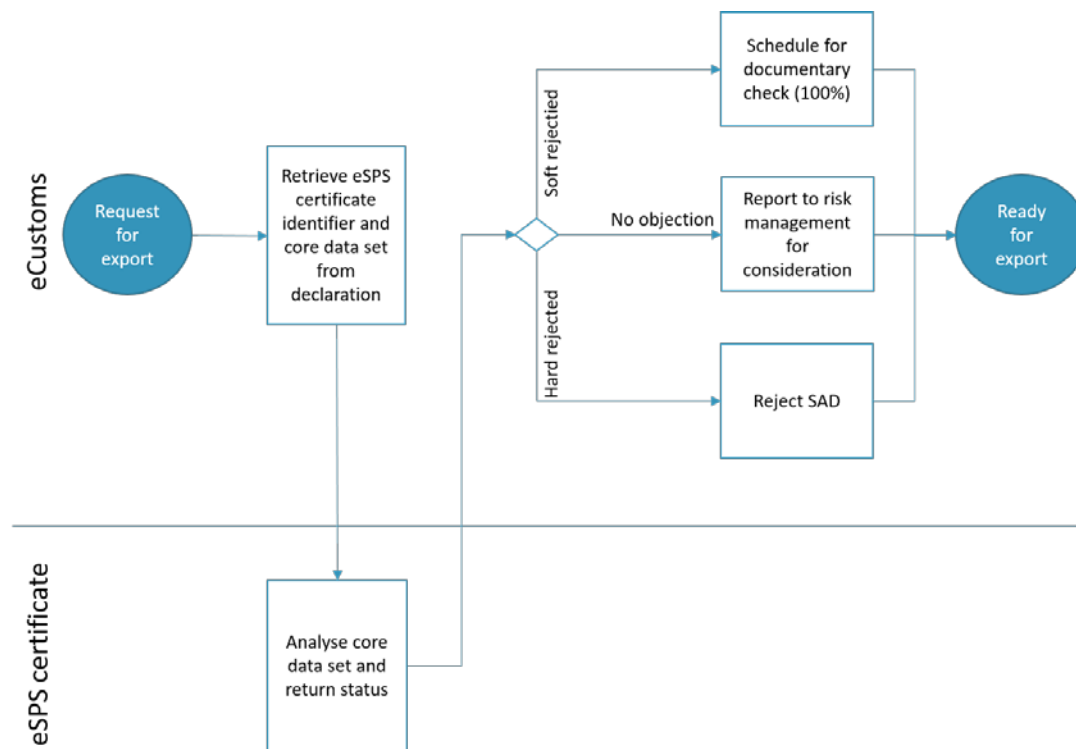
This status update could be one of the following: no objection; a soft rejection for minor inconsistencies in the information elements provided; or a hard rejection for major inconsistencies, such as an invalid certificate identifier. The eCustoms system can then decide the appropriate course of action such as continuing the process, scheduling a documental check, or rejection of the Customs declaration.

In case of a documental check the following process can be used: Border Control officials retrieve the Single Administration Document (SAD) and the contained electronic SPS certificate identifier. They then connect to the electronic SPS certificate management system and retrieve either the core data set or a PDF copy of the certificate for validation. The information from the core data set or the PDF version of the certificate is then compared manually by the officer with the SAD.

NOTE: In case of a physical check or in the case that paper documents are required by border control officials, the use of secure verification codes (embedded for example in a QR Code) can make the above process faster and easier for the border control officer.

6.2.4   Phase 4: In-country e-business process

The final step in the full implementation of eCERT is to develop an in-country e-business process to replace all paper-based systems. This process is often undertaken in the context of a National Single Window (NSW). More information about National Single Windows can be found on the UNNExT website and the *UNNExT Single Window Implementation Guide* (UNNExT, 2012).[19] National Single Windows can bring about greater efficiency to trade procedures, which can lead to savings in both time and cost. Implementing eCERT within the context of a National Single Window is the most consistent approach.

6.3   The implementation process

The implementation of electronic SPS certificates can begin with either imports or with exports. It is rare that both processes are implemented simultaneously. The business case for the two different paths can be somewhat different, as shown in Figure 6.8. If starting with electronic SPS certificates for imports, the key arguments for implementation may be the improvement of import controls and better compliance with quarantine regulations. If starting with exports, the process efficiency and the reputation as a trade partner may be the main motivations to implement electronic SPS certificates. The main contribution of electronic SPS certificates is the improvement of trade processes for both import and exports. The areas of contribution can be summarised as follows:

- Increased efficiency of procedures to the benefit of exporters, inspectors and other stakeholders involved in the issuance and verification of SPS certificates;
- Increased robustness of the certification process, resulting in less fraud and better monitoring;
- Enhanced reputation as a trade partner, resulting in easier marketing of food products internationally and potentially faster processes at the border.

While the end point – the exchange of electronic SPS certificates with trade partners – is the same, many countries do not implement electronic certificates for exports and imports at the same time. Countries may choose to e-SPS certificates for import or exports based on their most pressing needs; the import/export balance; the buy-in of senior management of relevant government agencies or the availability of resources. Thereafter, the country may choose to implement the other path.

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[19] http://unnext.unescap.org/tools/default.asp

Figure 6.8. Different Implementation paths
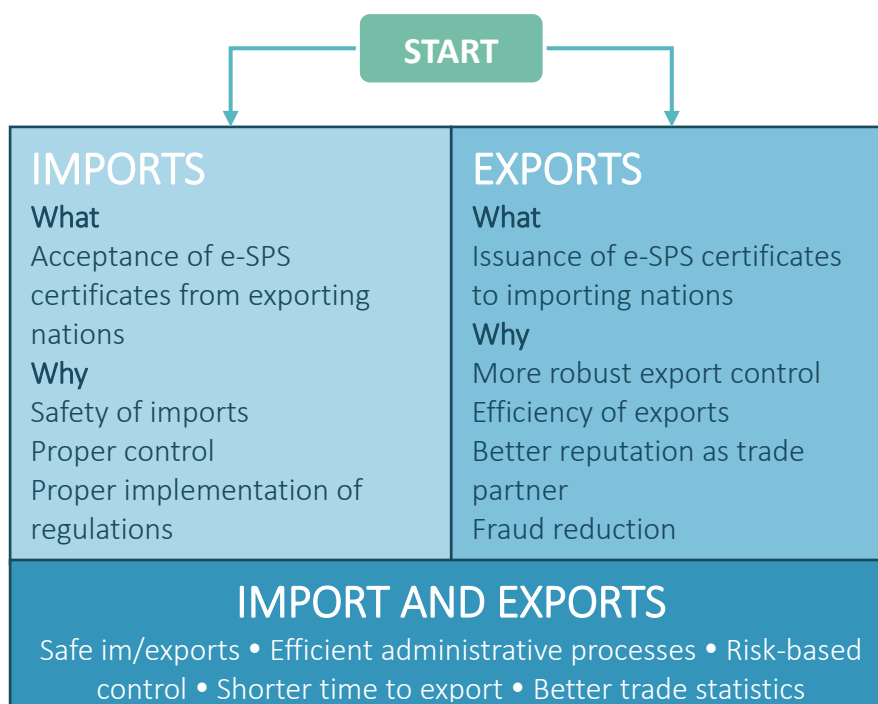
Electronic SPS for Export

If implementing electronic SPS certificates for exports first, the typical implementation process is 3-tiered and summarised in Figure 6.9. In the first step, a system is established for electronic application of SPS certificates and also to manage the in-country processes of inspection and certificate issuance. In the second step, this system is integrated with the border control processes to increase the efficiency and the robustness of the export process. In the third step, certificates are exchanged directly with the importing nation, either G2G or G2B2B2G.

Electronic SPS for Import

If implementing electronic SPS certificates for imports, the first step is typically the integration of electronic SPS certificates issued by the exporting country into management systems of the Competent Authority in the importing country.[20] The relevant component authority for sanitary and animal health certificates is often found within the Ministry of Agriculture and/or Health or food safety authority. For phytosanitary certificates, the Competent Authority would be the NPPO. The second step would be the integration into border clearance processes (e.g. by providing access to the electronic SPS certificate) or eCustoms systems.

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[20] For sanitary certificates the Competent Authority would usually be within the Ministry of Agriculture and/or Health, or the food safety authority. For phytosanitary certificates this would be the NPPO.

Figure 6.9. Implementation steps for electronic SPS certificates

Export Implementation

I. Electronic SPS management

Electronic application process
Electronic scheduling
inspections
Electronic issuance of
certificates
Integration with other
certificates requiring inspection

Key Benefits
•Greater processing efficiency
•Balanced scheduling of inspections
•Consistent collection of information and
real time validation of applications
•Quick communication channel to
im/exporters
•Creation of central registry or exporters
•Searchable application for data mining

II. Electronic Export

Integration with Border Control processes
and systems
Integration with other export certificates

Key Benefits
•Greater processing efficiency
•Better export controls
•Risk based border processes
•Less Certificate fraud
•Quick communication channel to
im/exports

III - Electronic Data exchange

Exchange of certificates with im/exporting nations
Pre-import checks
Scheduling of import inspections

Key Benefits
•Provable integrity of
certificates
•Detection of product fraud
•Non-repudiation of certificates
•Greater processing efficiency
•Less paper

Negotiations
Intergovernmental discussions
Border Control negotiations

Import Implementation

I.Electronic SPS managment

Electronic application process
Electronic scheduling
inspections
Electronic issuance of
certificates
Integration with other
certificates requiring inspection

Key Benefits
•Greater processing efficiency
•Balanced scheduling of inspections
•Consistent collection of information and
real time validation of applications
•Quick communication channel to
im/exporters
•Creation of central registry or exporters
•Searchable application for data mining

II. Electronic Import

Integration with Border Control processes
and systems
Integration with other import certificates

Key Benefits
•Greater processing efficiency
•Better import controls:
•Health and animal/plant disease
prevention
•Risk based border processes
•Less Certificate fraud
•Quick communication channel to
im/exports

III - Electronic Data exchange

Exchange of certificates with im/exporting nations
Pre-import checks
Scheduling of import inspections

Key Benefits
•Pre-arrival inspection
•Provable integrity of
certificates
•Detection of product fraud
•Greater processing efficiency
•Less paper

6.4 Contribution to the national economy

The following summarises how the electronic gathering and exchange of SPS certificates contributes to the national economy using the logframe approach.[21] A typical results chain is shown in Figure 6.10. The results chain summarises the results, which a project is expected to achieve. The results chain shown below will need to be adapted to the particular project and the country's realities. It should be based on evidence about what has worked in the past and take into account lessons learned, evaluation and research evidence available that underpins the design of the project. The evidence will also enable identification of realistic targets and in particular a reasonable assumption how much change might be achieved over the project period (DFID, 2011).

Figure 6.10. A typical results chain for the implementation of electronic SPS certificates
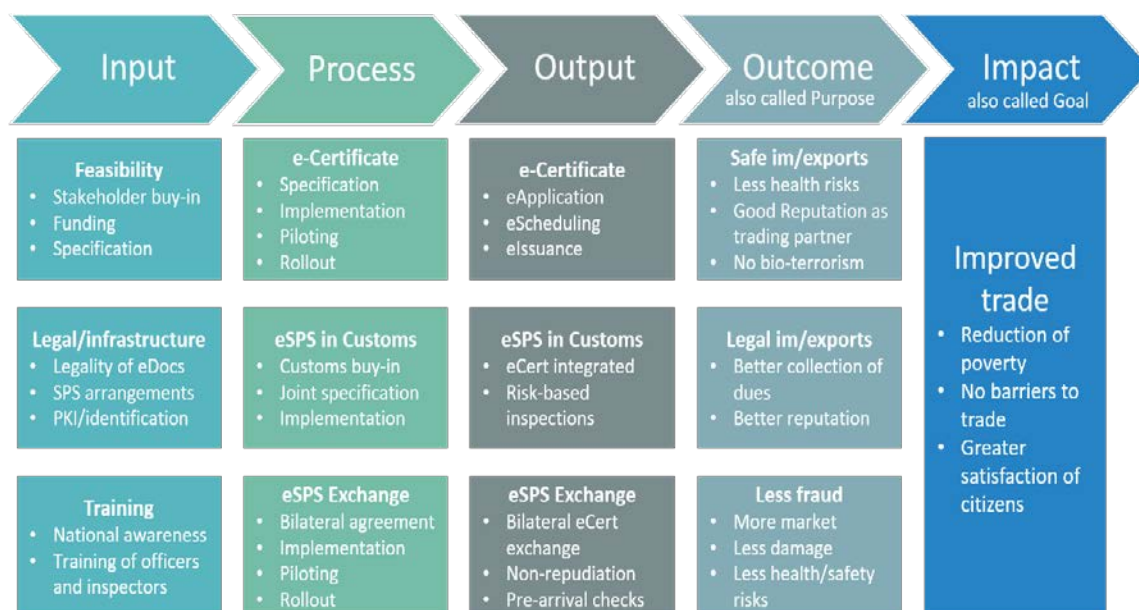
An alternative representation is shown in Table 6.4 below. The above results chain focuses on the results and does not list inputs or indicators (i.e. how the result is measured), whilst the below reproduced "logframe [matrix]" shows indicators, data sources and assumptions in addition to the expected results. The logframe needs to be adapted to the specific project and the available information/experience. It is essential to demonstrate coherent, robust measures of success in the logframe. It is particularly important to capture the baseline measurements, without which change cannot be demonstrated. It is also important to have milestones which act as an early-warning system, indicating how a project is progressing along the predicted trajectory (DFID, 2011).

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[21] See (EuropeAid, 2004; DFID, 2011; World Bank, 2005; USAID, 2012)

Table 6.4. A typical logframe matrix for the implementation of electronic SPS certificates

	Description	Indicators	Data Sources	Assumptions
Goal	- Improved trade	- Trade volumes - National development indices	- National statistics - Statistics of key trade partners	- Sustained market valuation of export goods - Sanity of financial markets - Availability of financial and physical export infrastructure
Purpose	- Safe im/exports - Legal im/exports - Less fraud	- Rejection statistics (e.g. RASFF)[22] - Results from in--country and border spot checks	- RASFF and similar systems of importing nations - Reports of in-country and Custom checks	- Inspectors and border control agents properly trained - Inspection protocol properly designed - Systems secure against intrusion - No corruption of inspectors and Border Control officials
pu Su	- Less health risks - Good reputation as trading partner - Better collection of duties - Better reputation - Better market access - Less damage - Less health/safety risks	- Less incidences of food poisoning or "food scares" - Higher trade volumes - Decreased or no food related security incidents - Increased revenue through dues - Less detection of fraud in spot checks	- National statistics - Reports from hospitals on food related bio-security issues and food poisoning - Border Control revenues - Reports of in-country and border spot checks	
Outputs	- e-SPS application system - Integration with Border Control Agencies - Exchange of eCERT with other nations	- Highly available system with >99% uptime - Border Control able to access eCERT system or eCERT system integrated into eCustoms system - Number of countries that electronic SPS certificates are exchanged with	- Operations report of eCERT application system - Experience report/interview with Border Control officials - Reports on the implementation of bilateral electronic SPS certificate exchanges	- Proper training of all stakeholders - Online resources for guidance - Brochures - Stable electricity and network - Access of importers to eInfrastructure[23] - IT infrastructure available - Bilateral agreements on e-SPS
Inputs	- Feasibility study - Funding - Specification - Legal framework - Technical infrastructure - Training - Identification of implementation partners	- Feasibility report - Project approved and funding available - Implementing partners identified and contracted - Legal base established - Pilot users identified - Product classification available - Identification schemes available	- Feasibility report - Minutes from approval meeting - Procurement notice - Laws/regulations published in official bulletins - List of pilot users - Database of product categories - Identification scheme	- Stakeholder buy-in[24] - Political will to implement e-Business solutions

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[22] http://ec.europa.eu/food/safety/rasff/index_en.htm
[23] Smartphones, PCs or similar input devices, internet and electricity
[24] This might involve agents that have an interest in keeping the status quo, e.g. border agents or custom brokers.

6.5 Other considerations for eCERT implementation

The generic implementation process described in Section 5 can be adapted and applied to the implementation of eCERT. Information regarding the cost of development and implementation of an electronic SPS management system is not generally available to the public. However, New Zealand spent about NZ$ 13-14 million from 1999 to 2002 on implementing the country's internal system including traceability, which amounts to NZ$ 19-20 million or US$ 12-13 million today.[25] About NZ$ 3.5 million of that amount was required for the export module, i.e. for secure web access and direct certificate exchange via SOAP. New Zealand spends about NZ$ 1 million annually on maintenance and improvements of the whole system.

Consultations with a number of experts and implementers indicate a general view, that the cost of implementing an electronic SPS IT system alone is about US$ 600,000-800,000. This does not include operation or the cost of driving adoption in-country by importers or exporters or making bi-lateral agreements with trading partners. Countries such as New Zealand and Australia have relied solely on public funding to support the development of their electronic SPS management system. However, other countries have used a mix of public-private partnerships for the implementation operation of electronic SPS certificate systems, see Figure 6.12.

Figure 6.11. Public-private partnerships as a model for funding the operation of electronic SPS certificate systems.

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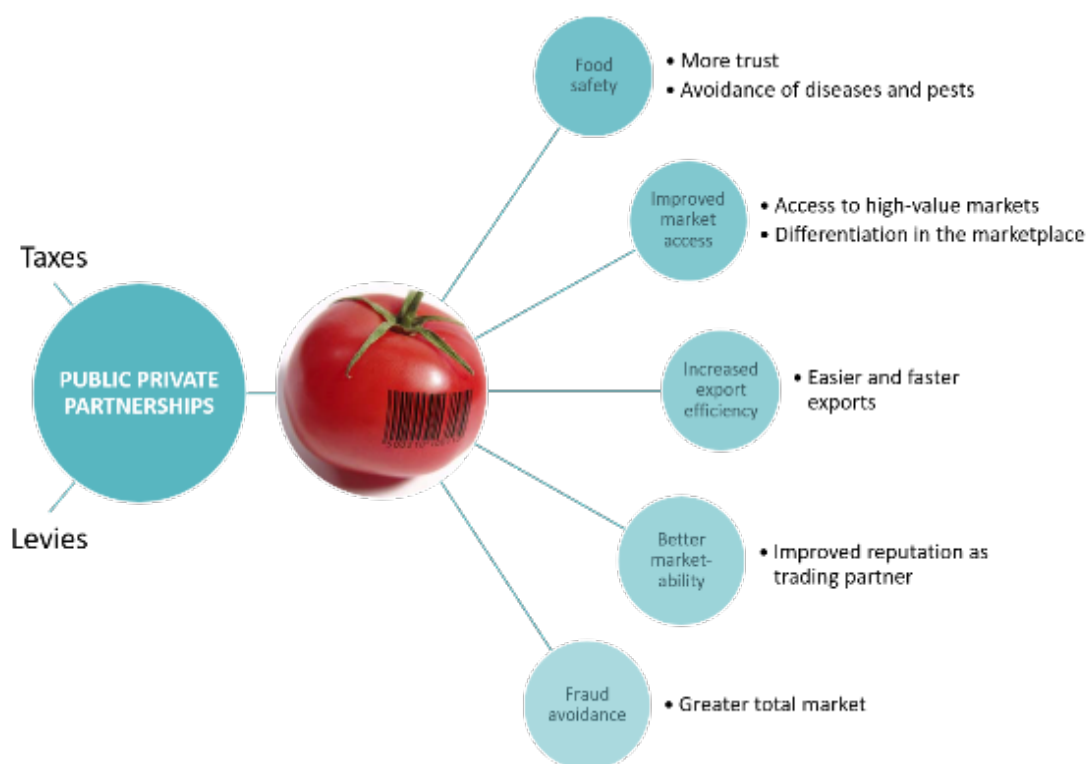
[25] Using historic inflation rates available at http://www.rbnz.govt.nz/statistics/key_graphs/inflation/

In the case of the Philippines, the electronic SPS system was developed for the Department of Agriculture by a private partner at no cost to the government. The development and the operation of the system would be funded by a transaction fee charged to traders (typically less than 1 USD per transaction). However, a transaction fee may not cover the full cost of past development, maintenance or the future evolution of the system. In particular, of the costs associated with certificate management, such as bilateral negotiations of the SPS measures required by importing and exporting country, are usually not covered by transaction fees.

Example: G2B2B2G process for imports into the Philippines

1. The importer electronically submits the SPS Import Clearance application to the competent authority.
2. Upon application approval, the import permit is issued to the importer; a copy of the import permit is transmitted to the exporter, which is then submitted as a support document to the application for the SPS Certificate to the SPS issuing authority in the exporting country. The said import permit contains specific conditions as may be required by the Quarantine Authority. In the Philippines, the import permit should be valid prior to departure of goods from the country of export.
3. Upon inspection of the goods, the SPS Competent Authority in the country of export issues the SPS certificate to the exporter and an electronic copy is transmitted to the import Quarantine Authority in the Philippines. The e-SPS Certificate follows the UN/CEFACT eCERT XML Message Specifications and includes the import permit reference number.
4. The import Quarantine Authority receives the electronic-SPS, and matches this with the import permit using the import permit reference number as the reference key.
5. If the electronic SPS is non-compliant to import requirements as specified in the import permit, the Quarantine Authority shall transmit a request for replacement, indicating the required section for clarification.
6. If compliant, the Quarantine Authority will use the data for quarantine inspection upon arrival of the goods at the port, and if everything is in order, the Quarantine Authority transmits a confirmation to the SPS issuing authority on the utilisation of the SPS Certificate. However, if there are findings requiring a replacement then a corresponding request is sent or the goods are rejected and barred from entry into the country.

Source: UNNExT Brief No. 18

Given that safe agricultural imports and exports are a matter of public health and a shared responsibility of trade partners, the use of public funds (i.e. taxes) to supplement levies is reasonable. Ensuring the safety of agrifood exports can boost the wealth of a country; generate jobs; and improve a country's reputation as a trading partner. Safe imports improve the public health and avoid animal- or plant-related diseases and pests entering the country, which can provide the basis for further exports. A good practice would be to look for different funding sources for the different stages of implementation process. Table 6.5 gives a summary of potential funding sources at different project stages.

Table 6.5. Sources of funding for different stages of system development

Stage	Funding Sources
Initial specification and development	International donor/ finance institutions Public funds for government involvement Private funds for development of the IT system
Piloting	International donor/ finance institutions Public funds for government involvement
Operation Adoption	Private funds, through transaction fee Public funds for government involvement in bi-lateral agreements Private funds for in-country adoption

6.6 SWOT analysis

A SWOT analysis is a structured planning method used to evaluate the strengths, weaknesses, opportunities and threats involved in a project or in a business venture.[26] The matrix below summarises the main benefits and challenges mentioned above.

Strengths
- Increased processing efficiency
- Integrity of SPS certificates
- Non-repudiation of SPS certificates
- More robust SPS processes
- Faster trade processes
- Compliance to laws/treaties

Weaknesses
- Additional cost for IT infrastructure
- Technical capacity required

e-SPS certificates

Opportunities
- Greater reputation as a trading partner
- Increased food safety
- Less diseases and pests
- Less fraud and increased collection of dues

Threats
- Lack of buy-in from senior government
- Bilateral negotiations slow
- Funding for development and operation
- Technical threats

The main weaknesses of implementing electronic SPS certificates relate to the need for funding and capacity for development.[27] The use of professional software providers might, to some extent,

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[26] (Lehr, 2015).
[27] The main strengths and opportunities were discussed in section 6.1.

mitigate the potential capacity gap. However, this introduces other risks, such as selection of the right service provider and ensuring the sustainability of the service.

There are also technical considerations, such as different versions of the eCERT standard in use simultaneously; new and emerging standards and protocols for electronic exchange; ongoing discussions on a hub or a point-to-point model etc. However, the main threat facing the implementation of electronic SPS certificate management would be the lack of buy-in from relevant senior government decision makers. Without high-level support, it is very difficult to develop and implement an e-SPS system successfully. Note that this requires alignment between different Ministries, such as the Ministry of Agriculture/Health, the Ministry of Commerce/Trade and the Ministry of Finance/Border Control.

The time and risks in reaching bilateral agreements on exchange of electronic SPS can also pose potential threats to the implementation of e-SPS system. If a country does not have a critical mass of trading partners willing to engage in electronic SPS certificate exchanges, the implementation of electronic management and exchange of certificates will be difficult for both the private and the public sector. Some countries have also slowed their progress on the implementation of electronic SPS certificate management, because their main trade partners do not yet accept electronic certificates. It is also important to clearly understand the advantages to a country by receiving the electronic certificate in order to facilitate adoption. Electronic management of SPS certificate has a series of advantages, even in the absence of trade partners for electronic exchange. Such advantages are:

- Increased processing efficiency means higher output with the same resources;
- Increased robustness of the process means lower risk of diseases and pests, which benefits their own economy either directly or indirectly through decreasing the potential spread of diseases and pests;
- Less fraud can mean more money for legal operators and more money for the country through the increased collection of dues;
- A better reputation as a trading partner, which can mean faster trade processes, increased trade and better positioning in the world market. This can boost the national economy and lead to greater consumer welfare.

6.7   The UN/CEFACT eCERT standard

The structure of an electronic SPS certificate has been published by UN/CEFACT as a global international standard under the name eCERT. The standard includes:

- A Business Requirement Specification (BRS) or Business Process Model, which explains the business processes that are supported by the eCERT standard;
- A Data Requirement Specification (RSM), which is a data model of the message and explains the data fields used in the message;
- A set of XML Schemas, which specify the structure of the message for electronic exchange of the certificates.

Information about the eCERT standard is available on the UN/CEFACT website (UN/CEFACT, 2008). The model provides an XML based message structure and associated data components suitable for use by developers in the building of eCERT compatible systems. The data structures of the eCERT are based on the CEFACT Core Component Library (CCL), which means that the data structures are compatible

with other CEFACT messages. The eCERT data model below describes the structure of eCERT components that are required to verify compliance with agreed requirements.

The **Certificate Header** comprises of base information relating to the whole consignment of goods shipped under the SPS certificate requirements. The certificate header section is primarily used for identification, traceability and authentication.

Figure 6.12. The eCert conceptual model
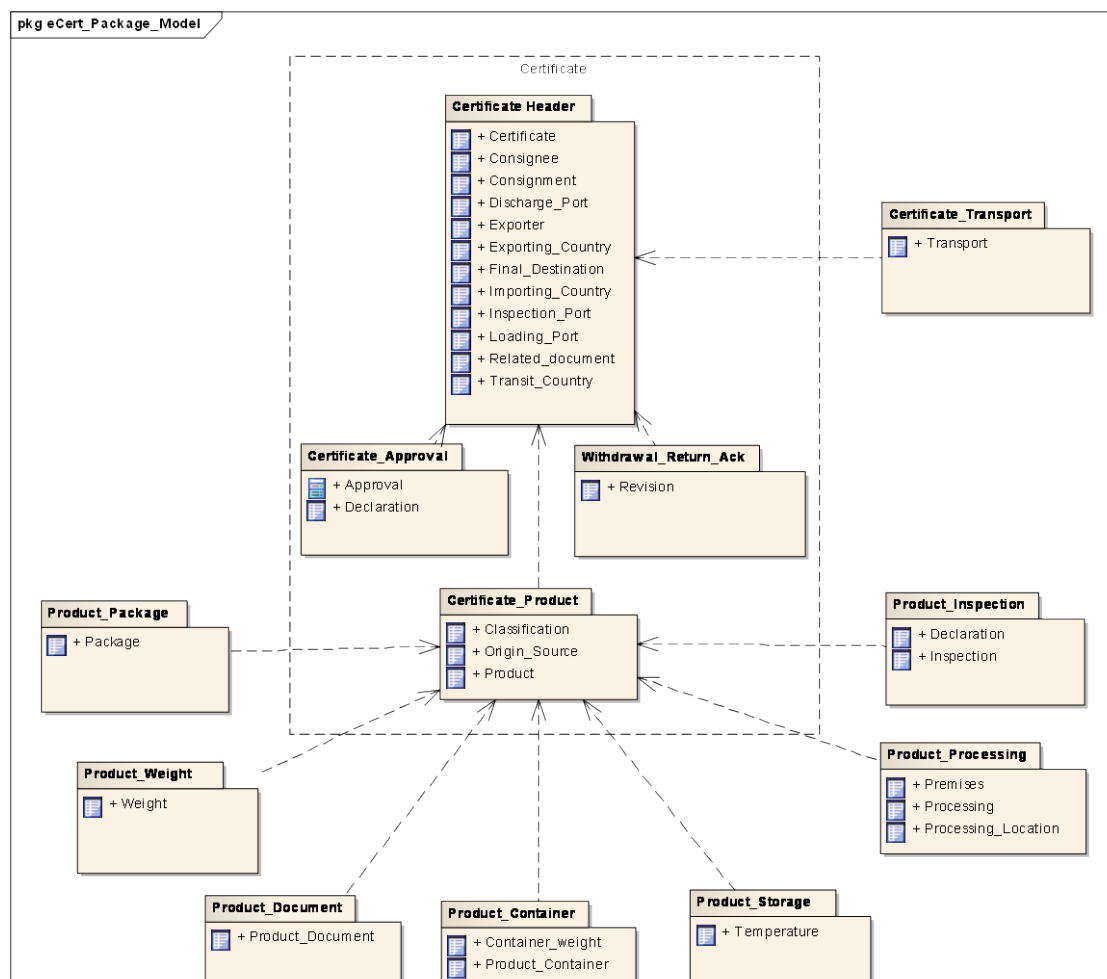
Source: *(UN/CEFACT, 2010)*

The **Certificate Transport** details identify the main carriage for this consignment, including routing details.

The **Certificate Product** details identify individual agricultural commodity items included in this consignment. This information will determine the type of certificate provided. It may also state the handling processes that were applied to the product, such as sterilization or packaging. It may be used by the border control authority to determine the level of inspection required at the point of entry.

The **Certificate Approval** comprises base information relating to the whole consignment.

The **Acknowledgement Document** comprises base information relating to the whole consignment.

The standard further defines a recognized data model and the implementation of sanitary and phytosanitary certification.

The current schema version at the time of writing is D.15A released on August 21st, 2015. This version contains the relevant SPS Certificate and SPS Acknowledgement schema in version 13.0. When implementing systems for the exchange of electronic SPS certificates, the different versions in use must be taken into consideration.

6.8   eCERT More information

More information is available on the eCERT website (UN/CEFACT, 2008) and in the references listed in the text. The eCERT schema is available from the UN/CEFACT website (UN/CEFACT, 2015).

The Netherlands Food and Consumer Product Safety Authority have created a website with short movies highlighting the different aspects of electronic SPS certification management systems. The website can be accessed via this link: http://www.clientexport.nl/ecertification.html.

Training materials from UNNExT can be found on unnext.unescap.org, in particular training materials from UNNExT Workshops on Trade Facilitation and Paperless Systems for Agrifood Products (UNNExT, 2015),[28] and within that "Streamlining and Automating Procedures for Agrifood Trade" (Lopez, 2015) and (Lopez, 2014). UNNExT Brief 18 outlines the case of the Philippines in streamlining and automating procedures for agrifood trade.[29]

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[28] http://www.unescap.org/events/unnext-workshop-trade-facilitation-and-paperless-systems-agrifood-products
[29] http://unnext.unescap.org/pub/Brief18.pdf

7 Electronic management and exchange of fishery information

7.1 Introduction

The world's fish stocks are being depleted due to overfishing and illegal, unreported and unregulated fishing. As of 2011, it was estimated that 28.8 percent of fish stocks were being fished at biologically unsustainable levels (FAO, 2014). This threatens not only the fish, but also the humans who depend on them. The breakdown or collapse of coastal fisheries has a direct impact on the economic well-being of the coastal communities, which rely on their fisheries for economic survival and as a dependable food source. According to the Marine Stewardship Council (MSC), "about 1 billion people largely in developing countries rely on fish as their primary animal protein source. In 2010, fish provided more than 2.9 billion people with almost 20% of their intake of animal protein, and 4.3 billion people with about 15 % of such protein" (MSC, 2015).

Why fishery management matters
The protection of the world's fisheries will not only ensure biodiversity in our oceans, but also regional economic success and employment. Without the sustainable management of fisheries, coastal fishing communities will see their fisheries collapse. Newfoundland in Canada is a clear example of this. "For centuries the cod stocks of the Grand Banks seemed inexhaustible. But in 1992 the cod fishery collapsed - and some 40,000 people lost their jobs overnight, including 10,000 fishermen. Nearly 20 years later, the cod have still not recovered. Science also indicates that the ecosystem has substantially changed, meaning that the cod may never make a comeback." (WWF, 2015)

In order to counter further depletion of this resource, global fish resources are managed by a large number of organisations. Some of these include:

- Regional Fishery Management Organisations (RFMOs)
  - In general, an RFMO manages a particular body of water. In addition, there are RFMOs for highly migratory species of fish, such as tuna, that are not bound to one particular body of water. Vessels fishing within the realm of an RFMO have to obtain a license and/or permission (in some cases linked to a quota) from the RFMO, so that fish stocks can be effectively managed. Through their flag states, vessels have to report catches.

- Coastal States
  - A key role of coastal States is to manage the fisheries of their own and other foreign vessels within their exclusive economic zone (EEZ).

- Flag States
  - A flag state is a state whose laws and regulations govern the commercial vessels registered or licensed by that state. Hence, a flag state has authority and responsibility to enforce regulations over vessels registered under its flag, act as a contracting party in RFMO and negotiate bilateral agreements with coastal States. It is also the responsibility of a flag state to a Fisheries Monitoring Centre (FMC), which receives and transmits reports and data to the FMCs of other flag states.

- International organisations
  - The European Union regulates and manages the fisheries for their own waters and also acts as an RFMO.

- Scientific bodies
  - These bodies advise on the state of fish stocks to governments and relevant authorities.

- The FAO
  - A UN organisation which works to combat global hunger; eliminate poverty and promotes sustainable management and utilization of natural resources.

Overfishing is largely due to poor management of fisheries; illegal, unreported and unregulated fishing (IUU); (by)catch of juvenile fish; oversized fleets; unfair fisheries partnership agreements; and destructive fishing practices (WWF, 2015).

In recent years awareness has grown with regards to the over-exploitation of the oceans resources and therefore several initiatives are seeking better ways to manage the sustainability of the world's oceans and fishery stocks. The World Wildlife Fund (WWF) report "Reviving the Ocean Economy", cites eight achievable actions for sustainable management of ocean resources:[30]

- Sustainable development;
- Decrease ocean warming and acidification by reducing emissions;
- Protect 10 per cent of coastal and marine areas;
- Ensure that over-exploitation, illegal fishing and the destruction of fisheries is addressed;
- International mechanisms for negotiation and collaboration;
- Appropriately structured public-private partnerships;
- Transparent and public accounting of the oceans benefits;
- Develop an international platform to share ocean knowledge.

The United Nations have recognised the critical role of the ocean and its resources in Sustainable Development Goal 14 (UN, 2015). Of the indicators proposed by the Global Ocean Commission for SDG 14, 4 out of 6 indicators relate to conservation of fish stocks (GOC, 2015).

An essential step for an effective management of fish resources is the timely acquisition of information which can be conveyed via monitoring systems in real time or reporting systems that require the user to declare record or send data to a central point (NOAA, 2011). The types of data exchanged include:

- The exchange of information between stakeholders on stocks and catches;
- Real time monitoring of vessel positions (VMS);
- Real time monitoring of on-going fishing activities by coastal parties;
- Reporting of fish landed and sales;
- Vessel data and characteristics;
- License and fishing authorisation requests.

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[30] (Hoegh-Guldberg, 2015)

Up until now the management of fisheries has been largely based upon the collection and exchange of large sets of data between various fishery institutions. The patchwork of data management solutions, which are being used to process very diverse data sets hinders data exchange, compromises data quality and greatly increases data management costs.

The FLUX (Fisheries Language for Universal eXchange) project has been initiated, in order to define a universal and efficient data exchange language that is compatible with (but not limited by) regulations and international requirements (UN/CEFACT, 2015). This e-Business standard has been developed so that it can be used by all organisations associated to fishery management. FLUX is now enacted by law in the EU. It is recommended that developing countries study implementation experiences of FLUX in Europe for a possible implementation of this standard in their own countries.

The key issues related to sustainable fisheries taken into account and addressed by the FLUX standard are the following:

- Fishing vessels can fish all over the world;
- Fishing is controlled by many organisations;
    - National authorities;
    - Fishing partnership agreements;
    - Regional Fishing Management Organisations;
- Monitoring is largely based on logbook data;
- Paper logbooks are gradually being replaced by Electronic Reporting Systems (ERS);
- Internationally there are different and incompatible ERS systems in place;
- Every new ERS version requires high costs for fishermen and flag state.[31]

The FLUX standard is an electronic logging and data exchange system based on UN/CEFACT standardised schemas, in addition to its Core Component Library. Schemas can be used for all data exchanges and processes included in the FLUX standard. The UN/CEFACT Core Component Library (CCL) is used to harmonise the data exchanged and published. The advantages of adopting these standards is that UN/CEFACT ensures that the system developed will be compatible with other standardisation projects where fishery data can be requested from sectors, such as Customs, trade and food and animal traceability.

The FLUX standard includes the data exchanges related to fisheries management and control. Future versions of the standard may include the exchange of scientific data, in order to determine total allowable catches and other fishery management instruments. The following business sub-domains are currently included in the FLUX standard:[32]

- UN/CEFACT Standard – CCL 13B (Completed)
    - P1000 - 1; General principles
    - P1000 - 7; Vessel Position domain
    - P1000 - 12; Aggregated Catch Data Report (ACDR) domain
- UN/CEFACT Standard – CCL 14A (Completed)
    - P1000 - 10; Master Data Management (MDM) domain

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[31] For more information see (DG Mare, 2013)
[32] (Honoré, 2015)

- UN/CEFACT Standard – CCL 14B (Completed)
  - P1000 - 1; General principles V2
  - P1000 - 7; Vessel Position domain V2
  - P1000 - 12; Aggregated Catch Data Report (ACDR) domain V2
  - P1000 - 2; Vessel domain
- UN/CEFACT Standard – CCL 15A (In progress)
  - P1000 - 2; Vessel v2
  - P1000 - 9; Fishing Licence; Authorisation & Permit (FLAP) domain
  - P1000 - 5; Sales domain
- UN/CEFACT Standard – CCL 15B
  - P1000 - 3; Fishing Activity (FA) domain

The most important component that requires standardisation is the fishing vessel monitoring system (VMS), so that fishery authorities can effectively monitor, control and carry out surveillance of vessels. The advantage of VMS is that it provides the fishery authority with "accurate and timely information about the location and activity of regulated fishing vessels" (FAO, 2015). The key aspect of the VMS system is that it is permanently installed on the vessel and assigns each participating vessel with a unique identifier.

Until now, the practice in fishery management has been for fishing vessels to record and report their activities using handwritten logbooks or in trial electronic logbook systems. However, these systems do not yet cover all the requirements for effective fishery managements. Logbook reporting has been subject to differing regulations depending on the country or RFMO that they report to.

Paper-based logbooks also have other significant drawbacks as shown in Figure 7.1. These drawbacks are largely due to the fact that paper documents are (a) easy to forge or manipulate; (b) prone to error and at times illegible; (c) lack in quality control mechanisms; and (d) subject to different bilateral agreements and format standards. Hence, paper-based logs are expensive to maintain and require large storage requirements with a high carbon footprint.

Figure 7.1. Differences in paper-based and electronic logging systems

	Paper-based logging	Electronic logging
Integrity	• No guarantee a report is valid • Difficult to consolidate • More scope for irregular behaviour	• Automatic unique report ID generation • Electronically secured log reports • Cross-checking in real time • Central database to register elogs
Efficiency	• Difficult to maintain and update in different data formats • Slower processing time • No automated validation	• Faster processing through pre-validation • Single view of all relevant information • Simple maintenance of forms
Security	• Higher risk of forgery and manipulation • Higher risk of illegal fishing practices • More difficult to identify patterns of fraud/misuse	• Very difficult to forge • Online verification • Searchable database with all logged data
Time	• More time to prepare • Longer time to deliver • More time to process	• Computer-assisted application preparation • Better informed decision making • Faster management through real time status

There have already been some initiatives to implement electronic logbooks, although these are usually in disparate formats. As a result, vessels have to report using different logbook formats depending on their fishing location. This creates extra costs for vessels as well as difficulties for control and management. FLUX resolves these issues by providing one international standard for the exchange of reports.

7.2 How FLUX works

The following describes what is required to implement the FLUX standard for electronic messaging exchanged between fishing vessels and the Fishery Monitoring Centre (FMCs) of their flag states, as well as from FMCs to RFMOs and other stakeholders, such as the Fishing Authorization Delivering Authority (FADA) or the Central Licence & Authorization Provider (CLAP).[33] For partial projects (e.g. vessel to flag state only) the project proposal should only consider the relevant parts.

FLUX involves two distinct, but related parts: The transportation layer and the business layer (also known as the FLUX messages).

The FLUX transportation layer, although not yet within the scope of the UN/CEFACT standard, describes one single, universal message format (FLUX envelope) that can encapsulate any business specific message or structured data in a predictable way. The FLUX transportation layer also includes a mechanism describing how to reliably deliver the FLUX envelope to its destination using state of the art technology (SOAP and Web Services), in order to avoid any interoperability issues that may arise from different solutions used by venders to implement FLUX.

The core of the FLUX e-Business message is the FLUX business layer. The FLUX business layer contains the detailed and standard description of each required data element, as well as the standardised grouping of those data elements in the messages required for exchanging data between parties. Figure 7.2 shows the FLUX business layer sub-domains and the way in which they would interact with the various parties once all phases of FLUX implementation have been completed.

Figure 7.2. Business sub-domains that will inherit the business layer standards.

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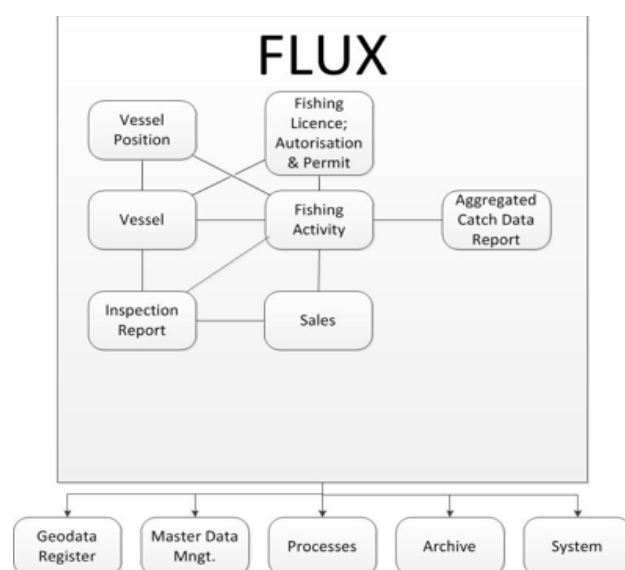
[33] For more details see (Honoré, 2015)

Not all parties are involved with all aspects of the fisheries business. Therefore, the FLUX business layer is based on individual stand-alone business modules, allowing various parties to implement only the modules they need. However, after implementing one module, it should be easier to incorporate extra modules as required. In terms of implementing FLUX, a four phased approach is recommended:

1. Vessel monitoring system (VMS);
2. Vessel logbook (ERS);
3. Implementation of the transport layer;
4. Implementation of tools for reporting, e.g. to relevant RFMO.

Note that for those countries, which do not currently have VMS, a project is currently under way to develop an online monitoring tool to track a vessel location. This monitoring tool would work in a similar way to Google Maps. Most coastal States want to know what their own vessels and foreign vessels are doing in their waters. For developing countries, who do not have the political weight to force foreign vessels to adopt their national software standards, a solution based on a global standard is preferable. Without such a solution, coastal States would not be able to perform their role as a flag state.

The ultimate goal for implementing FLUX is to create a bridging network that makes it easy to contact locally implemented software via the transport layer. This will allow for the transformation of information within local systems into UN/CEFACT FLUX messages, which can be exchanged between the parties. For example, the plan for the FLUX implementation in the EU is to create a central node in Brussels, so that countries can configure their software to transmit data via Brussels to another countries. Hence, the central node in Brussels would take care of forwarding the message.

Currently, there are no off-the-shelf software solutions available for FLUX. However, the European Commission's Directorate General for Maritime Affairs and Fisheries (DG MARE), is considering releasing, to interested parties, open source software for transportation layer software, VMS software (by the end of 2015) and an ERS software (by mid-2016). Fishery authories who are considering the implementation of FLUX may want to contact DG MARE through official channels for further information.[34]

There is also a technology stack available for any party wanting to add additional modules to their software. Parties who implement FLUX should develop their own, proprietary software following the standards outlined in this manual.

Messages exchanged in the FLUX system

The following parties exchange information in a FLUX message exchange system:

Vessels

- Data transmissions to FMC;
- eLogging vessel activity;
- Transmitting vessel location (e.g. from a Vessel Monitoring System, VMS);
- eLogging of catch data;
- eLogging of landing and sales data;

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[34] http://ec.europa.eu/dgs/maritimeaffairs_fisheries/about_us/contacts/index_en.htm

- eLicense requests with Local Administration/CLAP.

Flag State Administration (FMC)
- Data transmission responses to Vessels;
- Data transmission requests to CLAP/FADA;
- Data transmission to other FMCs;
- Data transmission to RFMOs .

Regional Fishery Management Organisations (RFMO) or Coastal States
- Querying of fishing activity;
- Data transmission to scientific or government bodies.

The FLUX standard includes a protocol for requesting information, the exchange of the information itself and the acknowledgement and rejection of information exchanged. The information exchange protocol is listed below.

The general process for FLUX business message exchange

1. The sender composes a message
2. The message is sent to the recipient
3. The system of the recipient analyses the received message and validates the XML
4. Depending on the content of the received message, the message can be:
   - Stored
   - Used for elaborated monitoring
   - Used for validation
   - Used for cross checking
5. In all cases, the recipient formulates a single return message and sends it using the transport layer back to the sender. The return message can be:
   - A simple business acknowledgement of receipt
   - A warning that the business content is not accepted by the recipient
   - A complex set of data
6. In all cases, the sender of the message is receiving one business reply from the recipient.
7. The single return message (response entity) can either be:
   - A rejection (in case of errors)
   - An acceptance containing the business response
8. Two alternative scenarios are also foreseen:
   - Report mechanism: where the sender (data owner) sends data to a recipient.
     - The recipient sends a response message:
       - Acceptance message: received, valid and processed
       - Rejection message: content rejected – invalid format
   - Request mechanism: Sender requests data from recipient (data owner)
     - The recipient sends a response message
       - A Rejection: cannot or refuses with/without explanation
       - A response message: Query dependant and contain extra business data defined domain by domain

A software system implementing the FLUX standard could consist of the following modules:

Figure 7.3. Typical modules of an electronic FLUX standard system
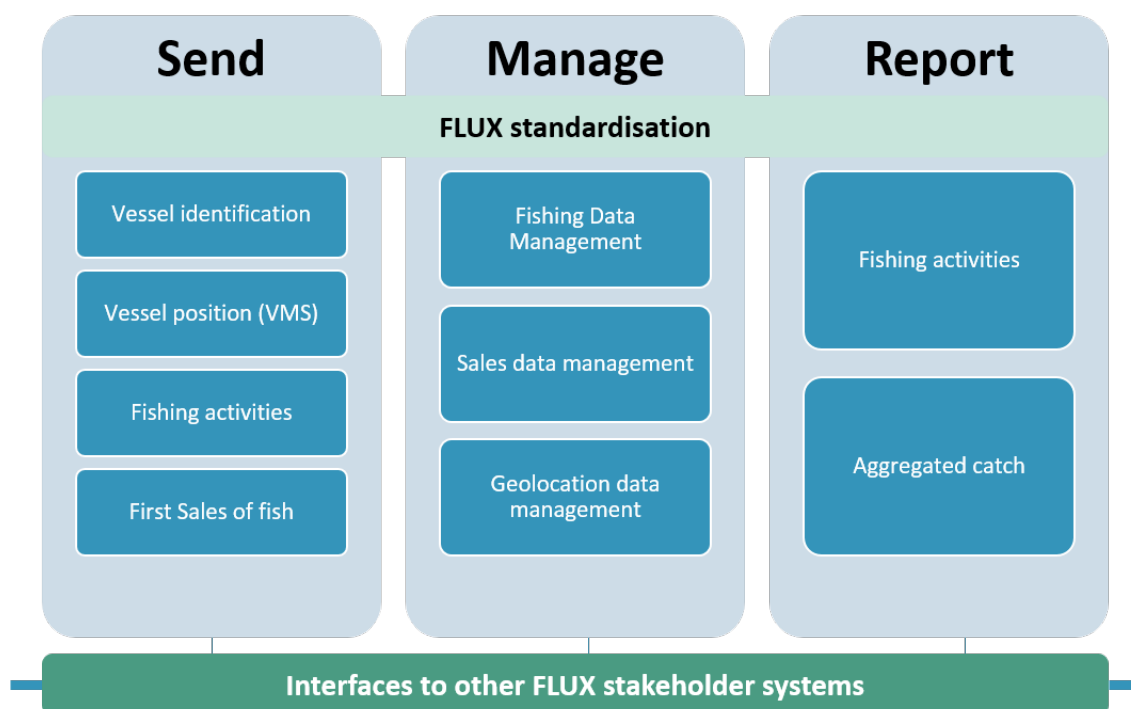
Send Module:

It is recommended to use the Send Module to allow for FLUX standardised message data to be sent between a vessel and their FMC via the FLUX transportation layer. From a vessel perspective, the five key messages to be implemented are vessel identification, position (VMS), activities, licensing and first point of sale when the catch of fish is delivered to a port. Vessels can send messages to report on the following activities[35]:

- Vessel departure and return to port;
- Loading/ unloading operation;
    - Landing;
    - Transhipment;
    - Relocation;
    - Discard at sea;
- Fishing operation: report on daily activity or after catch operation (haul-by-haul);
- Entering and exiting areas: i.e. a particular fishing zone (e.g.: NAFO regulatory area);
- Fishing data;
    - Species and quantity;
    - Catch area;
    - Event date and time;
    - Gear used;
- Additional data;

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[35] (Honoré, 2015) (Honoré, 2015)

- ▪ Vessel identification;
  - • Link to vessel characteristics;
- ▪ License/Authorisation Document;
  - • Link to FLAP document;
- ▪ Trip identification;
  - • Grouping events to clearly identify dependencies;
- • Fishing Activities;
  - ▪ Notification: event will happen in the future;
  - ▪ Declaration: event has already happened.

The key to the FLUX messaging and recording of vessel activities is the Universally Unique Identifier (UUID) following the RFC 4122 standard. The UUID is 128 bits long and can guarantee uniqueness across space and time and requires no central registration process[36]. The UUID identifies all activities and transactions in FLUX. Vessels are listed in the FAO global fleet registry with the so-called Unique Vessel Identifier (UVI), which is generated by the IHS-Maritime (formerly Lloyd's Register-Fairplay). This unique ID remains with the vessel for its entire life to ensure traceability through reliable, verified and permanent identification of the vessel (FAO, 2015). Currently, the only link between the vessel UVI and the activities of that vessel are registered manually in the vessel logbook. By implementing FLUX, every activity recorded will have a UUID linked to the vessel's UVI. This will allow for better management and control of vessels activities.

Manage Module:

The Manage module allows the collection of harmonised message data. The manage module also acts as the response hub to incoming and outgoing messages to notify senders whether their requests have been accepted or rejected using the appropriate message. The responses are sent to any sender that has legal authority to request or query the data base including vessels, FMCs, RFMOs, other coastal authorities, CLAP and FADA.

Report Module:

The reporting modules allow an FMC to send data to other stakeholders or it allows stakeholders to query data on fishing activity. In the EU, the stakeholders include, DG MARE, member States, EUROSTAT and third parties. The data which can be sent using this module include:
- • Logbook data;
- • Landing and transhipment declarations.

The reports are designed to provide important information about vessel activities, including aggregated catches and vessel activities. The data that a flag state can report includes:

- • Notifications;
- • Logbook data;
- • Landing and transhipment declarations.

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[36] For more information see (RFC Base, 2015)

7.3 The implementation process

Figure 7.4. FLUX implementation paths

START

eLogging

What
Acceptance of eLogging by vessel owners

Why
Understanding vessel location
Understanding fishing activity
Monitoring sales activities
eLicence authorisation
Reduce paper requirements

Reporting

What
Issuance of data reports

Why
Aggregated catch reports
More robust fisheries control
Better fishery management
Protection of fish stocks
Better scientific understanding
Fraud reduction
Combatting illegal fishing

eLogging and Reporting
Better management of fisheries· Efficient administrative processes
· Reduction in illegal fishing · Better trade statistics

Effective fishery management requires understanding the activities of vessels, in order to start building a data knowledge base, which enables the monitoring of a vessel's movements and activities. The priority of FLUX has so far been to focus on the implementation of FLUX data messaging between an FMC and their vessels.

For an FMC, Phase 1 of implementing FLUX would focus on establishing a fleet register. Ideally, FLUX would be set up so that vessels would only need to transmit their IDs, this would mean that a vessels masters would not be required to continually provide the characteristics of their vessel to the FMC. This would help to establish one of the key elements in creating a fully integrated fisheries data management system. Phase 2 would focus on developing the electronic logbooks of vessels; the data exchanges between vessels and the FMC; and the storage of that data in a data management system. The FMC would then require all vessels to use the FLUX protocol. The FMC might also define or even provide software for vessels for this purpose. Phase 3 would focus on the data communications and reporting channels between the FMC and their appropriate RFMO. Phase 4 would focus on supporting the electronic request for fishing licences by a vessel or agent to their FMC to access waters outside their jurisdiction, either that of another FMC or in international waters. A bilateral communication agreement could be established directly with the country having authority to deliver the authorisation, the Fishing Authorisation Delivery Authority (FADA), or optionally, with the Central

License & Authorisation Provider (CLAP, e.g. European Commission or Agency), who would act as the controller and send the request to the appropriate FADA. RFMOs may also want to develop a FLUX communication system with their counterparts.

In Figure 7.4, two implementation approaches are suggested, depending on the country's most pressing needs. The first path starts with eLogging and transfer of data between an FMC and its vessels. This will enable the FMC to better control implementation of their fishing policies and adherence to licenses issued. It will also reduce the need for foreign vessels to transmit information in different formats world-wide. The second part starts with the reporting side. This will allow the FMC to send summary reports to the RFMO or any other relevant stakeholders that request such data. The implementation of this process leads to better overall management of the fish resource within the realm of the RFMO. Efficient management of fish resources requires the implementation of eLogging and Reporting for both the country's own vessels and of foreign vessels in the country's own waters.

Electronic eLogging between FMC and vessel

If implementing eLogging for vessels first, the typical implementation process is 3-tiered path, which is summarised in Figure 7.5. In a first step the various FLUX modules for tracking vessel activities and vessel identification are implemented. It would be a best practice to start developing either the VMS system with FLUX standard messaging to enable better vessel location tracking and/or the electronic logging system to monitor the fishing activities of vessels. In a second step, the data messaging that is being set up needs to be stored in a database that is specifically designed to process the FLUX data messaging standard. This should be based on the UN/CEFACT Core Components. The third step would involve opening up access and reporting for other stakeholders via the Master Data Management component to ensure data can be exchanged with RFMOs and other coastal authorities. FLUX already standardises the aggregated catch report for this purpose.

Electronic eLogging between foreign FMC and vessel

The implementation process is the same for the foreign FMC, although the goal would be to set up a data exchange messaging link between multiple FMCs, RFMOs and other coastal authorities. The major difference here is the inclusion of the implementation of eLicensing for the Fishing Licence Authorization and Permit (FLAP) to enable management access to different fisheries[37].

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[37] As different countries will require different licenses for different for purposes and fisheries.

Figure 7.5. Implementation steps of FLUX standards with main tasks and benefits

Communication with own vessels

Communication with foreign vessels

I. Electronic Logging

Electronic logging of vessel activity
Electronic communication of vessel location (VMS)
Electronic logging of catch data
Electronic logging of landing and sales data
Electronic License requests

Key Benefits
•Greater processing efficiency
•Greater control of Vessel activities
•Consistent and real-time collection of information
•Central registry of vessel data
•No paper logbooks
•No duplication of paper work
•Real-time license processing

Key Benefits
•Integration with foreign vessel data.
•Better control of foreign vessel activities
•Consistent and real-time collection of information
•Real-time license processing
•No duplication of paper work
•Central registry of all vessel data
•No paper logbooks
•No duplication of paper work

I.Electronic Logging

Electronic logging of vessel activity
Electronic communication of vessel location (VMS)
Electronic logging of catch data
Electronic logging of landing and sales data
Electronic License requests

II. Electronic Reporting

Integration of Vessel data
Aggregation of catch data
Landing and first sales data

Key Benefits
•Greater processing efficiency
•Better Fishery control
•High quality data exchange
•Report standardisation
•Quick communication channel to stakeholders

Negotiations
Intergovernmental discussions
Vessel buy in
FMC & RFMOs

Key Benefits
•Greater processing efficiency
•Better Fishery control
•High quality data exchange
•Report standardisation
•Quick communication channel to stakeholders

II. Electronic Reporting

Integration with RFMOs
Integration of Vessel data
Aggregation of catch data
Landing and first sales data

III - Electronic Data exchange

Central Data Repository
Data exchange with FMCs, RFMOs and other Stakeholders
FADA fishing Licenses and permits
Landing operation to first sale

Key Benefits
•Cost savings
•Central Repository
•Greater processing efficiency
•Less paper
•Detection of illegal fishing
•Non-repudiation of data
•Better monitoring of Vessels
•Improved auditability
•Identification of illegal fishing
•Better scientific advice

Key Benefits
•Cost savings
•Central Repository
•Greater processing efficiency
•Less paper
•Detection of illegal fishing
•Non-repudiation of data
•Better monitoring of Vessels
•Improved auditability
•Identification of illegal fishing
•Better scientific advice

III - Electronic Data exchange

Central Data Repository
Data exchange with FMCs RFMOs and other Stakeholders
FADA fishing Licenses and permits
Landing operation to first sale

7.4   Contribution to the national economy

The following section summarises how the electronic gathering and exchange of fishery information contributes to the national economy using the logframe approach.[38] This information should help project managers to draft a project proposal and submit it for funding from donor agencies. A typical results chain is shown in Figure 7.6. The results chain summarises the results a project expects to achieve. The results chain shown will need to be adapted to the particular project and the country's realities. It should be based on evidence regarding what has worked in the past and take into account lessons learned, evaluation and research evidence available that underpins the design of the project. The evidence will also enable identification of realistic targets and in particular a reasonable assumption how much change might be achieved over the project period (DFID, 2011).

Figure 7.6. A typical results chain for the implementation of FLUX standards
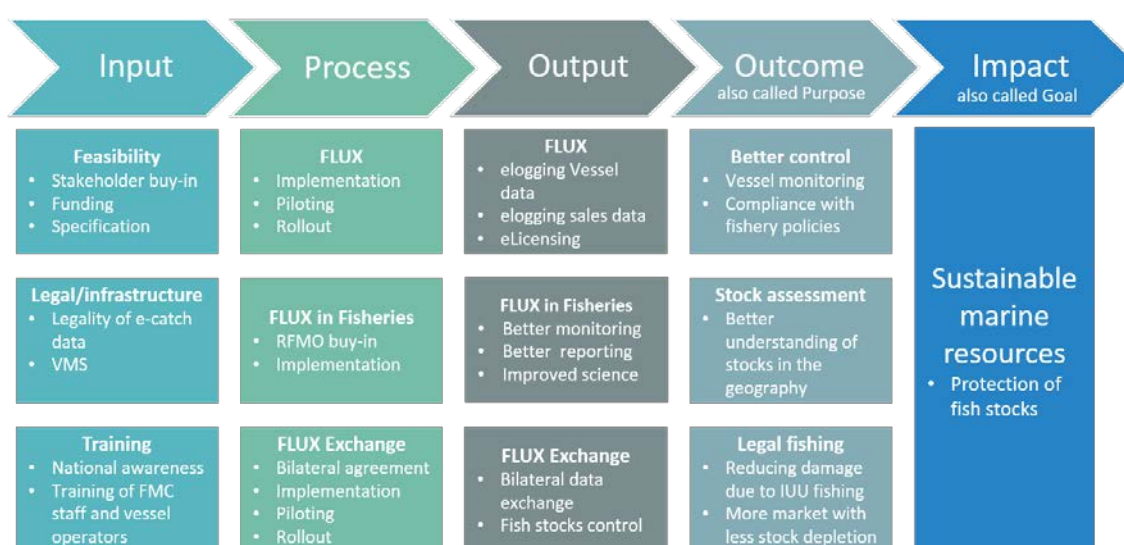
An alternative representation is shown in Table 7.1 below. The above results chain focuses on the results and does not list either inputs or indicators (i.e. how the result is measured). The below reproduced "logframe [matrix]" shows in addition indicators, data sources and assumptions. The logframe needs to be adapted to the specific project and the available information/experience. It is essential to demonstrate coherent, robust measures of success in the logframe. This is particularly true for baseline measurement, without which change cannot be demonstrated. It is also important to have milestones which act as an early-warning system, indicating how a project is progressing along the predicted trajectory (DFID, 2011).

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[38] For more information see (EuropeAid, 2004; DFID, 2011; World Bank, 2005; USAID, 2012).

	Description	Indicators	Data Sources	Assumptions
Go	- Sustainable marine resources	- Stock assessments	- RFMOs	- Sustained consumption of fish - Good scientific base for stock assessments
Pu	- Better control - Stock assessment - Legal fishing	- Less reports of overfishing - Better information base for stock assessments - Less reports of IUU activities	- Landing reports, NGOs - Scientific community - Law enforcement, NGOs	- Inspectors and law enforcement officers properly trained - Active scientific community - Systems secure against intrusion - No corruption of inspectors and law enforcement officers
pu Su	- Vessel monitoring - Compliance with fishery policies - Better understanding of stocks in the geography - Reducing damage due to IUU fishing - More catch with less stock depletion	- Knowledge of vessel position at all times - Compliant landing volumes - Less reports of fishing in protected areas - Less reports of IUU activities - Economic health of legal fishing sector	- Monitoring system + spot checks - Landing certificates - Law enforcement, NGOs - Law enforcement, NGOs - National statistics	
Ou	- eLogging Vessel data - eLogging sales data - eLicensing	- Highly available system with >99% uptime - Foreign vessels properly managed - Own vessels properly managed in foreign waters - Law enforcement able to access licenses & permits	- Operations report of FLUX system - Incidence reports - Experience report/interview with law enforcement officers	- Proper training of all stakeholders - VMS installed on vessels - Online resources for guidance - IT infrastructure available on board - RFMO buy-in
Inp	- Feasibility study - Funding - Specification - Legal framework - Technical infrastructure - Training - Identification of implementation partners	- Feasibility report - Project approved and funding available - Implementing partners identified and contracted - Legal base established - Pilot users identified	- Feasibility report - Minutes from approval meeting - Procurement notice - Laws/regulations published in official bulletins - List of pilot users - Database of product categories - Identification scheme	- Stakeholder buy-in[39] - Political will to implement e-Business solutions

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[39] This might involve agents that have an interest in keeping the status quo, e.g. foreign or local fishermen.

7.5 Other considerations regarding implementation

Details on the cost of developing FLUX message standards is not clearly understood due to the early stages of the FLUX project. Costs can vary depending on the type of system that a party has and in particular, if there is an existing legacy system. After consulting with one of the key parties involved with the FLUX project, an indicative figure of EUR 500,000 may be required to develop a system with typical reporting capabilities that is able to read and store FLUX messages. This does not include the ongoing operation costs following implementation.

Whilst there is no public software currently available, DG MARE is willing to provide the FLUX transportation layer software to interested parties. Furthermore, taking into account the challenges that developing countries face in developing software as well as the importance of FLUX for sustainable fishery management worldwide, DG MARE is considering releasing a reference implementation of the FLUX system into the public domain. DG MARE has a strong interest in the implementation of FLUX, in order to more effectively manage its fleet and its fish resources. DG MARE is in the process of replacing NAF (The North Atlantic Format) electronic data transmission with the UN/CEFACT FLUX standard. [40] DG MARE currently has an agreement with Norway to test FLUX and have a fully operational using FLUX messaging protocols before June 2016. DG MARE is also working with the FAO to build a global vessel/fleet register using the FLUX messaging standard.

Since the protection of fisheries is in the national interest, it is certainly in the public interest to support initiatives such as the FLUX project through the use of public funds. Hence, governments would therefore be investing in fishery jobs; the sustainability of fisheries and national income in respect of the exportation of fish products, for both human consumption and health products. Other sources of funding for the FLUX project should also be considered including public-private partnerships.

7.6 SWOT analysis

The SWOT analysis matrix summarises the main benefits and challenges of implementing the FLUX e-Business standards. The main strengths and opportunities of implementing FLUX have already been discussed in section 7.1 of this chapter. The main weaknesses of implementing FLUX are related to the need for funding and the capacity for software development and implementation. The use of professional software providers might to some extent mitigate the risk associated with lack of capacity. However, this introduces other risks, such as selection of the right service provider, economic capacity and sustainability.

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[40] For more information see: http://www.naf-format.org/index.htm

Strengths

- Improved fishery management
- Increased control over own fishing fleet
- Increased control over foreign vessel activity
- Improved fish stock assessment
- Less IUU fishing
- Compliance to laws/treaties

Weaknesses

- No off-shore communications
- Additional cost for IT infrastructure, in particular VMS systems on board
- Potentially incompatible with existing legacy ERS systems
- No free reference implementation

FLUX

Opportunities

- Sustainable fish resources
- Combating fraud and illegal fishing, leading to more market for legal operators
- Cost reduction of information gathering
- Better stock assessments

Threats

- Lack of buy-in from FMOs
- Lack of buy in from vessel owners
- Technical capabilities of vessels
- Funding for development and operation

Another weakness is that there is currently no public domain reference implementation of FLUX is available for parties to develop their own FLUX based fishery management system. Each party must develop their own system, which must adhere to the FLUX standard. Having to develop the modules can be costly and require specialized technical skills, which may not be readily available. However, this might change, if DG MARE releases its reference implementation to the public domain or even provides a cloud-based reference implementation that nations can then simply adopt.

Other weaknesses pertain to the fact that for smaller vessels there may be no off-shore communications between themselves and FMCs. The costs of implementing a technically advanced system may also hinder buy-in from vessel captains. The issues relating to paper-based logging have been covered in section 7.1 and the challenge is the cost of implementation of VMS and ERS (including the necessary capacity building). There are also some legacy Electronic Reporting Systems currently in use, which might not be compatible with the FLUX standard. The feasibility study needs to be assess whether the legacy Electronic Reporting Systems can be encapsulated in a "FLUX wrapper" or whether it makes more sense to replace them.

The main threat to a FLUX implementation is the lack of buy-in from RFMOs, who may not see the potential savings that FLUX can generate through the harmonisation and standardisation of reporting practices. Coastal States, in partnership with RFMOs, will also benefit from being able to get members to deliver data faster, cheaper and more efficiently. The key to successful implementation of FLUX is to ensure the support of the flag states, even though they may face difficulties in terms of their fleet and the technical capabilities of their vessels. The benefit to the flag state, who can belong to several RFMOs, in supporting the implementation of FLUX is that they will be able to use FLUX standard and

technology in many fishing zones. Without the support of the flag state, it will be impossible to convince the vessel fleet of the benefits of implementing the FLUX messaging standard.

7.7   The UN/CEFACT FLUX standard

The structure of FLUX standard has been published by UN/CEFACT as a global international standard under the name FLUX. The standard includes:

- Business Requirement Specifications (BRS) or Business Process Model, which explains the business processes that are supported by FLUX, including the FLUX business layer and FLUX transportation layer;
- The UN/CEFACT standardised schema for business processes, a technical file called XSD (XML Schema Definition);
- UN/CEFACT standardised content (Core Component Library).

Information about the UN/CEFACT FLUX standard can be found in the report from the 25th UN/CEFACT Forum[41] or at the UN/CEFACT UNECE website.[42]

Figure 7.7. Overview diagram of classes used in General Principles document
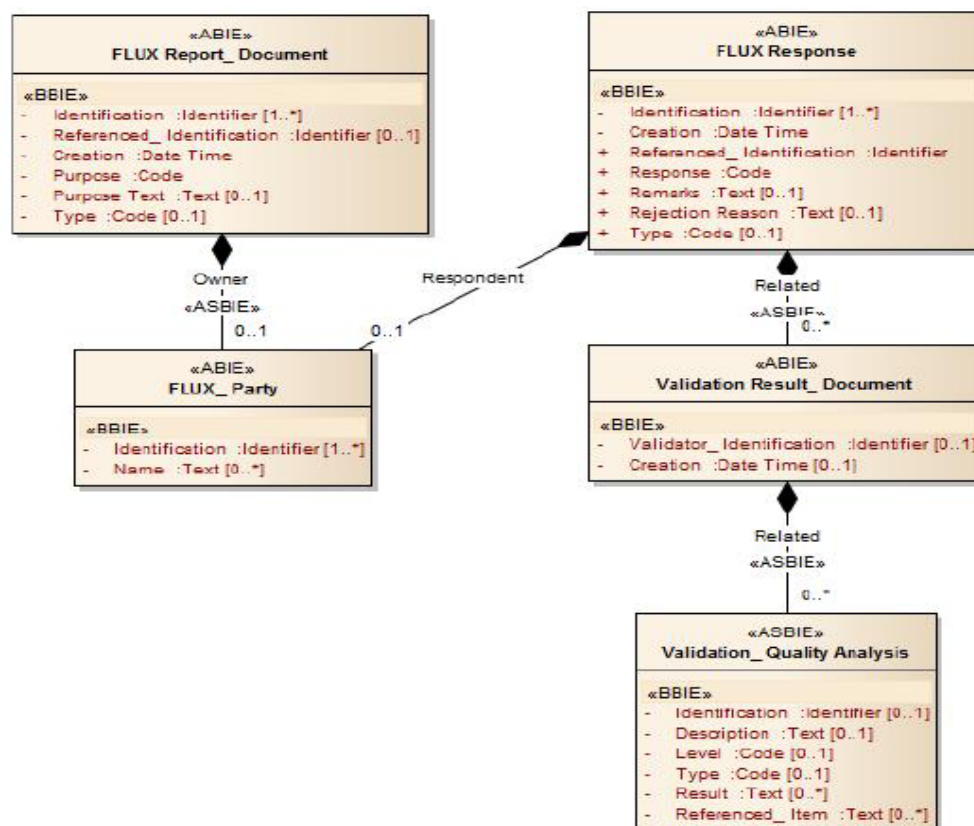
Source: UN/CEFACT

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[41] For more information see (Honoré, 2015)
[42] For more information see (UN/CEFACT, 2009).

The diagram of classes used in General Principles diagram in Figure 7.7 demonstrate the FLUX components that are required to comply with the UN/CEFACT data messaging standards (UN/CEFACT, 2015). This diagram does not include all the sub-business domains components, which are defined in their own BRS documents. The General Principles flow is designed to handle data exchanges between parties and sub-business domains using the same standard. For more information on each business sub-domain class diagram, please refer to the individual BRS documents:

- P1000 – 2; Vessel Domain (v3.0.0)
- P1000 – 3; Fishing Activity domain (v0.0.4)
- P1000 – 5; Sales domain (v0.4.0)
- P1000 – 7; Vessel Position domain (v2.0.2)
- P1000 – 9; FLAP domain (v0.2.1)
- P1000 – 10; MDM domain (v2.0.3)
- P1000 – 12; ACDR domain (v2.0.2)

The **FLUX Report Document** (FLUX Business Layer Message) comprises of information for any message to be exchanged between a reporter and recipient. Identification is defined by a Unique Universal Unique Identifier (UUID) following the RFC 4122 standard.[43]

The **FLUX Party** entity comprises of information about an individual, a group or a body, which has a role in a Fisheries Language for Universal eXchange (FLUX) business function.

The **FLUX Response** comprises of information sent to recipients confirming whether a data message has been accepted or rejected.

The current version at the time of writing for the General Principles BRS was v2.1.2. The versions of all BRS documents available at the time of writing have been included above. Parties should be aware that the BRS documents are works in progress and it would be advisable to check on the latest versions by visiting the UN/CEFACT web site.

7.8   More information

The UN/CEFACT website:
http://www.unece.org/cefact.html

The Master Data Register static pages:
https://circabc.europa.eu/w/browse/3cc8c417-0f2a-4eb4-8ff7-10d60638446a

Information on the EUPL:
http://opensource.org/licenses/EUPL-1.1

UN/CEFACT Modelling Methodology User Guide (CEFACT/TMG/N093)
UN/CEFACT Business Requirement Specification Document Template (CEFACT/ICG/005)

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[43] Note that this is done systematically for every individual message to be sent.

8 Electronic management and exchange of laboratory analysis information

8.1 Introduction

The increased occurrence of food safety crises and the rising concern over food safety is resulting in closer control by businesses, importers, retailers and public authorities of various aspects of the agrifood supply chain. Furthermore, there is also a growing need for faster, more efficient and sustainable supply chains to avoid wastage of perishable agrifood products. This has led to the development of an electronic standard to facilitate the exchange laboratory analysis data. The eLaboratory Observation Report Message, or eLab for short, is a new standard developed to modernise the exchange of information for laboratory observations in the agrifood supply chain.

The exchange of laboratory analysis results is one of the major data flows in the agrifood supply chain. As a response to the inherent inefficiencies, the Dutch government and standardization organizations initiated project LEIDRAAD, in order to develop consistent standards for the agrifood supply chain. The key organizations involved in the setup of this project were AgroConnect, Floricode (Florecom), EDI-Bulb and Frug I Com.

Why eLAB matters
In the global agrifood industry, the proof of product compliance with legislation and market standards is becoming ever more important. As demands from retailers, food trade partners, quality control agencies and government authorities grow for detailed reports on residue observation in agricultural products (Ernst & Young Advisory, 2013), the standardisation of laboratory reporting has become more important than ever to complement and drive efficiencies in the agrifood chain. This realisation has fuelled the conception and initial implementation of eLAB in the Netherlands and France. The pilot projects have already seen early improvements both in the laboratory and in the agrifood supply chain and promise to be the foundation for implementing eLAB around the world.

The first pilot project implementations of eLab in the Netherlands focused on residue analysis in fruits and vegetables and soil and crop analysis.[44] Prior to the initiation of the eLAB pilot project in the Netherlands, many custom-made solutions existed between producers, cooperatives, traders, packers and retailers. This made the exchange of information between stakeholders in the agrifood supply chain difficult and inefficient. These projects have shown that the exchange of standardised messages can reduce sample analysis turnaround time by 90 minutes per analysis and also provide a 15 minute time saving per sample at the laboratory.[45]

The French Ministry of Agriculture has also decided to initiate a pilot study for the implementation of eLAB to replace its current messaging system.[46] An experimental Electronic Data Interchange (EDI) station has been built and is now in the testing phase. Other nations that have already shown interest in adopting similar systems include China, New Zealand and the United States.

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[44] (Ernst & Young Advisory, 2013).
[45] Time between reception of an analysis sample to return of the results
[46] The pilot study was on-going at the time of writing this Handbook. .

The aim of eLAB is to standardize the exchange of information across heterogeneous systems nationally and globally. The key objectives include:[47]

- Harmonization of laboratory analysis data exchange including:
  - The harmonization of technical data;
  - The development of a consensual data dictionary for laboratory observation reporting;
  - The development of a standardized laboratory observation reporting message (LOR);
  - The implementation of an electronic laboratory observation report message.
- Providing information to stakeholders such as producers, growers, quality control agencies and authorities more efficiently and in a shorter timeline;
- Improving quality controls and food safety.

The eLAB messaging system uses Extensible Mark-up Language (XML) to transmit messages between the laboratories, farmers, food producers and cooperatives. eLAB can be used for the exchange of information regarding the analysis of samples taken from agricultural observations, such as water, soil, agricultural commodities, plant products, animal products and live animals. The results of these observations are used to obtain information on the quality of soil, water, crop products, animal products, or health information about plants or animals (Diepen, 2014).

Having a standard for the exchange of such information allows farmers and cooperatives to integrate this information into farm management systems. Cooperatives can then use this information to dispatch better guidance to farmers. Farmers can use it to manage their production in relation to the analysis results. For example, the information can be used to suggest which fertilizer should be used, in what quantities, for which crop and during which season. It can also assist in determining the health status of live animals or identify the chemical residues in products, in order to obtain export licenses.

The development of the eLAB standard is partly pushed forward by private sector associations and organisations working on improving interoperability in the agrifood sector. These organisations have focused on integrating business processes to exchange data using XML-messages and web service protocol.[48]

The eLAB standard itself was developed by the agricultural expert group of UN/CEFACT. The standard is based on the Core Component Library (CCL 13A) and the UN/CEFACT XML message standard. In conjunction with the UN/CEFACT standards, eLAB is working closely with GS1 on standards for fresh fruits and vegetables. GS1 has defined standards for a common language to share product information in the supply chain, which saves retailers and other stakeholders time, money and also reduces paperwork. The main GS1 standards adopted by eLAB are:

- Global Product Classification (GPC);
- Global Location Number (GLN);
- Global Trade Item Number (GTIN).

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[47] (Ernst & Young Advisory, 2013)
[48] (Conny Graumans, 2014; ENGELSE, 2014)

In the Netherlands and in France, the main challenge was the integration of existing heterogeneous systems into a single information exchange standard. In developing countries, however, the main challenge may be moving from a paper-based system to an electronic system. The benefits of moving away from a paper-based system are outlined in Figure 8.1 below.

*Figure 8.1. Differences in paper-based and electronic messaging systems*

	Paper-based logging	Electronic logging
Integrity	• No guarantee a report is accurate • Difficult to consolidate • More scope for irregular behaviour	• Electronically secured log reports • Cross-checking in real time • Central database to register messages
Efficiency	• Difficult to maintain and update in different data formats • Slower processing time • No automated validation	• Faster processing • Single view of all relevant information • Simple maintenance of forms
Security	• Higher risk of forgery and manipulation • More difficult to identify patterns of fraud/misuse	• Very difficult to forge • Online verification • Searchable database with all logged data
Time	• More time to prepare • Longer time to deliver • More time to process	• Computer-assisted application preparation • Better informed decision making • Faster management through real time status

8.2 How eLAB works

eLAB covers the relationship between a *requesting party* requiring an analysis of a sample, a *laboratory* conducting the analysis; reporting the result to a *receiving party* and invoicing the service (see Figure 8.2). The eLAB analysis request is a message sent by requesting party to the laboratory ordering one or more analyses to be performed on a sample. The message specifies the observations to be performed on the sample and the requested timeframe. The laboratory acknowledges the request for analysis, admits the sample, identifies it and characterises it for later traceability.

The eLab standard is agnostic with respect to the kinds of observations and analyses, which can be conducted on the sample. However, specifications for sampled objects do exist, so currently the eLAB standard can be used on samples of water, soil, agricultural commodities, plant products, animal products and live animals. These results are used to obtain information of the quality of soil, water, crop products, animal products, or health information about plants or animals. The laboratory specifies the actions taken on the sample and details the storage conditions. The laboratory then performs the requested observations, specifying the analysis method(s) used. Once finished, the laboratory proceeds to compile an *eLAB Observation Report*. The report contains the result of the observations with commentary; it can also contain pictures, documents and other (binary) files.

Figure 8.2. Sample workflow of eLAB
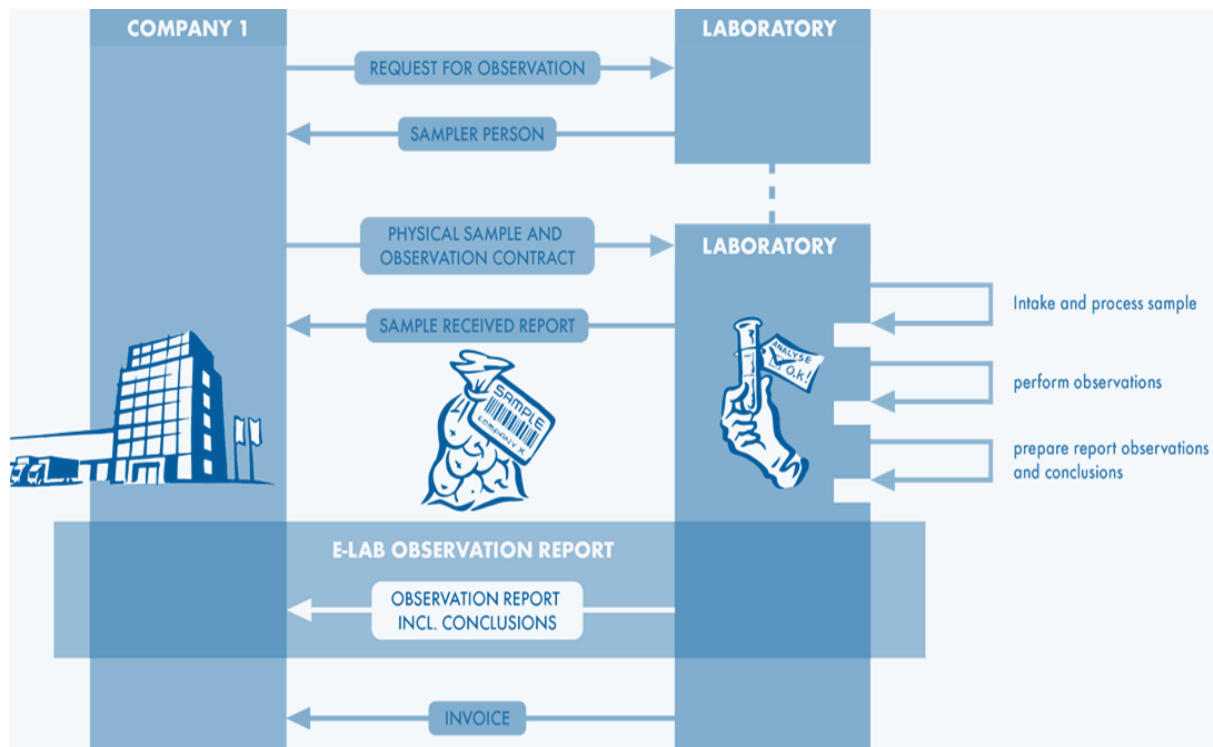
Source: (Conny Graumans, 2014)

The eLAB Observation Report is sent to the *receiving party* (which in many cases coincides with the *requesting party*). The *receiving party* acknowledges receipt of the report. The laboratory can then issue an invoice to the party as detailed in the observation contract. In practical implementations, the roles of *requesting party, laboratory and receiving party* can be represented by different stakeholders, for example:

Requesting party

- Farmers delivering electronic or paper requests for analysis to be performed on their products;
- Farmer cooperatives having jointly built an eLAB standard messaging system, submit electronic requests on the behalf of farmers to laboratories;
- Exporters or importers;
- Government agencies, e.g. as part of the export or import certification process.

Laboratory

- Commercial laboratories with working relationships with farmers or cooperatives;
- Commercial laboratories with working relationships with importers or exporters;
- State laboratories performing standard analysis on export goods, for example, and reporting then to the Competent Authority.

Receiving party

- Cooperatives accept electronic receipts and observation reports on behalf of their members and then distribute the observation report to interested stakeholders such as scientific bodies and importers/exporters;
- Competent Authority as part of a quality management system or a certification scheme (such as phytosanitary certification).

Ideally, the requesting party, the laboratory and the receiving party have access to an electronic system to effectively manage laboratory analysis. The laboratory should have a laboratory management system. In order to use the eLAB standard, this system will have to integrate three modules, as detailed below and shown in Figure 8.3.

Figure 8.3. Typical systems involved in eLAB and modules of the lab management system
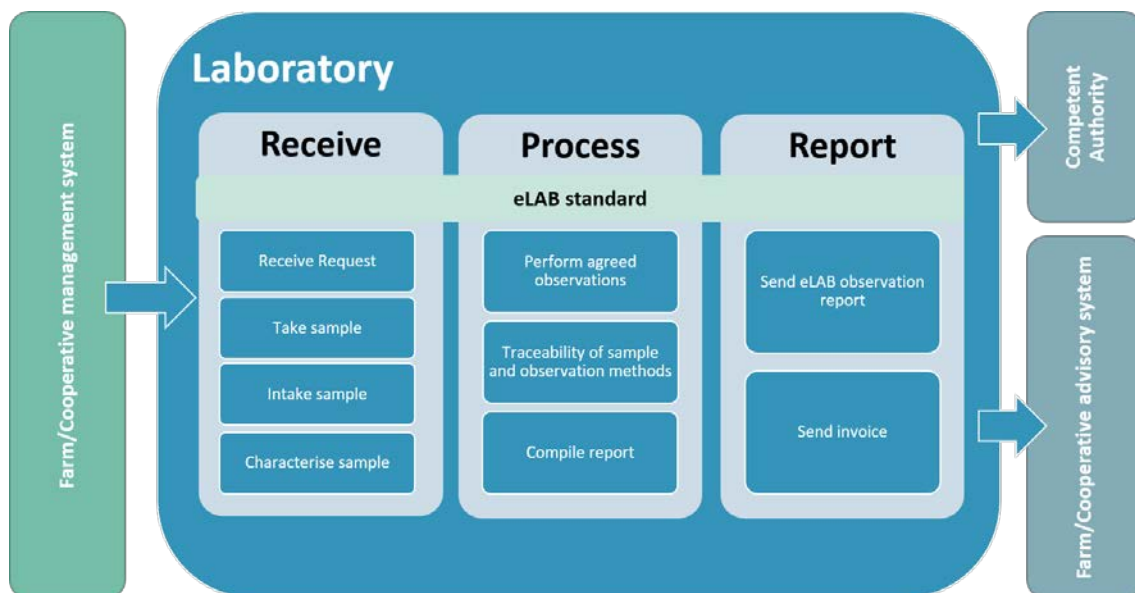
Receive Module:

The Receive Module accepts electronic (or manual) observation requests in form of an eLAB message from requesting parties such as farmers or cooperatives. In its most general form, the Receive Module should contain a feature where requests can be entered via a web interface by registered parties (which include laboratory personnel entering requests on behalf of requesting parties), in addition to accepting, typically via a web service, submissions from other systems.

The Receive Module will also support the registration of samples, their identification and characterisation. The Receive Module should also allow for the storage of information regarding sample packaging and storage.

Process Module:

The Process Module will support the laboratory personnel in their work with the samples. It should feature a sample queue, in order to organize the laboratory work. Such a queue system should prioritize the processing of urgent samples faster. For each sample, laboratory workers should be able to see the type and details of the requested analysis. Furthermore, the Process Module should provide links to analysis methods and allow the necessary data to be recorded. It should also continue to support the traceability of processed samples (recording when the sample was last used, where it is stored and under what conditions).

The Process Module shall record the eLab observation report. This can consist of a simple upload tool for a report written by a text processing system, but could also include an online report compilation tool with pre-configured snippets. The tool should support review and sign-off by the responsible laboratory manager.

Report Module:

The Report Module allows for the sending of the eLAB observation report to stakeholders such as the Competent Authority for regulatory analysis or the farmer/cooperative for commercial analysis. The eLAB observation report can be used in a quality management system of either a company, a cooperative or even a country.

8.3   The implementation process

Although the eLAB standard has been specified for generic purposes, so far it been used to achieve efficiency gains in the electronic management systems utilized by laboratories and highly developed farms and cooperatives. A pilot project of the eFoodChain project, conducted with The Greenery, a Dutch fruits and vegetable cooperative with over 600 members, showed that implementation of eLAB was able to:

- Improve efficiency and reduce costs:
  - o   An average of 90 minutes time reduction between the receipt of the sample and issuance of the observation report;
  - o   In total, 15 minutes were gained in the processing of each sample;
  - o   Based on this pilot, processing of 3.000 samples annually cost approximately EUR 22.500 yearly.[49]
- Improve transparency and quality control for better food safety:
  - o   Observation reports are typically required within 48 hours of submission, making electronic exchange of such reports more desirable. [50]

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[49] This is calculated based on 750 hours of processing time at a labour cost of EUR 30/hour
[50] For more information, see (Ernst & Young Advisory, 2013)

However, many farmers and farmer cooperatives in developing countries do not have the necessary farm management systems to fully realise the advantages listed above. It is therefore suggested that project managers wishing to implement eLAB consider implementing as a first step an eLAB messaging system between state laboratories and the Competent Authority. The purpose of such an eLab messaging system would be to:

- Implement simplified and standardised procedures;
- Strengthen official analysis and official quality management processes (e.g. issuance of phyto-sanitary certificates);
- Control outsourced analysis;
- Reduce fraud;
- Transmit analysis results to (the Competent Authority of) trade partners;
- Collect statistics on essential issues, such as pesticide residues, heavy metal contamination, mycotoxins, etc.

eLAB for Laboratories

Implementing eLAB for laboratories requires the development of three different modules, as summarised in Figure 8.3. The eLab system needs to be able to receive requests for analysis from the requesting parties, such as exporters, traders, retailers or in some cases farmers and cooperatives. The system should have a web interface to allow requesting parties to directly submit such requests (ideally by mobile devices as well). This applies in particular to analysis requests from official sources, such as the Competent Authorities of the country. However, the system should also include a feature, which allows for manual entry by laboratory personnel on behalf of the requesting party. Ideally, such a system would be integrated with a central database used for all laboratory observation reports in the agricultural domain.

eLAB for Competent Authorities

Competent Authorities need to be able to issue Laboratory Analysis Requests for official analyses. At the same time, they need to be able to integrate Laboratory Observation Reports into their records database for official processes, such as the issuance of a phytosanitary certificate. The system should also be capable of drawing geolocalised statistics on relevant issues (e.g. pesticide residues, mycotoxins, soil qualities, illnesses etc.). This data should be transmitted to those parts of the food safety, plant or animal health authority that deal with prevention of diseases and management of intra-country quality management systems. It would also be desirable to be able to share specific and aggregate data with (the Competent Authority of) trade partners, in order to demonstrate progress towards common food safety/plant or animal health goals. For a summary of implementation steps and their benefits, see Figure 8.4.

Figure 8.4. Implementation steps of electronic eLAB messaging with main tasks and benefits

Accredited laboratory

Data exchange with importing/exporting country

I. Electronic Logging

Electronic input of paper observation request
Electronic scheduling of sample collection
Electronic issuance of laboratory results

Key Benefits
•Greater processing efficiency
•Less paper work
•Greater control of food industry activities
•Consistent and real-time collection of information
•Central registry of agricultural data
•No duplication of paper work
•Real-time report processing

I.Electronic Logging

Electronic issuance of lab observation requests
Electronic receipt of sample collection receipt
Electronic acceptance of laboratory observation reports
Integration with certificate management processes

Key Benefits
•Better control of food im/exports
•No paper work
•Consistent and real-time collection of information
•Real-time observation result processing
•No duplication of paper work
•Central registry of agricultural data

II. Electronic Reporting

Integration with quality control processes and systems
Integration with quality/safety certificates

Key Benefits
•Greater processing efficiency
•High quality data exchange
•Report standardisation
•Quick communication channel to stakeholders
•Better export controls
•Less potential fraud

II. Electronic Reporting

Integration with quality control processes and systems
Integration with quality/safety certificates

Key Benefits
•Greater processing efficiency
•High quality data exchange
•Report standardisation
•Quick communication channel to im/exports
•Better im/export controls
•Less potential fraud

Intergovernmental discussions
Laboratory buy-in

III - Electronic Data exchange

Central Data Repository
Development of consensual data dictionaries
Data exchange with relevant authorities

Key Benefits
•Provable integrity of observations/certificates
•Cost savings
•Central Repository
•Greater processing efficiency
•Less paper
•Non-repudiation of data
•Improved auditability
•Better scientific advice

III - Electronic Data exchange

Central Data Repository
Data exchange with Broder control
Data exchange with importing nations

Key Benefits
•Provable integrity of observations/certificates
•Cost savings
•Central Repository
•Greater processing efficiency
•Less paper
•Non-repudiation of data
•Improved auditability
•Better scientific advice

8.4 Contribution to the national economy

The following summarises how the electronic gathering and exchange of eLAB certificates and permits contributes to the national economy using the logframe approach.[51] A typical results chain is shown in Figure 8.5, which summarizes the results a project is expected to achieve. The results chain shown will need to be adapted to the particular project and the countries realities. It should be based on evidence about what has worked in the past and take into account lessons learned, evaluation and research evidence available that underpins the design of the project. The evidence will also enable identification of realistic targets and in particular a reasonable assumption how much change might be achieved over the project period.[52]

Figure 8.5. A typical results chain for the implementation of eLAB standards
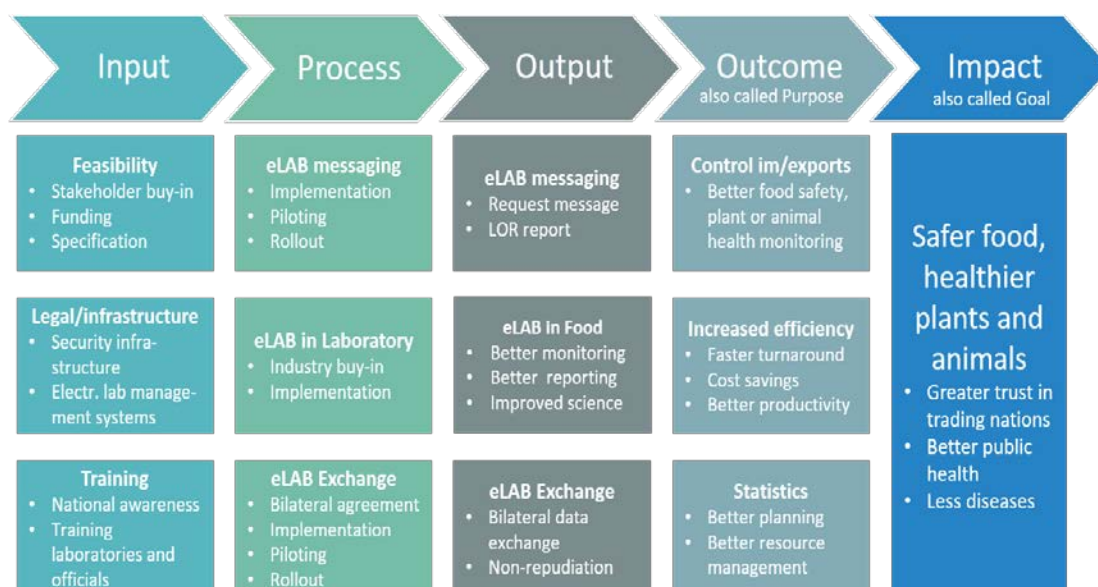
An alternative representation, the logframe matrix including indicators, data sources and assumptions, is shown in Table 8.1. It is essential to demonstrate coherent, robust measures of success in the logframe. This is particularly important for baseline measurement without which change cannot be demonstrated. It is also important to have milestones which can act as an early-warning system, indicating how a project is progressing along the predicted trajectory (DFID, 2011).

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[51] See (EuropeAid, 2004; DFID, 2011; World Bank, 2005; USAID, 2012)
[52] (DFID, 2011)

Table 8.1. A typical logframe matrix for the implementation of the eLAB message

	Description	Indicators	Data Sources	Assumptions
Goal	- Efficiency improvements	- Quicker turnaround of laboratory tests	- Farmers - Laboratories - Exporters/Importers	- Sustainable food industry - Good scientific base of food residue levels
Purpose	- Better control	- Better information on residual levels - Less reports of bad exports	- Scientific community	- Relevant authority officers properly trained
Sub-purpose	- Fresh food monitoring - Reducing reputational damage due to poor food exports	- Knowledge of food resources - Compliant food exports/imports - Less reports of rejected food products - Economic health of a well monitored food industry	- Monitoring system and spot checks - Support for phytosanitary certificates - Law enforcement - National statistics	- Active scientific community - Systems secure against intrusion - No corruption of inspectors and law enforcement officers
Outputs	- Laboratory results	- Highly available system with >99% uptime - Food production properly managed - Quality of exports properly managed - Law enforcement able to access observation results	- Operations report of eLAB system - Incidence reports - Experience report/interview with law enforcement officers	- Proper training of all stakeholders - Stable electricity and network access - Online resources for guidance - IT infrastructure available
Inputs	- Feasibility study - Funding - Specification - Legal framework - Technical infrastructure - Training - Identification of implementation partners	- Feasibility report - Project approved and funding available - Implementing partners identified and contracted - Legal base established - Pilot users identified	- Feasibility report - Minutes from approval meeting - Procurement notice - Laws/regulations published in official bulletins - List of pilot users - Database of product categories - Identification scheme	- Stakeholder buy-in - Political will to implement eLAB solutions

8.5   Other considerations regarding eLab implementation

Section 5 outlined some of the generic considerations to be made in the implementation of e-Business solutions, those considerations also apply in the case of eLab. Information regarding the cost of developing eLab is not generally publicly available. However, such costs will depend on the current state of a country's eLAB system as well as local costing. The implementing party may incur additional costs if a legacy system is already in place.

As eLAB is relatively easy to implement, implementation without existing infrastructure has been reported to cost around EUR 30,000. This is supported by the first two pilot implementations in the Netherlands that reported IT costs of EUR 30,000 and EUR 120,000 in resource costs.[53] The pilot projects were implemented over 14 months.

Currently, there are no off-the-shelf software solutions available for an eLAB-based system. Parties wishing to implement will have to develop their own IT infrastructure to support the eLAB messaging standard or adapt an existing legacy system to support eLAB messaging. However, the aforementioned EU project eFoodChain has released a B2B connector into the public domain, which manages the secure exchange of eLAB messages, such as the Laboratory Analysis Request (LAR) and the Laboratory Observation Report (LOR). The tool can be used to store such requests and transmit them securely. For those parties with the IT infrastructure already set up, eLAB messaging can be cheaper to implement. Using the B2B connector of the eFoodChain project, cost for simple transmission of messages can be further reduced. However, the B2B connector does not provide integration into management system, which is the most relevant and costly part.

Fees charged from the processing of the eLAB observation report could also be seen as another potential source of funding for the eLAB system. Arrangements could be made with the private sector to contribute to funding for eLAB implementation and operation. Given that safe and efficiently managed agrifood chains are a matter of public health and a shared responsibility of trade partners, the use of public funds (i.e. taxes) to supplement funding is reasonable.

8.6   SWOT analysis

The main strengths and opportunities of implement eLAB have been summarised previously, please see section 8.1 for a summary. The main weakness of implementing eLAB messaging is that it requires an electronic infrastructure, at the very least an electronic laboratory management system. This has cost implications. Another weakness is that while the message itself is standardised, eLAB requires the use of code lists, which need to be understood by the trade partner. Perhaps the most important weakness is that while electronic management of laboratory information provides the opportunity to improve the quality of goods, the full benefits of eLAB can only be realised, if the requesting and receiving party use electronic systems and actively manage the information provided by the laboratory.
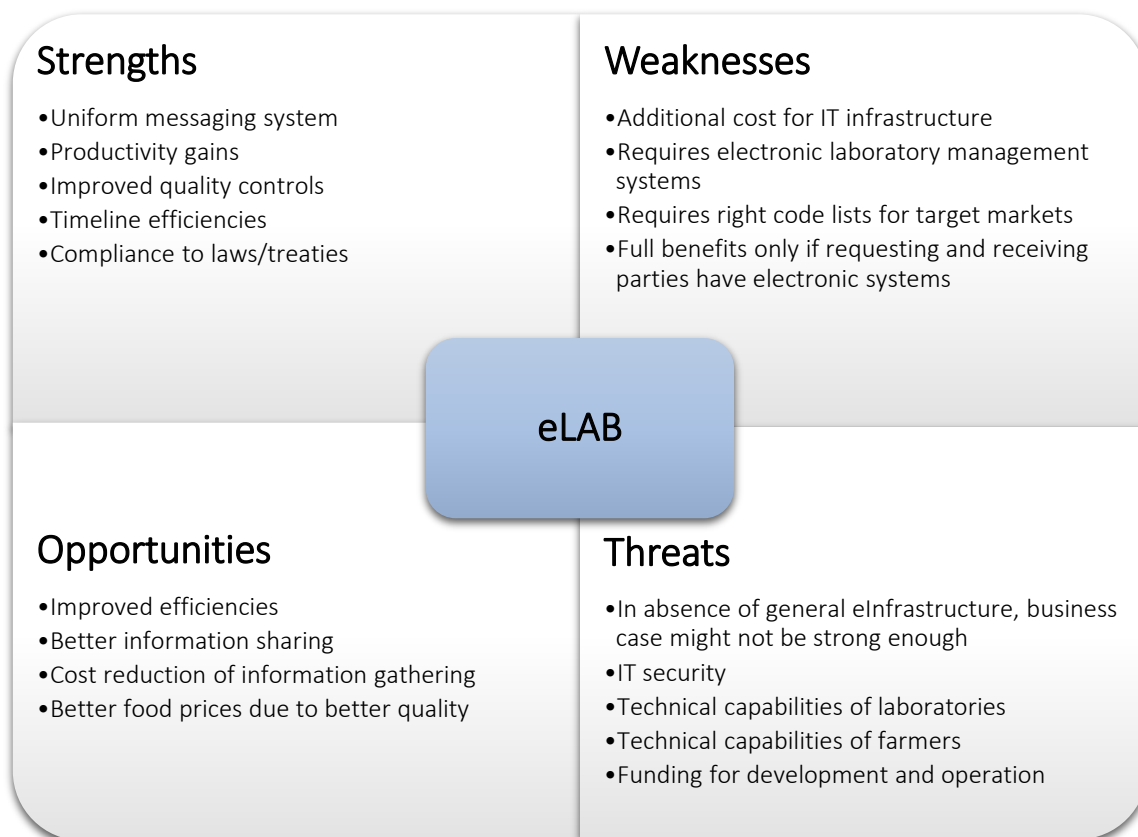
If the implementing country does not have an electronic infrastructure, this can be considered a potential threat as the business case for implementing eLab might not be strong. eLAB was based

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[53] (Ernst & Young Advisory, 2013).

mainly on efficiency gains of a highly developed industry. Its unique selling point is helps to speed up procedures in the supply chain, this is a particularly important advantage for perishable goods.[54] However, in developing countries the major bottleneck for obtaining speedier analysis results may not be the information transmission, but rather the availability of adequate laboratory facilities.

Due to its novelty, there are no working implementations of eLAB in developing countries at the present moment. However, the pilot projects have demonstrated productivity increases resulting in a return on investment in approximately about 18 months (Conny Graumans, 2014).

Strengths	Weaknesses
• Uniform messaging system • Productivity gains • Improved quality controls • Timeline efficiencies • Compliance to laws/treaties	• Additional cost for IT infrastructure • Requires electronic laboratory management systems • Requires right code lists for target markets • Full benefits only if requesting and receiving parties have electronic systems
eLAB	
Opportunities	Threats
• Improved efficiencies • Better information sharing • Cost reduction of information gathering • Better food prices due to better quality	• In absence of general eInfrastructure, business case might not be strong enough • IT security • Technical capabilities of laboratories • Technical capabilities of farmers • Funding for development and operation

8.7 The UN/CEFACT eLAB standard

The structure of the eLAB standard has been published by UN/CEFACT as a global international standard. The standard includes:

- Business Requirements Specification (BRS), which explain the business processes that are supported by eLAB including the eLAB business and entity references;
- Requirements Specification mapping (RSM);
- The UN/CEFACT standardised schema for business processes, a technical file called (XML Schema Definition);
  UN/CEFACT standardised data components (Core Component Library).

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[54] https://copy.com/FXgq73IxLmQN

8.8   More information

YouTube: eLAB https://www.youtube.com/watch?v=OwR8cuzOO7Q

eFoodChain: http://www.efoodchain.eu/

UN/CEFACT Modelling Methodology User Guide (CEFACT/TMG/N093)

UN/CEFACT Business Requirement Specification Document Template (CEFACT/ICG/005)

UN/CEFACT E-CERT BRS

UN/CEFACT E-DAPLOS BRS

UN/CEFACT CRIE cattle registration and information exchange BRS

UN/CEFACT agricultural observations BRS

9 Electronic management and exchange of CITES permits/certificates

9.1 Introduction

International wildlife trade is worth billions of dollars and includes the exchange of hundreds of millions of plant and animal specimens. Without the implementation of regulated controls the survival of some species is threatened. In the early 1960s, the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) was established for the regulation of wildlife trade for conservation purposes. CITES is an international agreement between governments to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Over 850,000 permits are issued per annum through CITES, certifying that trade is both legal and sustainable (CITES, 2015). The CITES agreement came into force in July 1975 and today there are 181 Parties to the Convention. Since its establishment the CITES regulatory controls have helped to

Why biodiversity is vital
As the world's population and economies grow, there is more pressure than ever on the planets resources and ecosystems that support the biodiversity of plant and animal species. CITES recognises the value of biodiversity and as a part of their strategic vision 2008-2020 statement the core vision states: "Conserve biodiversity and contribute to its sustainable use by ensuring that no species of wild fauna or flora becomes or remains subject to unsustainable exploitation through international trade, thereby contributing to the significant reduction of the rate of biodiversity loss and making a significant contribution towards achieving the relevant Aichi Biodiversity Targets." (CITES, 2013)

preserve global flora and fauna. As a result, only 3% of CITES listed species are considered to be endangered and are generally prohibited from international trade.[55]

The World Trade Organisation (WTO), whose regulatory framework governs international trade (see section 4.1 for more details), and CITES, whose multilateral environmental agreements use trade-related measures to achieve their goals, have forged a strong relationship to work towards sustainable development, particularly in the trade of plant and animal species (WTO, 2015). In 2015, the WTO and CITES celebrated 20 years of collaboration with a view of continuing their working relationship into the future. As two distinct organisations, the relationship between CITES and the WTO has evolved into a leading example of how global trade and environmental regimes can work together to achieve their shared objectives (WTO, 2015).

In the 2012 Rio+20 outcome document, *The Future We Want*, heads of state and government recognised the important role of CITES in achieving sustainable development. Furthermore, it was acknowledged that the CITES agreement stands as the intersection between trade, the environment and development (Scanlon, 2012).

Trade transactions in CITES listed species are controlled through CTTES certificates. A typical process related to CITES paper permits or certificates is depicted in Figure 9.1. Paper-based CITES permits or certificates involve processes that are time and resource intensive and have a negative impact on the ability to trade sustainably. The lack of access to information stored in paper document may compromise the robustness of the CITES process. As was documented in a study undertaken in

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[55] https://www.cbd.int/doc/external/kmmea-01/kmmea-01-p05-cites-epermit-en.pdf

Thailand, the verification of CITES permits usually requires two to three physical visits to the appropriate border control authorities (Keretho, 2015).

In an effort to assist Parties in the implementation automated and efficient procedures using electronic permits, the CITES Secretariat has developed a CITES e-permitting toolkit.

*Figure 9.1. Typical processes involved with CITES certificates*
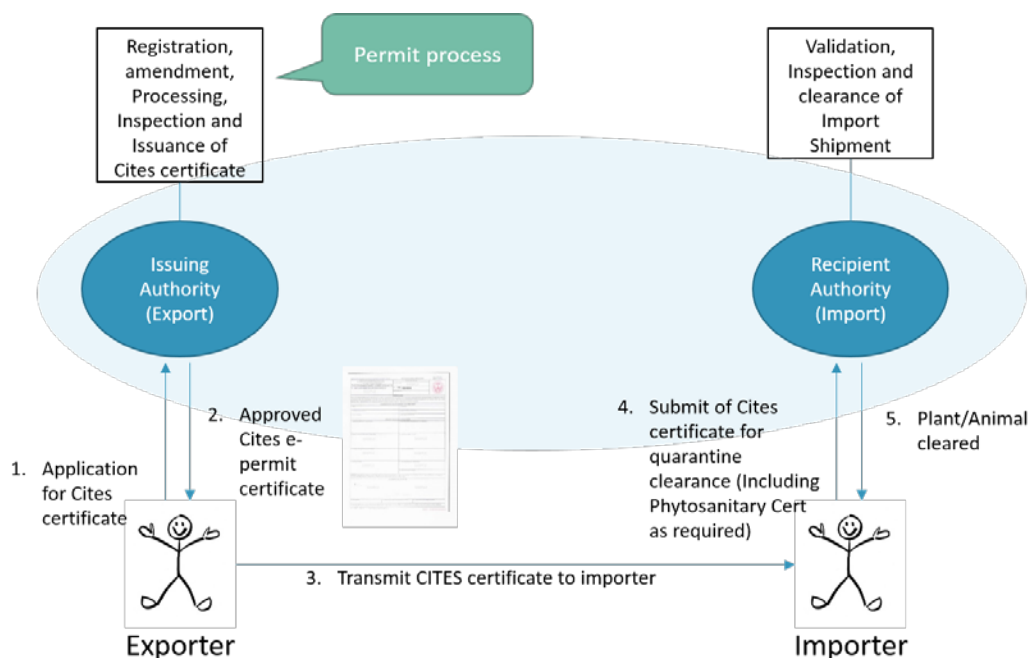
In developing this toolkit, CITES has worked closely UN/CEFACT and World Customs Organization (WCO) as the leading standard setting organizations in this domain. CITES, through its e-permitting toolkit supports the implementation of efficient, electronic work flows and automated procedures. The CITES e-permitting toolkit can be used to set up a CITES electronic permitting system, which handles the management of electronic CITES systems in the country. The exchange of CITES permits with other national government agencies, for example Customs, can be made either through the National Single Window or directly between the CITES e-permitting system and the data management system of the other government agency. Figure 9.2 summarises the benefits of both traders and CITES management authorities from the implementation of a CITES Single Window approach.

In 2014, the CITES Secretariat and UNCTAD formed a partnership to devise a strategy for customs authorities to be able to regulate trade in wildlife. This involved the development of an electronic CITES e-permit module called ASYCER that can be fully integrated with UNCTAD's computerised management system Automated SYstem for Customs DAta (ASYCUDA).[56] The ASYCUDA ASYCER module will be able to link with the national computerized customs system and/or the national Single Window.

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[56] ASYCUDA is a computerised management system currently used in over 90 countries which covers most foreign trade procedures.

Figure 9.2. Benefits of integrating the CITES e-permitting toolkit into national Single Windows
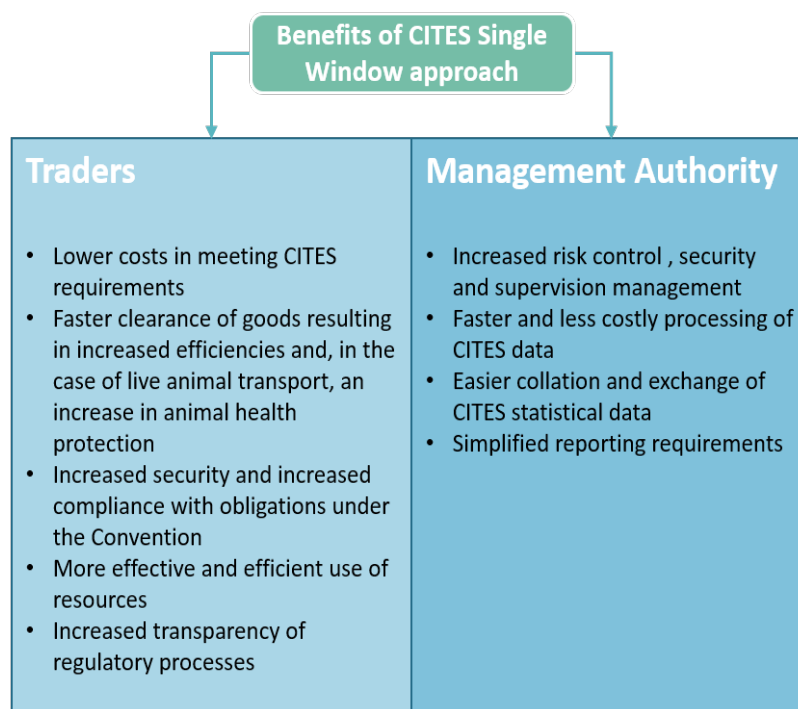
CITES Secretary-General John E. Scanlon said during the signing of the Memorandum of Understanding between the CITES Secretariat and UNCTAD:[57]

> "The use of these tools will contribute towards ensuring the sustainable use of species legally in trade and to preventing illegal trade by reducing the opportunities for fraud. CITES parties developing e-permitting systems will be able to access technologies that provide new solutions by utilizing cutting-edge efficient information and communication technologies."

9.2 How an CITES e-permit management system works

The following describes the functionality of a fully electronic CITES e-permit management system with electronic exchange between trading nations under the CITES regime. The e-permitting Toolkit is compliant with paper-based permitting procedures to allow for parallel use of paper and electronic permits in international trade. The main stakeholders in a CITES permit process are:[58]

IMPORTS

- Management Authority for CITES e-permit agreements;
- CITES authority;
- Competent authority/National Plant Protection Organisation (NPPO) of the exporting country;
- [Border Control of the exporting country];
- Border Control of the importing country;
- [Exporters];
- Importers.

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[57] http://www.asycuda.org/wnfiles/ASYCUDA_CITES.pdf
[58] Square brackets indicate parties that do not necessarily play a role in the process.

EXPORTS

- Management Authority for CITES e-permit agreements;
- Competent authority/NPPO;
- CITES authority;
- [Border Control officials of the exporting country];
- Exporters;
- [Border Control officials of the importing country];
- [Competent authority of the importing country];
- [Importers].

To ensure a successful implementation of the CITES e-permitting toolkit, a three phase implementation process is recommended. For the establishment of an in-country CITES e-permit management system (Phase 1), the Management Authority and defined stakeholders should use the business process analysis methodology (see section 9.3) to assess the current state of permit management and the envisaged future solution. Integration with Border Control systems (Phase 2) requires collaboration and exchange of electronic CITES permit information between the Management Authority and Customs and border control officials. The exchange of CITES e-permits with Management Authorities of other countries or the CITES secretariat (Phase 3) requires bilateral agreements between the national Management Authorities. Even though CITES will continue to support paper-based permits, the paper-based permit system for CITES has many shortcomings, particularly with regard to the speed of processing permit applications and effective implementation of the CITES regulations.

Figure 9.3 below shows an example of electronic CITES permit exchange between two CITES Management Authorities, in this case Switzerland and the United Kingdom. From a business perspective, the set up can be described as a single window solution. Technically, the data exchange processes uses two servers as single points of exchange (SPoX), one on the import side and one for the exporter (CITES, 2013).

*Figure 9.3. Typical set-up between CITES management authorities*
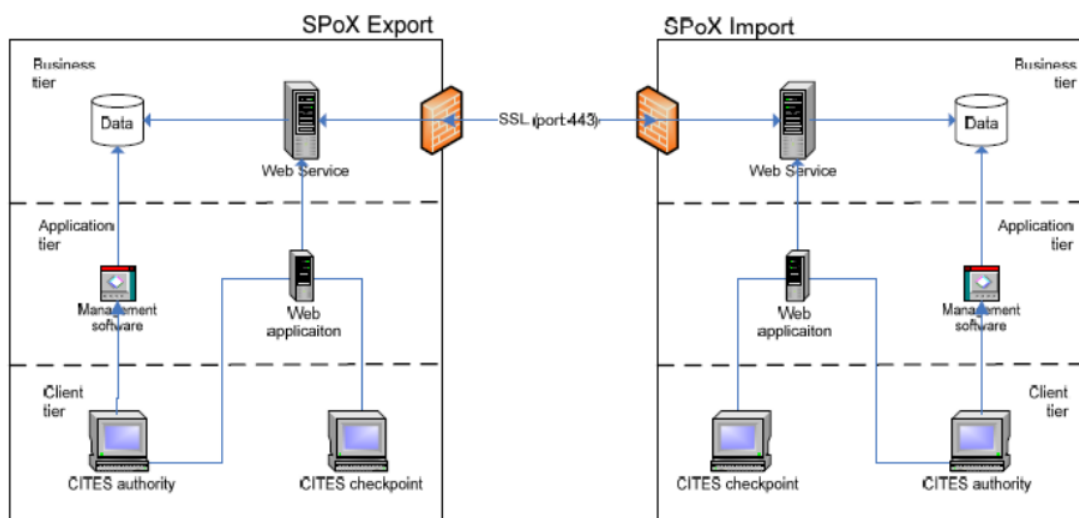
Source: CITES Data Exchange pilot project (Switzerland-United Kingdom)

Components of an electronic CITES permit system figure

In order to collect and manage applications electronically an information system is necessary. Such a system allows importers or exporters to file an application for a CITES permit online (including the submission of supporting evidence when required); (b) the Management Authority to review and ask for amendments to the e-permit as required; and (c) manage, issue or decline CITES permits electronically (or in print as required). The following modules would typically be applied:

Apply Module

Figure 9.4. Typical modules of an electronic CITES management application
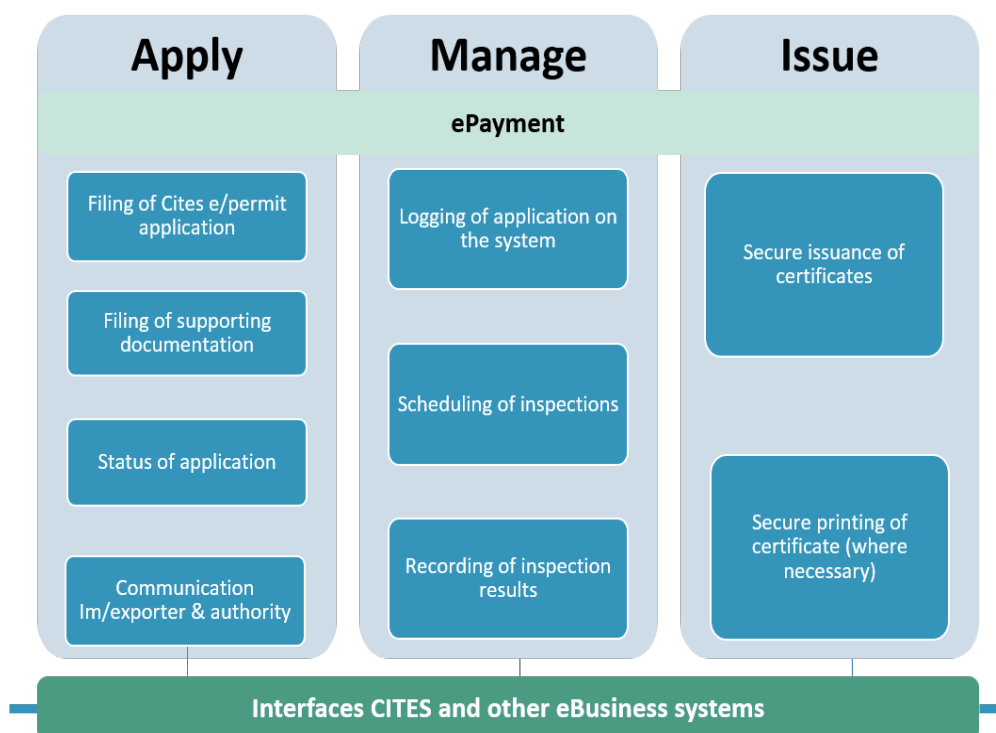
The Apply set of modules allows importers and exporters to apply for a CITES e-permit. Importers and exporters can apply for an export, re-export and import e-permit. The application of the CITES e-permit will require various details to be uploaded to the system for inspection by the Management Authority officials. These details may include type of permit or certificate, importer name and address, exporter name, address, country, country of import and the Mangement Autority seal/stamp or address. The Management Authority may refer to the Scientifc Authority for additional information.

Permits and certificates that are issued by the Management Authority (MA) or the Scientifc Authority (SA) include:
- Export permits (MA and SA);
- Import permits (Appendix I only) (MA and SA);
- Re-export certificates (MA);
- Certificates of Origin (Appendix III) (MA);
- Pre-Convention certificates (MA);

- Captive-breeding certificates (for animals) (MA);
- Artificial propagation certificates for plants (MA).[59]

The application process will typically require payment of a fee, which can ideally be paid online. Electronic payments in their simplest form require an upload of a scanned payment slip/bank transfer slip. More sophisticated solutions provide users with bank transfer options using secure transfer codes or online payment services, such as PayPal and credit card payment.

The Apply set of modules should allow applicants to see the status of their application and to receive relevant communications from the authority, such as the approval of the e-permit request, requests for additional documentation or a rejection of the application with explanation.

Manage Module

The Manage Module addresses the internal management of the certification process between the Management and Scientific Authorities. It will typically manage the identities of officers and other relevant personnel and associate each application with the intervening officials. The Manage Module should support the internal workflow for processing of the application. Based on the information provided in the application, the Scientific Authority may need to be contacted. The Manage Module should allow for an electronic workflow between the Management Authority and the Scientific Authority.

Issue Module

An e-permit or certificate is issued based on the results of the review by the Management Authority and/or Scientific Authority. The certificate will be stored in the XML or UN/EDIFACT format based on the specifications in the toolkit. The certificate can be issued using electronic signature and encryption methods defined in the CITES toolkit.

The United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC) has implemented the Electronic Permit Information Exchange (EPIX) project. In the future EPIX will serve as a mechanism for electronic exchange and verification of CITES e-permit data among Management Authorities (WCMC, 2010). The EPIX portal will allow Management Authorities to:

- Share permit data electronically in near real time;
- Submit online queries on permits issued by their own or other Management Authorities;
- Submit annual reports automatically to the UNEP-WCMC.[60]

The formats for data transfer protocols between the management Agencies and the EPIX system are based on the CITES e-permitting toolkit. Management Authorities can access the EPIX portal at http://epix.unep-wcmc.org and by entering their allocated username and password, can search for permits via the permit number. As a result of the search, a summary of the permit is provided at the top of the screen and the detailed information below.

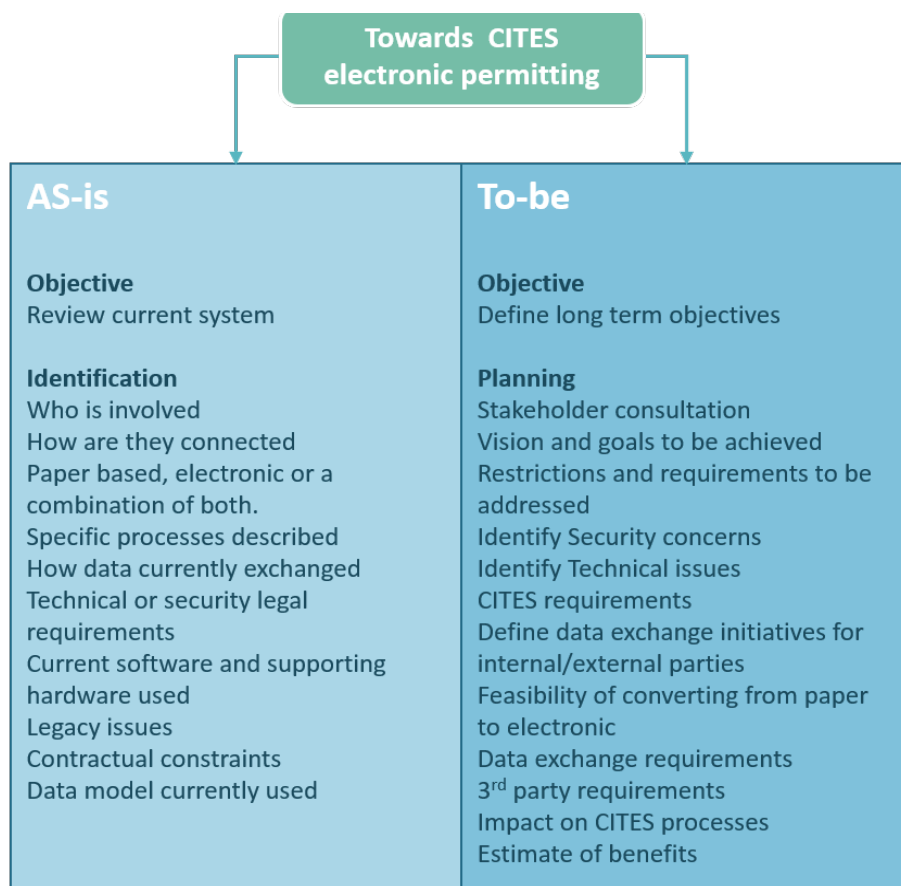[59] (CITES, 2010)
[60] http://epix.unep-wcmc.org/Home/About

9.3   The implementation process

A national implementation for CITES e-permitting should be based on the standards set out in the CITES e-Toolkit. The goal of the Toolkit is to ensure that the national e-permitting systems are aligned with international standards and to accommodate for future developments, particularly inclusion in Single Window environments. When establishing an electronic permitting system, it is recommended that the status quo ('as-is') is first analysed and then subsequently the long term objective ('to-be') should be clearly defined. The UNNExT Business Process Analysis guide is a good resource to conduct this exercise. The 'as-is' step is to review the current paper-based system, identify stakeholders and their interrelations. This step should also ascertain whether the current data exchanges are paper-based, electronic or a combination of both. Once this review is finalised, it is possible to develop the implementation scenarios for an e-permitting system taking the following steps into consideration:

- Define the data exchange approach between CITES authorities, G2G and B2G;
- Define the type of applications that will be used for data exchange;
- Define the interaction level at which the system will operate and the actors involved.

The 'to-be' process works towards establishing the long-term objectives of a national CITES e-permitting system. The approach taken is similar to the 'as-is' approach, although the implementation planning should include stakeholder consultations. Furthermore, it is important to clearly define the goals and objectives to be achieved. In Figure 9.5 below shows the link between the 'as-is' and the 'to-be' analysis.

Figure 9.5. Initial preparatory steps for an implementation of the CITES e-permitting toolkit

Towards CITES electronic permitting

AS-is	To-be
Objective Review current system	**Objective** Define long term objectives
Identification Who is involved How are they connected Paper based, electronic or a combination of both. Specific processes described How data currently exchanged Technical or security legal requirements Current software and supporting hardware used Legacy issues Contractual constraints Data model currently used	**Planning** Stakeholder consultation Vision and goals to be achieved Restrictions and requirements to be addressed Identify Security concerns Identify Technical issues CITES requirements Define data exchange initiatives for internal/external parties Feasibility of converting from paper to electronic Data exchange requirements 3rd party requirements Impact on CITES processes Estimate of benefits

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For each part of the subsequent implementation process, CITES offers some recommended standards as shown in Table 9.1.

Table 9.1. Recommendations for implementation steps (CITES, 2013)

Implementation Task	Recommendation
Technical Specifications	**(R1)** Use internationally agreed to and established open standards for describing and mapping CITES documents for use in e-permitting systems
IT-Security & Secure Data Communication	**(R2)** Establish a management system in conformity with ISO 27001 to designate, co-ordinate and monitor IT security related tasks.
Protection Aims & Secure Data Communication	**(R3)** Identify and use appropriate technologies when communicating using open or insecure networks (i.e. the Internet) to ensure confidentiality, integrity and authenticity of the data being exchanged.
Web Services and Web Service Security	**(R4)** Use Web service technology among different systems to exchange CITES-related data. **(R5)** Use Web service communication such as, SOAP via HTTP/HTTPS), or, where appropriate, SOAP via SMTP (E-Mail) as an alternative systems.
Web service technology	**(R6)** Use Web services to facilitate exchange of CITES-permit data between applications (coupling).
Secure Web Services	**(R7)** Use Secure Web Services for data communication made through open or insecure networks (i.e., the Internet).
Securing data content	**(R8)** Use standards based on XML Digital Signature and XML Encryption when implementing Secure Web services for the exchange of CITES related information.
Deployment and implementation of Web services	**(R9)** Use WS-I profiles as guidelines to implement Web service communication and to ensure interoperability of the resulting service.

Once the CITES e-permitting system has been implemented, the improved "to-be" situation should support the following simplified and automated business processes:

- Importer and/or exporter can submit their application forms online;
- Importer and/or exporter can check the status of their applications online;
- Management authority officers can issue the CITES permit online;

- CITES Permits issued electronically can be accessed by the border control agencies. Data management systems in the border control agencies compare CITES permit data with information in the Customs declaration;
- Data cross-checking between Competent Authority/NPPO, the border control agencies, and Customs to reduce fraud and improve accuracy;
- Amendments (Add/Update/Delete) can be easily handled electronically;
- Customs sends used permits back to the Management Authority;
- The e-permitting systems supports reporting to the CITES secretariat.

The main contribution of a CITES e-permitting system is the improvement of trade processes for both import and exports. The areas of contribution can be summarised as:

- Electronic transactions, instead of manual transactions;
- Electronic documents, instead of paper documents;
- Faster processing of permits;
- Reduced costs of processing and issuing permits;
- Fewer physical visits for each transaction;
- Better compliance with data cross-checking.

9.4   Contribution to the national economy

The following summarises how the electronic gathering and exchange of CITES e-permit certificates contributes to the national economy using the logframe approach.[61] A typical results chain is shown in Figure 9.6, which summarises the results a project expects to achieve. The results chain will need to be adapted to the particular project and the country's realities. It should be based on evidence about what has worked in the past and take into account lessons learned, evaluation and research evidence available that underpins the design of the project. The evidence will also enable identification of realistic targets and in particular a reasonable assumption how much change might be achieved over the project period (DFID, 2011).

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[61] See (EuropeAid, 2004; DFID, 2011; World Bank, 2005; USAID, 2012)

Figure 9.6. A typical results chain for the implementation of electronic CITES permits
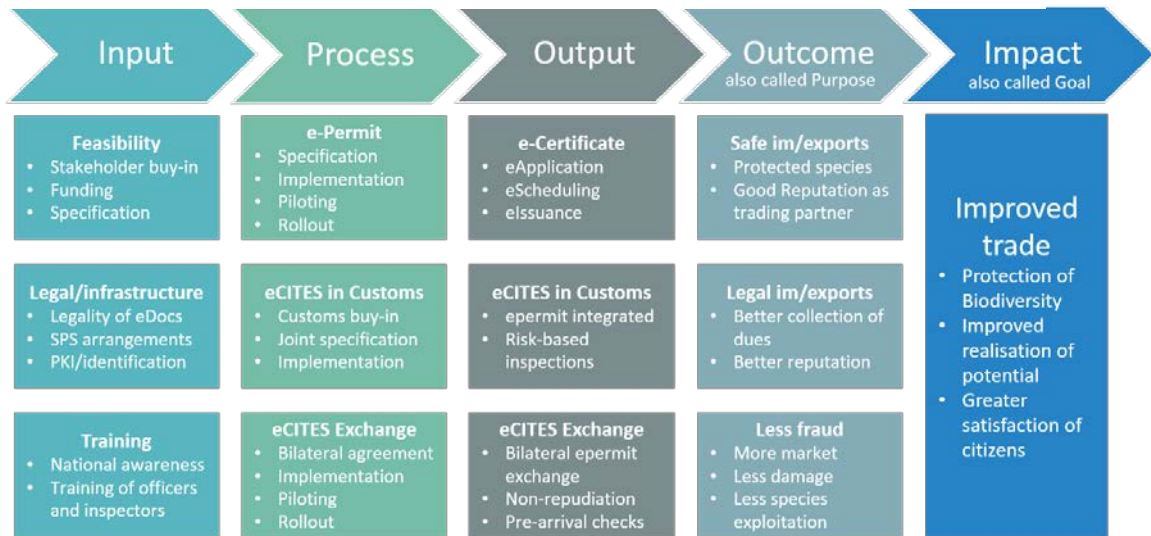
An alternative representation is shown in Table 9.2 below. While the above results chain focuses on the results and does not list either inputs or indicators (i.e. how the result is measured), the below reproduced "logframe [matrix]" shows in addition indicators, data sources and assumptions. The logframe needs to be adapted to the context of the specific project. It is essential to demonstrate coherent and robust measures of success in the logframe. This is particularly important for baseline measurement, without which change cannot be demonstrated. It is also important to have milestones, which act as an early-warning system, indicating how a project is progressing along the predicted trajectory (DFID, 2011).

Table 9.2. A typical logframe matrix for the implementation of eCITES

	Description	Indicators	Data Sources	Assumptions
Go	- Traceable and sustainable trade in endangered species & plants	- Stock assessments - Maintained biodiversity	- National statistics - Scientific studies	- Sustained trade in species and plants - Good scientific base for stock assessments
Pu	- Secure trade - Better control - Species assessment - Legal imports and exports	- Less reports of loss of species & biodiversity - Results from in-country and border spot checks	- Landing reports, NGOs - Scientific community - Reports of in country and Custom checks	- Inspectors and border control agents properly trained - Inspection protocol properly designed - Active scientific community
pu Su	- Less illegal trading - Good reputation as trading partner - Better collection of duties - Better reputation - Better market access - Less species loss - Less health/safety risks	- Knowledge of species numbers at all times - Less species exploitation - Increased revenue through dues - Less detection of fraud in spot checks	- National statistics - Reports from hospitals on food related bio-security issues and food poisoning - Border control revenues - Reports of in-country and border spot checks	- Systems secure against intrusion - No corruption of inspectors and Border Control officials
Out	- CITES application system - Integration with Border Control Agencies - Exchange of CITES e-permits with other nations	- Highly available system with >99% uptime - Border Control able to access CITES electronic system integrated into eCustoms system - Countries that CITES e-permits are exchanged with	- Operations report of CITES application system - Experience report/interview with Border Control officials - Reports on the implementation of bilateral CITES e-permit exchanges	- Proper training of all stakeholders - Online resources for guidance - Brochures - Stable electricity and network - Access of importers to e-Infrastructure[62] - IT infrastructure available - Bilateral agreements on CITES
Inp	- Feasibility study - Funding - Specification - Legal framework - Technical infrastructure - Training - Identification of implementation partners	- Feasibility report - Project approved and funding available - Implementing partners identified and contracted - Legal base established - Pilot users identified - Species classification available - Identification schemes available	- Feasibility report - Minutes from approval meeting - Procurement notice - Laws/regulations published in official bulletins - List of pilot users - Database of product categories - Identification scheme	- Stakeholder buy-in[63] - Political will to implement e-Business solutions

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[62] Smartphones, PCs or similar input devices, internet and electricity
[63] This might involve agents that have an interest in keeping the status quo, e.g. border agents or custom brokers.

9.5   Other considerations regarding implementation

Section 5 outlined some of the generic considerations to be made in the implementation of e-Business solutions, which also apply for the implementation of the CITES e-permitting toolkit. Information regarding the cost of developing a solution for electronic CITES permits is not generally publicly available. Such costs will depend on the current state of the CITES permitting system in each country and local costing. There may be some funding support available for developing nations via several agencies, but generally speaking countries will need to fund their own implementation of CITES. Other sources of funding can come from the fee structure applied during the CITES e-permit application. It would also be worthwhile to explore public-private partnerships, where together with government funding, arrangements may be made with the private sector to partially finance the CITES e-permit development and share in a proportion of the fees charged for filing a CITES e-permit. It is hoped that the availability of a standard software solution through ASYCUDA ASYCER will significantly reduce the implementation costs in the future. Government funding and resources could be raised through legislation and measures for CITES implementation. These could include:

- Permit and certificate application and issuing fees;
- Licence and registration fees;
- The proceeds of fines paid for violation of regulations;
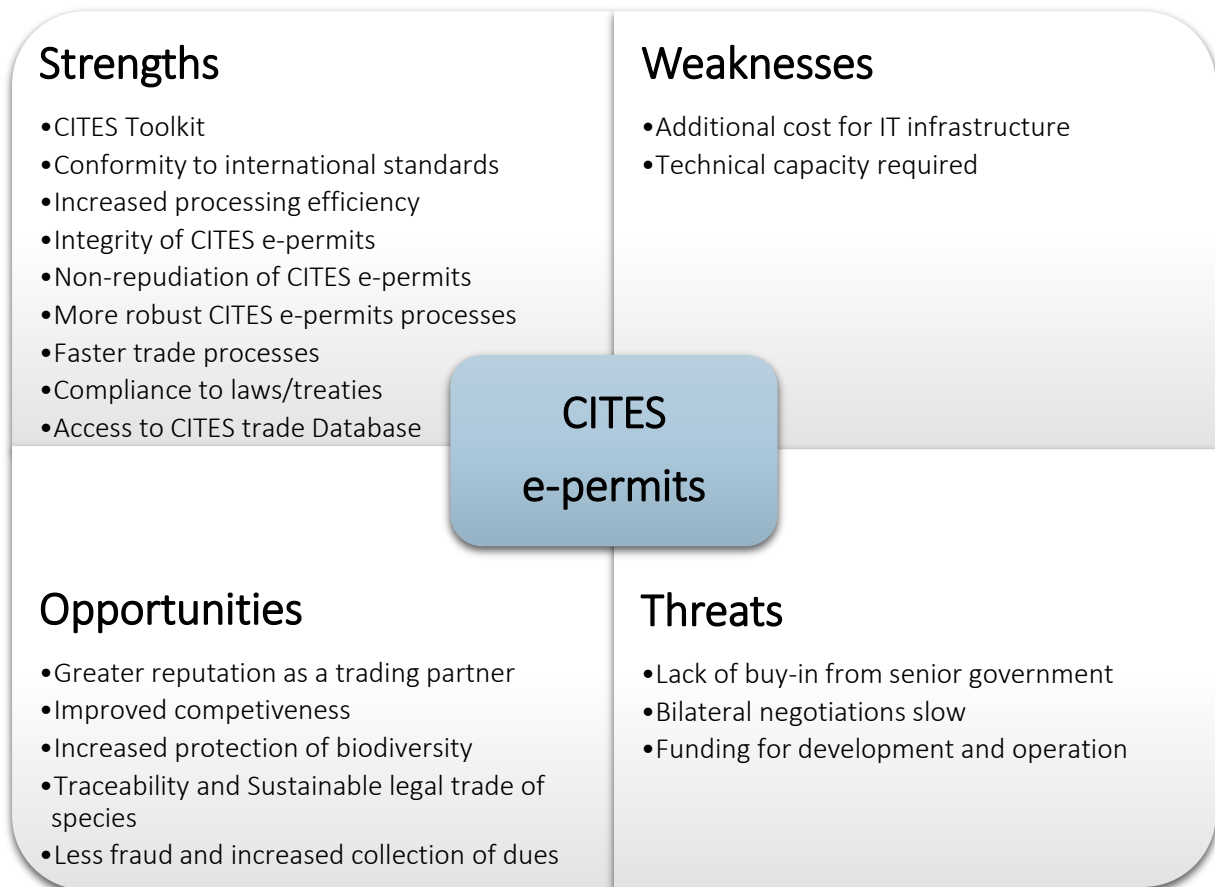- The proceeds of the sale of confiscated specimens.

Such schemes have been set up in various countries to support other conservation initiatives, and there is no reason not to believe that similar funding could be set up for the implementation of the CITES e-permitting toolkit (Klemm, 1993). It is not unreasonable to expect funding in this area, particularly as biodiversity and the protection of endangered plants and animals is to the public's benefit. Organisations such as the Innovative Finance Foundation (IFF)[64] and Global Environment Facility Funding (GEF)[65], are considering funding CITES permitting projects.

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[64] http://www.iisd.ca/vol21/enb2184e.html
[65] https://www.thegef.org/gef/content/gef-41st-council-meeting-day-1

9.6   SWOT analysis

Strengths

- CITES Toolkit
- Conformity to international standards
- Increased processing efficiency
- Integrity of CITES e-permits
- Non-repudiation of CITES e-permits
- More robust CITES e-permits processes
- Faster trade processes
- Compliance to laws/treaties
- Access to CITES trade Database

Weaknesses

- Additional cost for IT infrastructure
- Technical capacity required

CITES e-permits

Opportunities

- Greater reputation as a trading partner
- Improved competiveness
- Increased protection of biodiversity
- Traceability and Sustainable legal trade of species
- Less fraud and increased collection of dues

Threats

- Lack of buy-in from senior government
- Bilateral negotiations slow
- Funding for development and operation

In summary, the CITES e-permitting toolkit offers recommendations on the use of standards based on those developed by UN/CEFACT and the WCO, as well as reference to the transmission model (SOAP, secure SMTP, secure web access) and the model (B2B, B2G, G2G). For reference see section 9.1 and 9.2.

The main weaknesses of implementing CITES e-permits are not dissimilar to the other e-Business areas, including the need for funding and technical capacity for development. As has already been mentioned, the use of professional software firms might mitigate to some extent the risk associated with the lack of capacity in this area. However, this introduces other risks, such as:

- Identifying the right long-term partner;
- Economic sustainability of the partner organisation;
- Capacity of investment of the partner organisation;
- Economic viability of a private operation funded by fees without impacting exporters.

Developing countries in particular may not have the available funds or technical resources to implement a CITES e-permitting system and may require support from the UN, donors or developed nations. That being said, the CITES e-permitting has been designed to make allowance for those nations that still need to use a paper-based CITES permitting system.

9.7   Technical details of the CITES e-permitting toolkit

The e-permit model provides an XML (or UN/EDIFACT) based message structure and associated data components suitable for use by developers in the building of CITES e-permit compatible systems. Information about the specification of the component model, system design, and presentation standards can be found with the CITES e-permitting toolkit (CITES, 2013).

The CITES reference data model is based on the UN/CEFACT Core Component Library (CCL), which is an open and international standard for trade. The Toolkit has also been harmonised with standards developed by the WCO to ensure exchange of CITES e-permits with automated data flows for risk assessment and declaration processing by the Customs.

The class diagram that is available in the CITEs e-permitting toolkit describes the structure of CITES e-permit components that are required to verify compliance with agreed requirements. CITES has designed the toolkit to specify a component model with standards to ensure harmonisation between different Managing Authorities (CITES, 2013).

The current version of the CITES toolkit, V2.0, contains reference to all relevant schema information for the implementation of CITES e-permits. Information about e-permitting toolkit is available on the CITES website, CITES.org.

9.8   More information

Two versions of the CITES electronic permitting toolkit have been published: version V1.0 in 2010 and version V2.0 in 2013, which can be found at www.cites.org. The version 2 of the toolkit is fully integrated in the WCO Data Model and supports UN/EDIFACT (the United Nations rules for Electronic Data Interchange for Administration, Commerce and Transport). These standards are used by Customs organizations and trade and transport operators world-wide. The use of these standards facilitates the exchange of electronic CITES permits with Customs and other organizations.

More information is available on the CITES website. CITES also offers a virtual college that features a variety of training materials.

The CITES Toolkit and e-permit schema is available from the CITES website: http://www.cites.org/eng/prog/e/e-permitting-toolkit.php.

10 Emerging UN/CEFACT standards

This section provides an overview of upcoming UN/CEFACT standards.

10.1 UN/CEFACT Rapid alert system for food and feed (RASFF) notification exchange

The Rapid Alert System for Food and Feed (RASFF) was implemented by the European Commission to provide food and feed control authorities with an effective tool to exchange information regarding the measures taken in response to the detection of serious food- or feed-related risks. RASFF helps countries to act in a rapid and coordinated manner in response to such health threats.

Figure 10.1: Information flows of RASFF
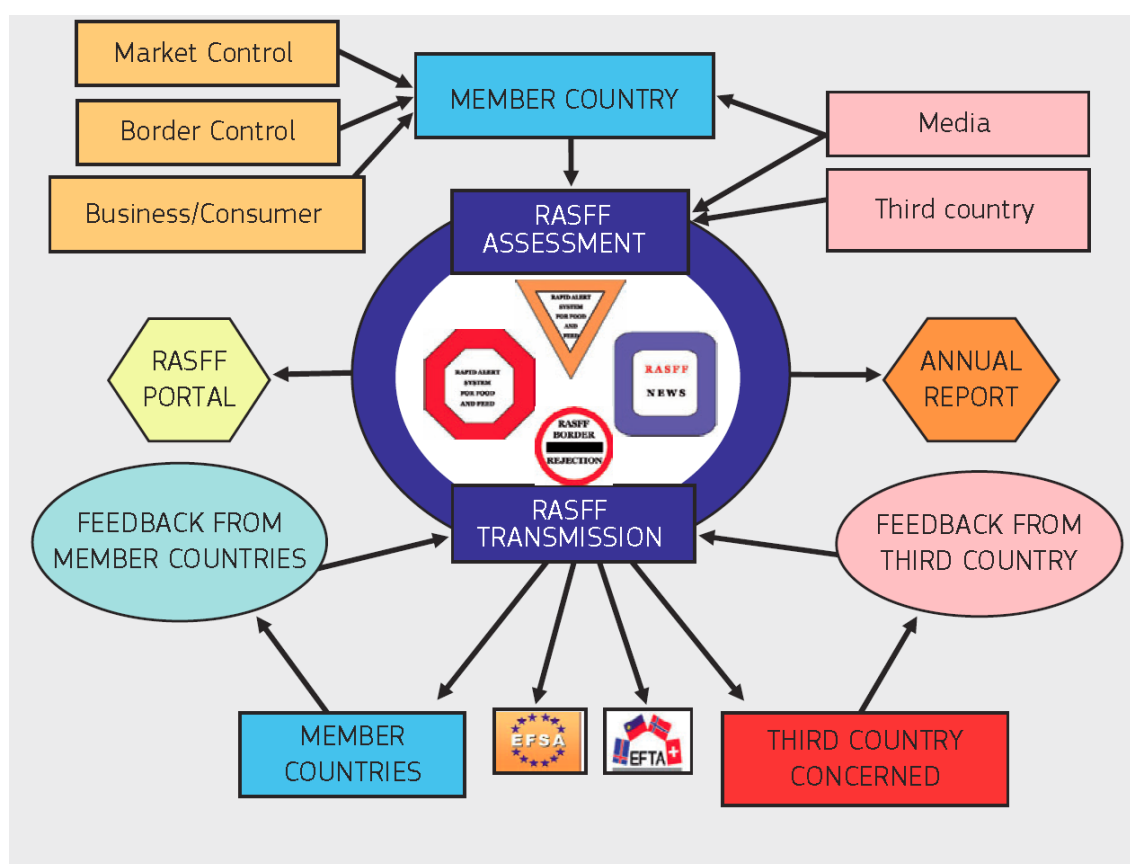
Source: **(EC, 2015)**

Figure 10.1 shows the basic information flow of the RASFF system (EC, 2015). The sources of reported alerts are the member countries from the European Union that perform border controls, market controls. Alerts might also stem from consumers or businesses, through mechanisms such as food recall or withdrawal. The information is reported by the member country through their National Contact Points (NCPs) using the iRASFF system. The notification is then centrally classified; the classification then triggers appropriate action.

A summary of RASFF information is publicly accessible through the RASFF portal,[66] a search engine for notifications. The RASFF system has shown in its 35-year history to be a very valuable tool in the communication of health risks.[67] See Figure 10.2 for a summary of notifications from 2014.

Figure 10.2: Notifications 2014

NOTIFICATIONS BY PRODUCT CATEGORY

Product category	Notifications	Compared to 2013
Fruit and vegetables	620	-3%
Fish and fish products	323	+4%
Feed	309	+14%
Nuts, nut products and seeds	308	+13%
Dietetic products, food supplements, fortified food	204	+31%
Poultry and poultry products	185	-14%
Food contact materials	185	-17%
Meat and meat products	157	-37%
Shellfish	125	+2%
Herbs and spices	121	-12%
Cereals and bakery products	116	+4%

Source: (EC, 2015)

While the RASFF system has a link to countries outside of the European Union, this integration is very limited. One of the obstacles in the path of improved communication about health risks in food is the lack of a global standard for notifications on food and feed. For this reason, a standardisation process was initiated in 2013, by the agricultural expert group of UN/CEFACT, to create a specification for:

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[66] https://webgate.ec.europa.eu/rasff-window/portal/?event=SearchForm&cleanSearch=1
[67] In the Commission's own words: "Vital information exchanged through RASFF can lead to products being recalled from the market. A robust system, which has matured over the years, RASFF continues to show its value to ensure food safety in the EU and beyond." (EC, 2015).

- Processes capturing the notification and distribution of information from one member of a notification network towards a cluster and other countries;
- Data and information exchange messages.

A global standard for the exchange of such information will strengthen cross-border food and feed safety management, as well as allow for better management of food and feed safety issues between exporting and importing nation.

It would also help coordinate international efforts, between the following:
- RASFF, the European Commission's rapid alert system for food and feed;
- ARASFF, the ASEAN rapid alert system for food and feed;[68]
- GRASF, the Golf Cooperation Council's rapid alert system for food and feed;[69]
- RFR, the Reportable Food Registry of the United States;[70]
- INFOSAN, the International Food Safety Authorities Network managed by WHO;[71]

Countries wanting to implement a Rapid Alert System for Food and Feed would typically consider implementing the three modules listed in Figure 10.2.

The **Notify module** would deal with incoming notifications by consumers, businesses as part of their recall/withdrawal notification, border inspection posts, and other reporters, including other RASFF systems and networks such as INFOSAN.

Such notifications would have to be assessed and verified in the **Assess module**, before they are published country or region wide. An important aspect of a RASFF system is in the collection of data for statistics, which are typically published in an annual report. The data collected may also be used in bilateral trade negotiations to improve safety of food exports and imports.

Finally, there would be an **Alert module** which deals with the publication of alerts and notifications. Most importantly, these notifications need to reach country officials tasked with food safety and public health, as well as border inspection posts for input into their risk management system. For example, the report of salmonella infected eggs from a particular country could trigger a higher inspection level of eggs from that country at all inspection posts.
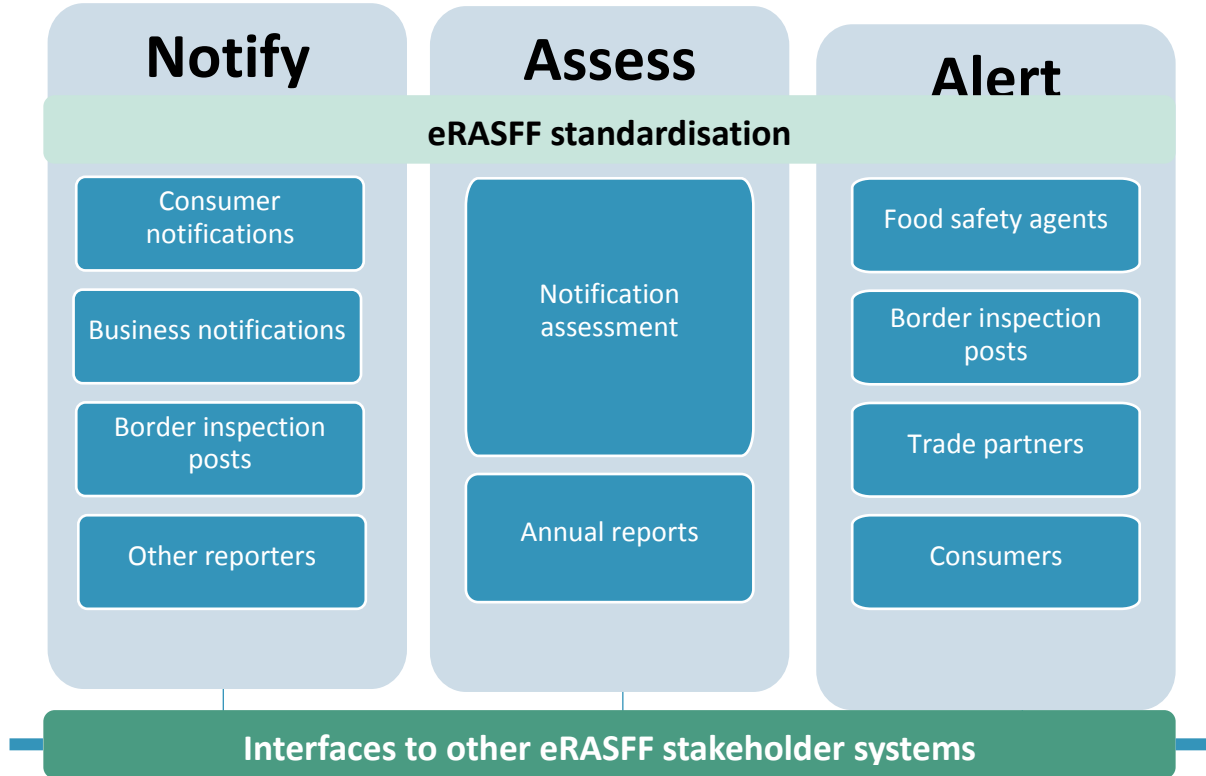
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[68] http://www.arasff.net/
[69] https://grasf.sfda.gov.sa/
[70] https://www.safetyreporting.hhs.gov
[71] http://www.who.int/foodsafety/areas_work/infosan/en/

Figure 10.3: Typical modules of a Rapid Alert System for Food and Feed

In the case of border rejections, these should be communicated to the trade partner using the new eRASFF standard, once it becomes available. This will allow a faster management and inspection of the food safety issue. It is also good practice to provide information of alerts and notifications to interested consumers. Countries implementing such a system eRASFF system can reap the following benefits:

- Faster management of food and feed safety issues;
- Limiting the expansion of food/feed incidences before these become food crises;
- Coordination between food safety agencies nationally, regionally and with trade partners;
- Faster reaction to incidences with trade partners;
- Better control of exports and imports.

Countries in implementing the eRASFF standard can find more information on the corresponding UN/CEFACT website.[72]

10.2 UN/CEFACT Animal traceability data exchange

Animal diseases are a major concern world-wide. For example, past outbreaks of the Highly Pathogenic Avian Influenza (HPAI) have reportedly cost billions of dollars globally and claimed more than 200 lives (McLeod, et al., 2005).

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[72]http://www1.unece.org/cefact/platform/display/CNP/Rapid+Alert+System+for+Food+and+Feed+%28RASFF%29+Notification+Exchange

Initially, as a measure for containing bovine spongiform encephalopathy (BSE) or more commonly known as "mad cow" disease, the European Commission implemented an animal traceability requirement, initially only for cattle. Within approximately 10 days of life, all cattle have to be tagged with a double plastic ear tag, identifying the animal individually. Using that tag the following elements are recorded: owner, farm, movements between farms, animal type (beef cattle, dairy cattle, suckling cow), birth date, and end of life (slaughter, death etc.).

Figure 10.4. Cattle in Estonia marked uniquely with two plastic ear tags. In addition, most farmers use electronic Ids (EIDs) mainly for assisted milking. Left: transponder system. Right: Electronic ear tag.

Source: Heiner Lehr, 2015

Figure 10.5. Estonian cattle passport

Source: Heiner Lehr, 2015

Bovine identification in Europe is regulated by Regulation EC/911/2004. The regulation sets a framework for identification, but leaves member States to provide more detailed regulations.

Cattle are then issued a "passport", which includes information such as the owner history, veterinary history, pedigree and laboratory monitoring is recorded. The issuing of passports is also regulated by Regulation EC/911/2004. However, for international movements of cattle, rules of passport issuance are not standardised. Some countries prefer to issue new passports losing the link to the original passport and therefore breaking the traceability chain. Similar systems have been implemented e.g. in Australia (National Livestock Information System or NLIS), Canada (TRACECANADA), to a limited extent in Malaysia, Namibia (FANMS), Botswana, Uruguay, Brazil, South Korea, Japan and other places (Bowling, et al., 2008; Lehr, 2013)

In order to properly address cross-border traceability of cattle and other animals, a project was started in 2013 in UN/CEFACT to standardise the exchange of information related to animal passports, animal inspections and animal import/export notifications. The standards address bovine animals, sheep and goats, porcine animals, poultry and fish. It aims to establish traceability by unique animal identification, combined with a location, transport details and a responsible party. The standard is intended to work on different aggregation levels (van Diepen, 2014):

- Individual identified animals (bovine, sheep, goat);
- Group identified animals (porcine, poultry);
- Animal products (eggs, semen, embryo).

The standard covers the full lifecycle of livestock, while for caught fish it covers the point of first sales to retail.

Figure 10.6. Conceptual supply chain covered by the standard

Source: (van Diepen, 2014)

The standard recognises that some information elements are quite sensitive and has opted for a four-level data model. Different access rights can be associated with the information levels, making the exchange of traceability information more secure.

Figure 10.7. The four levels of information
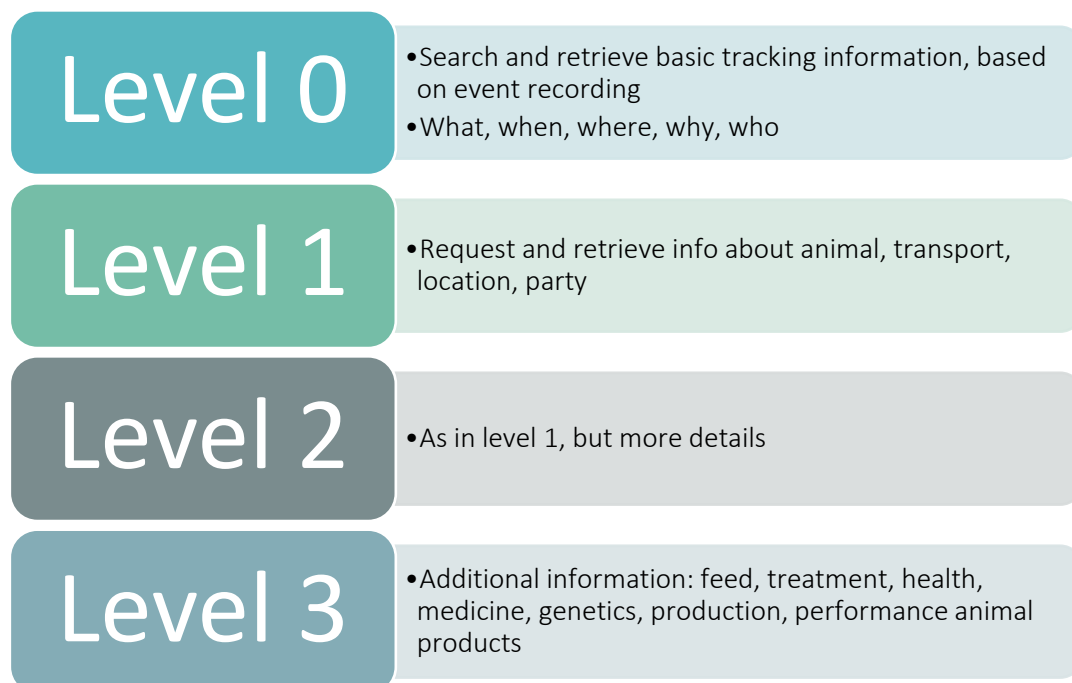
Source: Adapted from (Van Diepen, 2014)

A first pilot implementation of the UN/CEFACT animal and fish traceability standard in the pig sector was conducted with a small number of pig farmers, breeders and fatteners, transporters,

slaughterhouses and service providers. The piggeries used RFID chips for easier event recording (van Diepen, 2014).[73]

A global standard for animal traceability would have several advantages. Traceability has been associated with a number of benefits related to food and feed safety:

- Market access to those markets requiring traceability (European Union, China, Japan, United States, etc.);
- Improved compliance to quality and safety standards;
- Improved risk management;
- Speedier identification of contamination/infection sources, limiting the extent of food and feed incidences;
- Accountability (within the country and with trade partners);
- Fast reaction to safety related trade issues. [74]

An animal traceability system not only constitutes an effective risk management tool for the avoidance of animal or human health issues, but can support the collection of relevant information about the country's livestock sector for public statistics and as input into the policy making process.

Countries interested in implementing the UN/CEFACT for the animal traceability data exchange standard may find more information available on this website: http://www1.unece.org/cefact/platform/display/CNP/Animal+traceability+data+exchange

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[73]http://www.smartagrimatics.eu/Portals/4/SAM2014/5%20Smart%20Food%20Awareness/Session%205.2%20Meat%20Information%20Provenance/5.2.A.5%200140615%20fvd%20paris%20Traceability%20of%20animals%20and%20fish.pdf

[74] For more information see (Lehr, 2013; Lehr, 2015)

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12 Annex I: Basics of Business Process Analysis

Business process analysis (BPA) offers a simple methodology to document and analyse the existing "as-is" business processes involved in international trade, as well as, to assist in the development of recommendations for further improvement. Business Process Analysis is a practical study to understand attributes of business processes and their relationships.
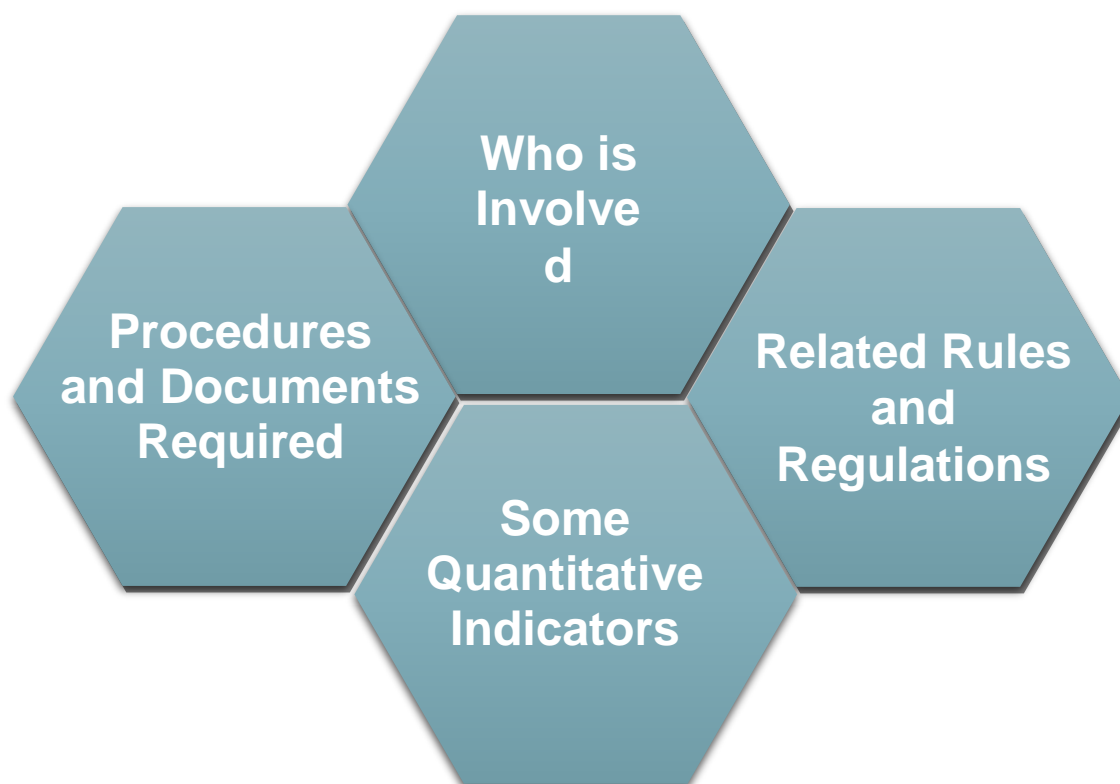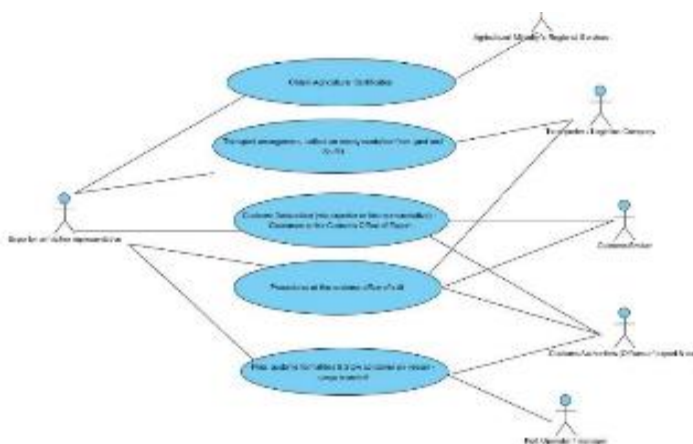

Figure 12.1. Example Use Case diagram

BPA uses the Unified Modelling Language (UML) to describe business processes. UML is a general-purpose modelling language in the field of software engineering, which is designed to provide a standard way to visualize the design of a system. UML is an ISO standard.

Main tools employed:
- Use case description;
- Sequence diagrams.

Creating the BPA:

- **Phase I**: *Scope setting*, which includes the following two steps:

  - Step 1 - Define a project scope;
  - Step 2 - Develop a detailed work plan and secure resources.

- **Phase II:** *Data collection and process documentation*, which includes two steps:

  - Step 3 - Acquire background information
  - Step 4 - Conduct interviews and document collected data

- **Phase III:** *Process analysis and recommendations development,* which includes the following two steps:

  - Step 5 - Analyse the "as-is" processes
  - Step 6 - Develop and propose recommendations

Key elements of a BPA

1. Identification of actors
2. Creation of the Use Case diagram
3. Creation of individual activity or sequence diagram

Main outputs of a BPA

The main deliverable of the business process analysis is the BPA report, which should contain the following components:

- A Use Case diagram showing the scope of the business process analysis project;
- A set of activity diagram - each explains a core business process as represented in the use case diagram;
- A set of process descriptions - each provides a textual description of an activity diagram itself and related information, including relevant laws, rules, and regulations, documentary requirements. The process descriptions should also contain input and criteria to enter/begin the business process, output and criteria to exit the business process, and indicate the average time required to complete them;
- A list of trade forms and documents, which may be accompanied with samples of physical copies;
- An integrated activity diagram;
- A time-procedure chart;
- A list of identified bottlenecks;
- Recommendations to improve the business process and/or "to-be" business process models.

Good practice in BPA

1. First process analysis based on literature and interviews
2. Verification activity (ideally by others) involving stakeholders and site visits
3. Using a co-creation process for analysis of the process and development of recommendations

Figure 12.2. Comparison of BPA with time-release studies (TRS) and time-cost distance studies (TCD) (UN ESCAP, 2014)
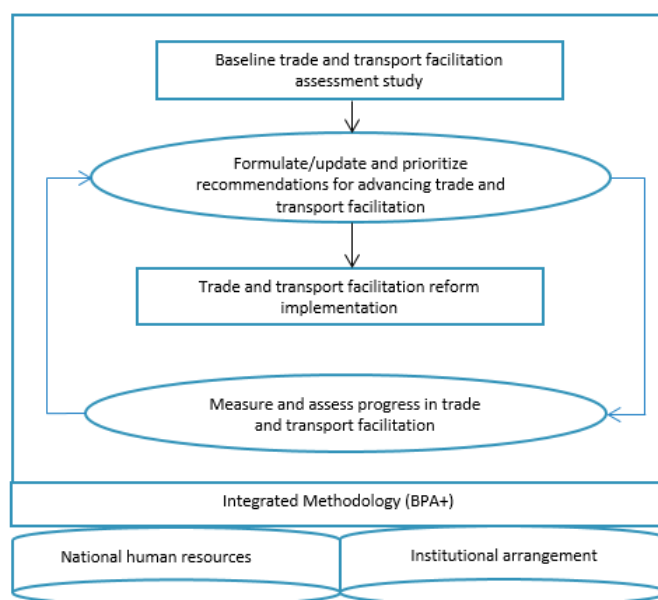

Source: (UN ESCAP, 2014)

Beyond BPA: Towards a national integrated and sustainable Trade and Transport Facilitation Monitoring Mechanism

Despite the efforts made by many developing countries to facilitate trade and transport, few have effective mechanisms in place to (a) monitor the actual effectiveness of their trade and transport facilitation reforms, and (b) identify the trade and transport process and procedures that should be prioritized for simplification or streamlining. To bridge this gap, ESCAP and ADB have jointly developed a guide on establishing a national integrated and sustainable Trade and Transport Facilitation Monitoring Mechanism (TTFMM) to enable the countries to monitor progress in trade facilitation and adapt their strategies to the changing national, regional and global environments.

The key functions of the TTFMM are two-fold: (a) to formulate/update and prioritize recommendations for advancing trade facilitation; and (b) to measure and assess progress in trade facilitation. It is emphasized that TTFMM should be anchored within a national trade and transport facilitation committee (or an equivalent institution) and rely upon national resources to make it sustainable and affordable. Underpinning TTFMM is the methodology called Business Process Analysis Plus (BPA+) which is built on the Business Process Analysis methodology, supplemented by Time Release Studies (TRS) and Time-Cost-Distance (TCD) methodologies. TTFMM is being implemented in Bangladesh, Bhutan and Nepal. In these three countries, national trade (and transport) facilitation committees take the lead in implementation, with support from ESCAP and ADB. National training workshops on the implementation of TTFMM in these countries

Figure 12.3. Key functions and components of TTFMM

Source: (UN ESCAP, 2014)

were held in March-April 2014. The TTFMM baseline studies will be carried out during 2014-2015.

More information on TTFMM is available in a guide published by UN ESCAP, "Towards a National Integrated and Sustainable Trade and Transport Facilitation Monitoring Mechanism: BPA+" (UN ESCAP, 2014).

More information on BPA

More information is available from the UN ESCAP website and in particular in the Business Process Analysis Guide (UN ESCAP, 2009). ESCAP e-Learning Series on Business Process Analysis to Simplify Trade Procedures is available here: http://www.unescap.org/our-work/trade-investment/trade-facilitation/bpa-course