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Glossary

CCC	Customs Code Committee
COMSAR & NAV	Navigation, Communications and Search and Rescue now NCSR (Navigation, Communications and Search and Rescue)
CRG	Common Reporting Gateway
CRS	Common Reporting Schema
DGMOVE	Directorate General for Mobility and Transport
ECSA	European Shipowners' Association
EDIFACT	United Nations/Electronic Data Interchange For Administration, Commerce and Transport - the international EDI standard
EEZ	Economic Exclusive Zone
EFFORTS	Effective Operations in Ports Project
e-Freight	FP7 Scheme which aims to support the three pillars of the European policy, from a transport perspective
EFTA	European Free Trade Area
EIS	Electronic Information System
EMSA	European Maritime Safety Agency
EMSF	E-Maritime Strategic Framework
ESPO	European Sea Ports Association
Freightwise	Management Framework for Intelligent Intermodal Transport, Integrated Project (IP)
IA	Impact Assessment
ICT	Information and Communication Technology
IMO	International Maritime Organization
LCA	Local Competent Authority
MarNIS	Maritime Navigation Information Services Project
MAS	Maritime Assistance Services
MIM	Maritime Information Management
MOS	Maritime Operational Service
NAV	See COMSAR
NCA	National Competent Authority
R&D	Research & Development
RFID	Radio-frequency identification
SAR	Search and Rescue
SKEMA	Sustainable Knowledge Platform for the European Maritime and Logistics Industry Project
SOAP	Simple Object Access Protocol
SSN	SafeSeaNet
STW	now HTW (Human element, Training and Watchkeeping) of the IMO
TCG	Trade Contract Group
VTS	Vessel Traffic Service
WTO	World Trade Organization
XML	Extensible Markup Language

Executive Summary

- This deliverable has considered the potential impact of eMar based on the pilot studies as well as stakeholder views.
- eMar has the potential for considerable economic benefit. We know from recent research that time is a significant factor for international trade.
- There are also potential benefits from cost savings and decision making capability as a result of better and more timely information.
- Societal benefits include improved safety and security through tracking and monitoring. Equally, there may be environmental benefits as a result of better data.
- Inevitably, technology calls for different skills sets and this could lead to some restructuring of the workforce and a requirement for more training.

- The initial survey (D 1.1), the e-Maritime Conference (Section 5), and the e-Maritime Survey in this deliverable (Section 7) draw out some common themes which are important for policy development.

- In a number of areas, e.g. in logistics optimisation, e-recruitment, e-purchasing, ship services, the market will drive e-maritime development. Here the role of the Commission would be in promoting the benefits in order to establish a critical mass of users in order to ensure an effective system.

- In other areas, e.g. common standards to ensure interoperability, European Single Window, paperless trading, transparency information there is arguably a need for greater intervention.

- The development of policy needs to take account of international practice as well as involve stakeholders in order to achieve sufficient buy-in.

1. Introduction

“e-maritime” signifies electronic communications between the different actors involved in maritime transport, including public authorities and the interfaces with other modes of transport. Replacing paper-based information exchange by electronic communication is part of the broader digital agenda, and has the potential of significantly improving maritime transport performance and improving transparency and trust between all parties involved, whilst reducing the administrative burden.’(DGMOVE, 2011;p.1)

One of the key objectives of e-Maritime has been to establish a framework which increases the competitiveness of the EU maritime transport industry in recognition of specific issues and challenges that exist in this sector. Such challenges were highlighted in the SKEMA, (2011) project as follows:

- Administrative procedures in maritime transport are complex and time-consuming and are still often paper based transactions. In cases where they are carried out electronically, the systems differ from region to region.
- Electronic exchange of messages and data is often not well developed since Maritime transport is insufficiently integrated in the logistics chain.
- Ship, port and logistics operators and national administrations have to develop several adaptors to integrate with a plethora of different systems they encounter in their day to day operations which has a serious cost implication and generates no benefit in terms of economies of scale.
- The lack of interoperability creates barriers to utilizing information and communications technology (ICT) applications which could increase the operational efficiency of ports and ships and lead to more sustainable and optimum solutions.

Based on the Vision 2020 document and description of work (DoW), the areas of impact assessment for eMAR will focus on key deliverables of the eMAR project framework, which sets out to provide:

1. IA of the major reporting and information exchange issues within eMAR
2. IA of the expected issues concerning proposed standards
3. Impact Assessment of pilot studies in terms of connectivity and common digital resources
4. Impact Assessment of ‘eMAR techno-change alignment’ based on a stakeholder survey
5. An impact assessment of policy recommendations

The Impact Assessment broadly follows the EU Impact Assessment Guidelines:

http://ec.europa.eu/governance/impact/commission_guidelines/commission_guidelines_en.htm

‘Impact assessment (IA) is a set of logical steps to be followed when you prepare policy proposals. It is a process that prepares evidence for political decision-makers on the advantages and disadvantages of possible policy options by assessing their potential impacts. The results of this process are summarised and presented in the IA report.’

In many cases, the impact cannot be measured but is quantified as an order of magnitude based on a -3 (very negative), -2 (negative), -1 (slightly negative), 0 (neutral), +1 (slightly positive), +2 (positive), +3 (very positive) scale.

In conducting an IA, a number of key questions have to be addressed in relation to the above main deliverables of the eMAR project framework:

- What is the nature and scale of the problem, how is it evolving, and who is most affected by it?
- What are the views of the stakeholders concerned?
- Should the European Commission be involved?
- If so, what objectives should it set to address the problem?
- What are the main policy options for reaching these objectives?
- What are the likely economic, social and environmental impacts of those options?
- How do the main options compare in terms of effectiveness, efficiency and coherence in solving the problems?
- How could future monitoring and evaluation be organised?

(see paragraph 1.1 Impact Assessment Guidelines, European Commission)

At the core of the impact is an assessment of the major reporting and information exchange issues within eMAR from the perspectives of: (a) Ship operations (ship operators and suppliers); (b) Port Operations (port, terminal operators); (c) Logistics Chains Management (shippers/ freight forwarders); (d) National/Regional EU Maritime Authorities (See Figure 1).

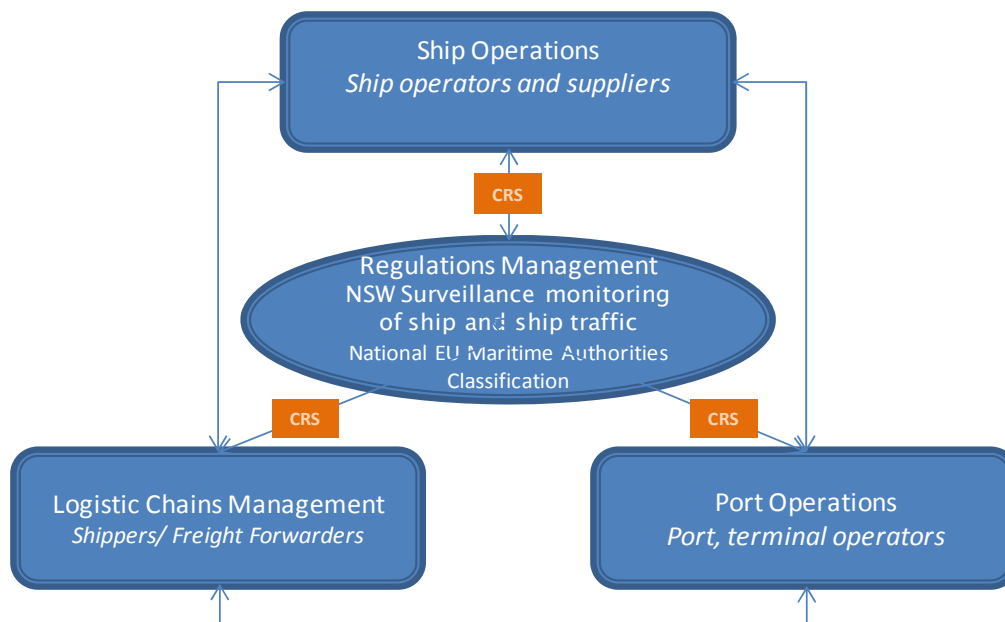


Figure 1. Conceptual eMar Strategic Framework

2. Approach and methodology

In order to carry out this impact assessment, we have:

- a) Considered theoretical issues and experience of e-Maritime in other regions around the world (See Section 3).
- b) Considered relevant outputs from other EU Projects (see Section 4).
- c) Analysed the EU Maritime Conference 2012 footage to highlight and explicate relevant stakeholder questions and discussion concerning the nature of likely problems; how the situation is evolving; and who will be most affected.(see Section 5)
- d) Approached project partners for their views of the current situation, models of data interchange, as well as future reporting requirements for NSW developments and information exchange (as part of identifying a Vision for 2020). In particular pilot project leads have been asked to assess impacts of those pilots and suggest areas for policy development via a short questionnaire (see Section 6).
- e) Designed and distributed a techno change survey to identify stakeholder expectation and needs (see Section 7).
- f) Synthesised issues from qualitative and quantitative data collected, and identify how policy options might be developed to address same (see Section 8).

3. Theoretical Analysis and International Best Practice

The theoretical analysis and study of international practice is shown in full in Annex 1. The findings can be summarised as follows:

Macro perspective:

- The impact of technological advancement upon competitiveness of a country is enormous
- Technology raises welfare and makes everyone better off
- There are spillover effects from one country to another. The EU public spending on R&D is an example of a bloc subsidy to sustain the technological development of the region – Europe – as the effects spread all over the continent.
- Competitiveness is fostered by the institutional and regulatory environment as it creates the right framework for adopting and developing new ideas.
- The task of the policy-makers is to provide incentives for building more effective and widespread networks in their local regional economies. The removal of administrative barriers and the access to a common knowledge infrastructure and collaboration platform could boost network activities in new areas that are fundamental to growth.
- The other impact of technology is to facilitate and harmonise trade and technical standards. The e-MAR standards will promote interoperability between ship operations, transport applications and authorities' systems, which as a facilitator of trade will support the future policy. The project will create a Common Reporting Scheme (CRS) for the countries of the European Union, which will be part of the e-MAR Strategic Framework.

Micro perspective:

- Technological change leads to structural changes within the firm and the industry.

- The Schumpeterian forces of “creative destruction”¹ will put pressure on firms from the industry to become more efficient and dynamic via structural and organisational changes in order to adapt to the offered innovation.
- The specific technological advancement that the eMar project offers between ship operators, ports and forwarders in the countries of the European Union will induce the “skill-biased technological change” (SBTC) within the sector.
- Any technological improvement that will reduce waiting times or the overall delivery times to the EU market will have a profound effect on new market entries or the openness of the European economy.
- The framework, policy, regulations and technical standards has a significant impact on the operation of a business. EU policy development and initiatives support the progress of the Integrated Maritime Policy. The technological advancement that will facilitate the information sharing and partially contribute to achieving the goals of this integrated policy will be implemented under the eMar project.

Paperless trade:

- Paperless trade has characteristics of a public good in that the marginal social costs are higher than the marginal private costs. This means that its implementation creates externalities to which governments should contribute. Market mechanisms alone will not be enough to see paperless trade in operation. Public bodies and organisations need to take a leading role in the implementation.
- The transition to electronic documents is a long-term process that requires the strong involvement of many international stakeholders. Most of the logistics platforms and customs electronic documents are confined to a specific geographical area, so much more work is expected before the information can be accessible throughout the entire supply chain.

International Best Practice:

- There are basically three models of paperless trading: an enterprise or industry –led model; a government-led model; and a government-backed model.
- In the government-led model, the State is driving the agenda of application development as well as policy.
- In the government-backed model, the government is not directly involved, but it is an important participant. The Australian government, for example, does not directly interfere in the application of electronic customs clearance, which is instead pushed by the relevant industry associations. However, Australia introduced the Electronic Transaction Act, which ensured technology neutrality (no form of technology is favoured over another) and media neutrality (paper-based commerce and e-commerce should be treated equally by the law).
- In the enterprise-led model, the government is less involved in the specific applications, instead, the industry and large corporations push forward the application. The US is an example of this model.
- It is difficult to conclude which of the three models is better for implementation than others, because paperless trading requires coordination and integration between sectors of the economy as well as technological innovation and reorganisation of the relation between institutions.
- The developments vary from region to region, but there is an international attempt to push forward with all applications in order to boost trade and promote efficiency. Public

¹ Schumpeter J., “Capitalism, socialism and democracy”, London 1942

and private service partners cooperate in various degrees and create new value-added services. Governments build and support long-term paperless trade development mechanism. As a result, the integration of logistic systems and the cross-border data exchange is working towards to goal of available information throughout the whole global supply chain.

- Paperless trading cooperation has achieved outstanding results in the regions with similar culture, trade or geographical proximity. For instance, the single window in ASEAN economies has been launched and developed rapidly. Other economies or blocs, in their negotiation of free trade agreements, consider trade facilitation and harmonisation of paperless standards and regulations. The negotiation process between the EU and the US will reflect upon such integration trends in the development of paperless trade.

4. Summary of Projects in the domain of eMAR

The summary presents the main projects that e-Mar developments will lean on. The outcomes of already completed projects will be utilized in defining the e-Mar strategic framework, regulatory and policy recommendations.

4.1. MarNIS Project (Maritime Navigation Information Services)

MarNIS – the EC co-funded 6th Framework project that contributed to the development of e-Maritime concept, focused on the improved exchange of information and provision of services and the required infrastructure to meet the requirements placed on both authority and business level. The stakeholders include, on the one hand, the ship itself together with the ship owner, operator and agent, and on the other hand shore-based entities, including maritime authorities, related authorities (e.g. customs and immigration) and commercial parties within the port sector.

MarNIS proposed means to put an end to present fragmentation of measures in place through the development of a concept where resources, systems and services are organised and strengthened into one coherent set of measures.

MarNIS has essentially addressed the maritime transport ‘reporting’ issue both from the point of view of improved efficiency of the ship reporting processes and from the way, in which the information is used by authorities in enhanced safety and environmental risk management. In the context of e-Maritime initiative, MarNIS outputs address an integrated approach to Information Management for Maritime Safety Security & Environmental Risk Management. The overall purpose of such a system would be to enable authorities to better monitor/control maritime traffic in European waters, which is in line with the modified 2002/59/EC VTM Directive aimed at establishing a Community vessel traffic monitoring and information system. The two main MarNIS outputs are:

- 1) MOS: Maritime Operational Services addressing the integration of emergency related processes;
- 2) MIM: Maritime Information Management addressing the adoption of National Single Windows;

In more detail, MOS promotes proactive services to avoid incidents occurring and to minimise their impact once detected. Functions such as SAR, VTS, enforcement, oil pollution response, risk determination, use of places of refuge through the use of temporary Maritime Assistance Services (MAS) and sending Emergency Towing Vessels (ETV) are combined in a MOS centre; people

responsible for one or more of these tasks can share the same information and equipment and cooperate in performing their tasks. MOS centres combine seamless information such as ETAs, AIS tracks, Risk Indices, meteorological information, surveillance info in order to support the operation of dynamic MARAs (MarNIS Risk Areas). MOS is aimed at supporting pro-active vessel traffic management to ships not only in their Territorial Sea but beyond and through into the boundaries of their Economic Exclusive Zone (EEZ).

MIM recommends adoption of National Single Windows by all member states improving the manner in which data is reported to the authorities but also the way in which this data is distributed and made available to the various authorities, these being not only the “traditional” maritime authorities but also authorities such as customs, immigration and health. MarNIS has established specifications for Port Entry Profiles and Port Exit Profiles (PEPs) generated by the NSW to support decision-making before the vessel arrives at port thus increasing clearance efficiencies. PEPs are designed for approximately 10 roles with emphasis on inspection reports and coordination of inspections.

The Risk and Environmental Impact analysis of MarNIS was performed under five tasks:

Task 1 Risk levels in European waters, aimed to determine risk levels and safety bottlenecks by using a traffic and accident database. From the traffic pattern, different exposures as a function of casualty types are derived applying the Safety Assessment Model for Shipping and Offshore on the North Sea Model. Combining these numbers and accident data of the member states, casualty rates were produced that distributed the risk. Consequently, this led to the calculation of accident frequencies, oil spill frequencies and persons at risk.

Task 2 Coastal Environmental prioritizing method aimed to address the prioritising of the natural resources with respect to oil pollution. First, the method was described for sensitive mapping and priorities of marine resources. Second, at a later stage the method was applied to the Portugal coast, because the coast is vulnerable, crossed by significant sea routes and with the occurrence of much oil spills incidents. It analysed the impact from oil spills on the marine and coastal species.

Task 3 Risk indices for vessels, aimed to develop further risk indices for vessels in the European waters. Each vessel has an assigned individual risk index. This index provides information to the authorities about the presence of a vessel with a higher risk. The risk index included factors of static nature such as ship type, size, age, class, flag, cargo and factors of dynamic nature – meteorological and other traffic in the sailing area.

Task 4 Assessment of risk control options aimed to assess the risk control. For this purpose, the present and additional preventive measures needed to be addressed and assessed (even the present and additional remedial measures). This task also explored a theoretical model and applied in practice, when possible. Moreover, it determined the number of persons at risk on the Dutch part of North Sea by using the SAMSON-model².

Task 5 Tools to support Maritime Assistance Services discussed a tool that may be used by Maritime Assistance Services. The tool had to determine the probability of survival for a ship that

² SAMSON – Safety Assessment Model for Shipping and Offshore on the North Sea

was involved in an accident under certain wind and wave conditions. It might be used to define whether or not a vessel could be guided to a certain place of refuge or not.

4.2. e-Freight

The eMar technology is a subsection of the bigger e-Freight platform and as an integral part of it will provide the necessary mutual data flow exchanges.

The e-Freight project is run under the FP7 Scheme and aims to support the three pillars of the European policy, from a transport perspective:

- 1) Strengthening of the internal market and competitiveness;
- 2) Improving regulation to create a more dynamic business environment;
- 3) Promoting sustainable development.

The project is aligned to support the initiatives of the White Paper 2011 by creating the appropriate framework that allows tracing goods in real time; ensures intermodal liability and promotes clean air. It puts the concept of the “single window” and “one-stop administrative shop” in practice by creating a single transport document in electronic form and an appropriate framework for the deployment of tracking and tracing technologies, RFID.

The aim of this project is to enable transport users to identify and use direct or combine transport services most suited for their purposes. It provides transport chain management solutions that assist transport stakeholders to establish common end-to-end transportation processes incorporating regulation compliance and “intelligent” monitoring and control. Also the project develops Next Generation Single Windows for cargo and traffic monitoring irrespectively of mode and integration with SafeSeaNet and e-Customs to support the cooperation between administrations in security, safety and environmental risk management.

The project provided solutions for Next Generation National Single Windows as follows:

Freight Solutions for:

1. Next generation national single window (NGNSW) – B2A app
2. Central EU National Single Windows’ support services – A2A app
3. Collaborative security risk management – A2A app
4. Setting up co-modal transport networks – B2B app
5. Co-modal shipment planning – B2B app
6. Monitoring of transport services execution – B2B app
7. Single transport document – B2B app

Transport regulations – safety, security and environmental protection;

e-Customs Single Window – to enable economic operators to lodge electronically and once only all information required by customs and non-customs legislation for the cross-border movements of goods.

Import Control system – mandatory in all EU member-states and is extended to help increase the security of the global supply-chain. This requires an electronic Entry Summary Declaration (ENS) to be submitted to the first customs office of entry in the EU, prior to any cargo entering or transiting the EU.

Maritime Transport Single window – port single windows were implemented to facilitate port state control reporting and to provide a national maritime traffic database. The National SafeSeaNet (SSN) applications are regarded as a kind of national infrastructure implementing the Single Window concept.

Inland Transport Single window – there are complex reporting requirements that exist across different modes and in different countries.

National Single Window – will provide facilities for exchanging information between authorities within a Member state. These services will allow authorities to publish and access data, raise alerts and share information with one another.

Applications consist of:

- 1) Common reporting gateway;
- 2) Information exchange;
- 3) Central EU national single window support services;

The e-Freight Next Generation single window concept consists of a multimodal National Single Window (NSW) deployed in each member-state and supported by a number of central EU services. The NSW system consists of two applications:

- 1) The Common Reporting Gateway – a common interface for businesses to report all regulatory information in a standardized format;
- 2) The Information Exchange facilitates the distributions and sharing of information between Authorities within and across Member States, and with EU level systems.

4.3. EFFORTS Project (Effective Operations in Ports)

EFFORTS aimed to improve the competitiveness of the European port operations and the quality of the ports labour conditions and market, being a prominent one in coastal regions. The project was run under FP6 DG Research Integrated Project “Effective Operations in Ports”. The R&D focused on three areas:

- 1) navigation in ports dealing with safe and efficient approach and berthing of vessels usually increasing size faster than port infrastructure can follow;
- 2) ports and environment;
- 3) port organisation providing an architecture, process descriptions and software tools for operational support and risk assessment and management.

Results of the project include:

- EFFORTS ICT Handbook of process modeling;
- Process ontology and process modeling platform;
- Port process map;

- Procedure model for specification, implementation and quality assurance of interfaces;
- Prototype framework for development and testing interoperability solutions, based on standard business cases;
- Prototype system for port process optimisation;

The project provides free tools for ports. This is a standard high level process map and actors model that can be used in house to develop own models at a more detailed level and for specific purposes (risk assessments, process improvements, introduction of new ICT systems etc.). Port processes model aims at providing the methodology and necessary ICT tools to create interoperability solutions between stakeholders in ports. EFFORTS Roadmap incorporates Standard Business Cases, which can be used as “Toolbox” to model a specific business case. It is supported by a template defined as a Base Project, which is in the modelling tool “Enterprise Architect” (EA).

4.4. SafeSeaNet (Safe Sea Network)

The European Commission initiated the SafeSeaNet project to develop a European Platform for Maritime Data Exchange between maritime administrations of the Member States of the European Union, by:

- Setting-up a telematic network between all the maritime EU member states for their cooperation in preventing maritime pollution and accidents at sea;
- Creating this network that takes into account new technologies such as XML and the Internet, making it flexible to cope with future technological developments and being eventually expandable to the EFTA and accessing maritime countries.

The establishment of the network facilitates the communication of the competent authorities at local/regional level and the central authorities and their activities with regard to:

- Prevention of accidents at sea and of marine pollution;
- Efficient implementation of EU maritime safety legislation;
- Collection and dissemination of data related to maritime activities;
- Harmonised exchange of this data.

The SafeSeaNet takes into account new IT technologies and is flexible to cope with possible future technological developments. The participants directly concerned by and involved in the set up of the SafeSeaNet network are as follows:

- All local competent authorities (LCA) designated by the Member States before or during the requirements study as being in possession of any relevant data concerning the SafeSeaNet network;
- All national competent authorities (NCA) being in possession of relevant data for the network;
- Bodies acting as a central storage point for data that is gathered by LCAs;
- National bodies in possession of or responsible for a TESTA connection (or a national network giving access to TESTA);
- Shore based coastal stations, notably those involved in the AIS network;
- The EMSA, as a host of the central index application;

- Ports as major stakeholders in the information process;
- Shipping agencies.

The actors involved in SafeSeaNet were located in different European countries and belonged to a variety of authorities and administrations. SOAP Protocol was implemented for the exchange of messages. The system supports XML messages as well as EDIFACT messages. The XML protocol supports the development of the structured messages. Adherence to this schema then ensures that the messages can be understood by all systems in the SafeSeaNet.

Since October 2004 the EMSA has taken over the management of the system and is responsible for organising the follow-up in cooperation with the Member State's maritime administrations.

4.5. E-Customs (Electronic Customs)

This project was initiated by the EC and aims to replace paper format customs procedures with EU wide electronic ones, thus creating a more efficient and modern customs environment. The project's dual objective is to enhance security at the EU's external borders and to facilitate trade. The current legislation on customs processes is still based on paper declarations, and although Member states have electronic customs systems, they are not inter-connected. The convergence of IT systems would benefit not only the traders in doing their business, but also the EU competitive economy. It will improve safety and security for all EU citizens.

The New Computerised Transit System started in 1997. As a contribution to the e-government programme, in July 2003 the Commission published its communication on a paperless environment for customs and trade, which provided a vision of a modern customs service communicating electronically with trade. In 2012 the Multi-Annual Strategic Plan was issued for the creation of a European electronic environment, consistent with the operational and legislative projects and developments already scheduled or underway in the areas of customs and indirect taxation.

The EC and Member States will aim to ensure that:

- Electronic data exchange between customs offices is possible throughout the Union where required;
- Electronic operators can lodge their summary and/or customs declarations in electronic format from their premises, irrespective of the Member state in which the goods are entering into or leaving the EU;
- The collection and repayment/remission of customs duties will, in principle, be handled by the customs authority responsible for the place where the importer/exporter is established and keeps his records;
- The selection of goods for customs controls at border and inland customs offices is based on automated risk analysis using international, Union and national criteria, the Union criteria being electronically exchanged between the Member states;
- Traders will have to register only in one Member state for customs purposes, even if they perform customs transactions in other states;
- Traders have access to information portals and single electronic access points for import and export transactions and for security related customs procedures, irrespective of the Member State in which the transaction starts or ends;

- Whenever required, these computerized customs systems are interfaced with existing and future systems in areas other than customs;
- All authorities and agencies involved in import and export transactions are enabled to exchange electronic information, including with third countries if an international agreement provides for this. Customs will take a leading role in establishing a single window for these authorities and agencies;
- All physical controls are ideally carried out at the same time and at the same place (one-stop shop).

For the implementation of the e-customs projects, the EC services and Customs Policy Group (CPG) will work in close cooperation and/or consultation with the following bodies:

- Electronic Customs Group (ECG);
- Customs Code Committee (CCC) and possibly other committees involved in the legal work;
- Expert groups involved in the consultation process on the Union Customs Code;
- Customs 2013 Committee concerning the Programme's organizational and financial framework;
- Trade Contact Group (TCG), consisting of key trade associations and being the Commission's main consultation body for all aspects related to trade.

To achieve the electronic information system (EIS), the Commission together with Member states undertakes monitoring activities incl. annual reporting on the tasks under the e-Customs decision.

4.6. E-Navigation

E-Mar technology will ally itself with the e-Navigation developments.

E-navigation is a concept developed under the auspices of the UN's International Maritime Organisation (IMO) to bring about increased safety and security in commercial shipping through better organization of data on ships and on shore, and better data exchange and communication between the two. The concept was launched when maritime authorities from seven nations requested it be added to work undertaken in IMO's NAV and COMSAR sub-committees. Working groups in three sub-committee (NAV, COMSAR and STW), and correspondence groups are working on an e-Navigation strategy implementation plan meant for adoption in 2012.

Project ACCSEAS (Accessibility for Shipping, Efficiency Advantages and Sustainability) explores the future of e-Navigation in the North Sea Region and is supported by Interreg IVB (European Regional Development Fund 2007-2013). It aims to improve safety, security and environmental protection in the North Sea region by developing and implementing a practical e-Navigation test-bed to harmonise the exchange of electronic information on-board and ashore. Building on the development of e-Navigation in Europe through coordination with related projects, ACCSEAS will deliver timely and accurate navigation information to support mariner and, help shape e-Navigation solutions of the future.

The project employs a system engineering approach, where a phased programme of development to recognise problem areas and determine solutions using the IMO e-Navigation concept is implemented. It offers also training modules for practical e-Navigation solutions. All these outputs will be used to inform policy development and influence the creation of necessary institutional

structures and regulatory instruments needed to deliver future e-Navigation Aids to Navigation services.

4.7. SKEMA (Sustainable Knowledge Platform for the European Maritime and Logistics Industry)

This project ran between 2008 and 2011, funded by the EU FP7 scheme. It established a knowledge platform for the use of policy-makers and industry agents. The knowledge platform contains a knowledge base that was populated by consolidation studies, associated periodic studies and outputs from thematic activities. The structure of the platform is based on six general topics:

1. Economics and Regulations;
2. Transport and Logistics;
3. Technology;
4. EU Maritime Transport Policies;
5. Safety, security & sustainability;
6. Projects Directory

The EU e-Maritime initiative is represented on the platform and gives a generic understanding of the original concept. It aimed to support the development of European capabilities, strategies and policies, facilitating the adoption of eMAR solutions in support of an efficient and sustainable transport system. These solutions will facilitate the exchange of information between different stakeholder groups involved in:

1. Improving safety and security of the industry as well as environmental protection;
2. Increasing competitiveness of the EU maritime transport industry;
3. Integrating sustainable waterborne transport services into efficient door-to-door transport services in Europe;
4. Reinforcing the human factor particularly supporting competence development and welfare.

4.8. Freightwise (Management Framework for Intelligent Intermodal Transport, Integrated Project (IP))

This project was run within the FP6 scheme and aimed to bring together three different sectors:

- Transport Management – shippers, forwarders;
- Traffic and Infrastructure management – all transport modes;
- Administration – customs, border crossing, hazardous cargo, safety and security

One of the Work Packages provided a comprehensive analysis of the freight market structure, modal drivers, requirements for intermodal shift and economic variables and dynamics with particular reference to expected changes. The intermodal market tends to be dominated by RoRo transport and the principle actors are the freight-forwarders. To achieve integrated services many barriers have to be removed such as technological, organizational and administrative. Many companies find the threshold for using advanced IT and IT-based management tools still too high in terms of costs and necessary know-how.

The development of “virtual transport services” provides a possibility to manage information related to the optimisation of the available multimodal resources. It creates interesting links among different nodes in specific areas. Simulation of the total cost of a logistic chain could also be a relevant requirement that the users ask for from an independent software tool set. The next generation tools are required to be related for interoperability among existing WEB services, this will create a large community of users sharing relevant information about the potential demand and services in transport and logistics. The framework of Freight-wise project supports process interoperability, software interoperability and chain actor profiling.

Deliverable 17.1 of the Freightwise project describes the methodology for evaluating the business cases (8 cases) as the demonstration of Freightwise tools had to be seen as a pilot for the participating parties. The business cases were evaluated not only from a commercial perspective but also from a socio-economic point of view. CO2 emissions, fuel consumption, noise, traffic safety, health, social inclusion, peripheral areas, all these concerns were considered. Also it was deemed whether the EC subsidy to the intermodal services contributed to the positive societal benefits or whether these services could be realised without subsidies.

The cases in D17.1 varied widely:

- Some cases dealt with vertical integration, others – with horizontal integration;
- Some cases set-up a freight integrator function while others focused on improving specific parts of the transportation process;
- In some cases only one or two market agents were involved, while in others a whole range of agents from various transport modes;
- Some cases were “shipper-driven”, whereas others were “transport-operator driven”.

Examples of indicators used to evaluate each business case are shown in Annex 2:

The focus of Freight-wise project was co-modal freight transport. The architectural framework included all aspects related to co-modal transportation. All transport modes should be used to the best of their ability. The requirements and decisions with respect to the architecture can be summarised as follows:

- The architecture is common to all transport modes;
- The framework architecture has a focus on the generic issues enabling interoperability and efficiency in co-modal transport chains; the objective was to simplify procedures and information exchange between stakeholders;
- Fleet and terminal resource management was not a priority to the project, but the service providers were given sufficient information to be able to use their resources efficiently;
- The internal solutions in the systems of separate stakeholders were not focused.

The main elements in the framework are: 1) identification of related functions and business processes; 2) identification of roles; 3) identification of messages and 4) identification of information that can be published as part of the VTS concept.

The validation plan recognised that all services are derived within a structure or environment, which utilises technology and information.

Freightwise project identified the expected impact and associated target groups to assess the approximate impact magnitude on these groups. From the project’s description of work, five main impacts have been identified:

1. Standardisation and harmonisation: the aim was to create input for a European standard framework for the development and integration of ICT systems and modules in intermodal freight transport management.
2. Interoperability in intermodal transport chains: FREIGHTWISE set out a framework, which together with technical standards and the alignment of business rules, contributed to interoperability. Interoperability was considered in terms of information exchange between stakeholders, business models and processes.
3. Industrial competitiveness: the industry is expected to become more competitive as a result of the suggested improvements.
4. Co-modality: the architectural framework included all aspects of the co-modal freight transport.
5. Innovation: the architecture promoted the development and utilisation of open and “free” systems for management of intermodal transport operations.

The business cases that were selected for the validation plan included:

<i>Case</i>	<i>Actors to participate</i>
North East	Destia Ltd
Benelux	Logistics BV
Southeast	Proodos, Thessaloniki Port Authority

Details of the cases:

- I. Case North East piloted an information system for a cross-border transport network, providing information on arriving and waiting traffic at terminals, ports, border crossings, and support in managing traffic at the corresponding parking areas. The route included cross-border sea links (Finland – Estonia), and land transport links (Finland – Russia and Estonia – Russia) and terminal transfer points (ports, inland terminals) in Finland and Estonia.
- II. Case Benelux focused on the community system Port Infolink in the port of Rotterdam and a major road transport operator Jan de Rijk (JDR). The business idea was to provide support for the optimization of the transport chains. JDR wanted to make better use of the systems it already operated, by integrating road traffic management data with its transport management system. The Port Infolink developed a transport order service that enhanced the existing services. The Transport Order case involved a number of companies that developed a working demo by which standard transport orders for on-carriage transport could be sent and received electronically between different players in the logistics chain in an easy way.
- III. Case Southeast promoted solutions, which could absorb the increased freight transport demand without generating more traffic on the road networks. In this case scenario, Proodos holds a central role as a major multimodal freight transport integrator. In cooperation with various rail networks, incl. OSE, Proodos organised complete trains with general cargo or containers from central Europe for all Balkan countries, ending up in Greece and Turkey.

In summary, the validation plan of this project was undertaken to assess the approximate impact on the various target groups. The plan was supported by the exploration in detail of three business cases.

5. Analysis of Conference themes e-Maritime 2012

The themes discussed during the two-day conference in November 2012 highlighted relevant stakeholder questions, shared experience and debated concerns that are most likely to appear again at a later stage of the project. Each stakeholder presented viewpoints and gave a broader understanding of the strategic and operational role that the eMar initiative should play.

Table 1: Summary of Conference Themes

Key Stakeholder Representatives	Thematic topics that came up during the presentations
DG MOVE (Regulatory side)	<ol style="list-style-type: none"> 1. Increasing employment; 2. Industrial Policy – supporting the technological advancement in the sector; 3. Solutions: Business to Administration; Administration to Administration; 4. Developing standards and avoiding the introduction of too many varying IT systems; 5. Establishing proper IT structure; 6. Applying the standardisation of IMO, WCO, UN and the Economic Commission for Europe; 7. Integration with other transport modes.
European Parliament (Legislator side)	<ol style="list-style-type: none"> 1. Simplification of admin procedures for ships landing at EU ports, river ports; 2. Simplification of customs procedures; 3. Single Market Act 2, 2013 – the Blue Belt; 4. Standard documents – electronic paper and signature; 5. Sustainable and safe mobility.
Presidency of the EU, Cyprus	<ol style="list-style-type: none"> 1. Maritime Labour Convention; 2. Integrated EU Maritime Policy 2012; 3. Europe 2020 Strategy; 4. Electronic Transmission System.
Ship-owners' Association, ECSA (Industry side)	<ol style="list-style-type: none"> 1. Simplification of documents, procedures, etc.
Shipping Line, Maersk (Industry side)	<ol style="list-style-type: none"> 1. For captains – too much paper work; 2. 80% of his working time spent on paper work; 3. For the EU ports – 80 docs plus 42 docs sent in advance of the landing; 4. A wide range and diversified responsibilities.
Port of Antwerp (Industry side)	<ol style="list-style-type: none"> 1. Information and control system of the port – a very

	<p>complex and integrated system;</p> <ol style="list-style-type: none"> 2. Antwerp port system – linking sea points with river points; 3. It integrates port operations, terminal/lock's control, cargo management; federal police activities, customs procedures.
Port of Amsterdam (Industry side)	<ol style="list-style-type: none"> 1. "Circle Line" Metro system of the port; 2. Integrating port links with the hinterland transport, incl. airports and any logistics points; 3. It requires cooperation between rivals; 4. Distinctive management – traffic vs. transport
Society of Research of Synergy, France (Industry side)	<ol style="list-style-type: none"> 1. Data collection, concepts and using of data; 2. Their model – data warehouse; 3. Harmonisation of data (metric system); 4. Manage the flow of information; 5. Protecting confidentiality; 6. Providing admin continuity.
EMSA – Safety agency (Regulatory side)	<p>SafeSeaNet:</p> <ol style="list-style-type: none"> 1. Between maritime administrations to assure: 2. Safety, environment protection, port security, efficiency of maritime traffic and transport; 3. Exchange information of vessel traffic and cargo movements; 4. Monitoring of pollution; 5. Categorisation of vessels; 6. Electronic transmission of information; 7. Rationalisation of procedures; monitoring applications; 8. Information from Admin to Business; and Business to Administration.
ESPO Intermodal and Logistics	<ol style="list-style-type: none"> 1. Port Community system is an entry point to the single national window; 2. Simplification and harmonisation; 3. Data requirements; 4. E-Customs vs. National single windows; 5. Coordination between e-Freight, e-Navigation; 6. Integrated logistics chain; 7. Optimisation of data.
Cargo Operations	<ol style="list-style-type: none"> 1. Cooperation between Single Window and the Port community system; 2. Spanish Customs Authorities moving from security towards trade facilitation; 3. "Virtual" port system.
Ship Operations	<ol style="list-style-type: none"> 1. Characteristics:

	<p>increased efficiency; reduced costs; simplified reporting requirements; learning from the aviation industry.</p> <p>2. Challenges: EU member states are at different places; move to digital operations; IT solutions have limitations.</p> <p>3. Recommendations – harmonise requirements; clear legal framework; collaboration of all DGs; all stakeholders should be involved; IT should be seen as a support tool.</p>
Multimodal Group	<ol style="list-style-type: none"> 1. e-Mar Scope: interface public-private and private-private transactions; 2. Data Volume – new regulatory requirements; 3. Logistics – will be very itemised in the near future; 4. Electronic signature – required; 5. Confidentiality – important; 6. Recommendations – IT is a catalyst for innovation; Integration of the logistic chain; Sharing information; Standardise processes.
Practices from outside the EU Singapore	<ol style="list-style-type: none"> 1. Single Window System – Free Trade Zone, Custom System, Port community system; 2. Trade facilitation – speed, costs, productivity and security; 3. Single window – integrates all government agencies, customs authorities, entire trade value chains, regulatory agencies, management of all authorities, serves as the national, secure, trusted information broker/VAN 4. Single window extended to B2B, part of the WTO procedures; 5. ASEAN single window of 10 members; 6. Need to develop Global Vision/Framework for Trade Facilitation; 7. References to studies of the World Bank and OECD (“Trading across borders” and others)
NEAL-NET, China-Japan-Korea	<ol style="list-style-type: none"> 1. Lack of information exchange standards between these three countries; 2. NEAL-NET: logistics information sharing with a high level view throughout entire supply chain; 3. Architecture: Reduce info sharing costs; Timeliness data query; Security of data; Accuracy of data; 4. In 2012, NEAL-NET began the negotiation for extending the logistics information sharing to the EU; 5. NEAL-NET needs support from governments, as it is a long-term vision.

Brazil, Secretariat of Ports	Brazilian Single Window – “paperless port”; characteristics: <ol style="list-style-type: none"> 1. Single data basis; 2. Integrating authorities; 3. Access of data, analysing it; 4. Provide information about the infrastructure; 5. Vessels monitoring; 6. Paperless trade system changes the business processes.
Australia, Port of Australia	<ol style="list-style-type: none"> 1. Australian Port community system for sharing information since 1989; 2. Bureau for Customs – procedures; 3. Cargo Manifests – cargo automation; 4. Port management system – very inclusive system (even work permit applications are included); 5. One single window for Australian customs; 6. Ports are governed by the state authorities; 7. DG Hub Features serves the entire supply-chain; <ul style="list-style-type: none"> - No need to store paper forms; - Templates can be created for regular shipments; - Forms visible to nominated parties; - Forms are electronically signed.

The table shows that different stakeholders have different concerns and priorities, but some common themes are evident: the need for internationally acceptable common standards; simplification of administrative procedures; paperless systems; better integration of transport modes; better safety and security; and better environmental monitoring.

6 Pilot Projects

The pilot projects are at the heart of the impact assessment. Table 2 summarises these studies. The following sections take each study in turn, providing a brief synopsis before assessing the potential impact and policy implications. The leaders of the pilot projects provided much of the data on impact via a short questionnaire in which they were asked to assess impacts of the pilots in the following categories:

- Economic:
 - Costs
 - Revenue
 - Decision making capability
 - Work load
 - Time savings
 - Competitiveness
- Societal:
 - Safety

- Security
- Job creation
- Environmental
 - Emissions:
 - Noise

As part of the assessment they were asked to quantify as far as possible but at least give an order of magnitude on the following scale: -3 (very negative), -2 (negative), -1 (slightly negative), 0 (neutral), +1 (slightly positive), +2 (positive), +3 (very positive).

Note that some of this information has not yet been returned and will be added post the review meeting. Missing information is highlighted.

Table 2 : Summary of Pilot Studies

Study	Maritime Context	Description/objectives
Ship Voyage Monitoring (see Section 1)	Ship Operations	Standard data model for ship monitoring particularly addressing environmental issues IMO Energy Efficiency Operational Indicator (EEOI) SVM service for on-board and office use Ship voyage optimisation services Global ship status database
e-Recruitment / e-Crewing (see Section 2)	Ship Operations	Posting and viewing information about vacancies and job applicants Integration of existing systems (Access Point)
e-Purchasing (see Section 3)	Ship Operations	Information matching component Data/process modelling and standardisation Access Point connectivity
Shipping Service Descriptions (see Section 4)	Ship Operations	Use and test Transport Service Descriptions from e-Freight Enhanced searches, planning, input to optimisation, benchmarking
Benchmarking of shipping services (see Section 4)	Ship Operations	Standard data model for benchmarking of services provided by shipping companies (related to e.g. detentions)

		"Service Quality Report"- eBay seller/buyer rating for ships, credit rating
Survey Status Message (see Section 5)	Ship Operations	Create a Survey Status standard message
eMAR ecosystem access to PCS Services (see Section 6)	Port Operations	Access to PCS services to send lists of equipment (vessel loading lists) to the terminal Access to PCS services to consult lists of equipment status Connect the eMAR ecosystem with PCS services (interfacing)
Paperless environment for export container release at ports (see Section 7)	Port Operations	Paperless environment for the transmission of vessel loading lists and customs verification and goods/container release process for export flows. Sending electronic vessel loading list (see previous) Matching loading lists with single administrative documents (allowing paperless customs release)
PCS Service (see Section 8)	Port Operations	Real-time information container terminal for customs. Providing customs and with real-time information of the arrival of export goods to the port terminal
Logistics Integration (see Section 9)	Logistics Chain	Data model on information to be supplied to port/terminal system responsible for terminal and hinterland operation (TSD, TS) Linked to extended gateway concept/practices Links with TEP and TS
Multimodal Logistics Optimisation (Section 10)	Logistics Chain	Optimisation and scheduling of multimodal logistics operations including port activity and ship, rail & truck movements. Demonstration of scheduling

		and optimisation using simulated data centred on Valencia
Maritime Single Window (see Section 11)	Administration	Common reporting schema & MSW Building Blocks. Maritime Reporting Formalities
Statement of Fact (see Section 12)	Ship Operations	Electronic version of SoF, standard data model for communicating statement of fact information handled normally by ship agents. Log management service with data quality checks and distribution management
DNV Navigator (see Section 13)	Administration	DNV Navigator will be extended to be able to directly send CRS message to a Single Window using web services. Maritime Reporting Formalities

6.1 Ship Voyage Monitoring (Awaiting Comments from Pilot Leader)

This aims to share vessel charter-party performance between the charterer and principal. The demo gives access to all vessel performance reports sent from vessel to charterer and operator for a selected vessel and voyage. The user can recall performance reports from departure to noon report for any selected date. The user can also ask for charter party compliance calculations like speed performance claim EEOI, Emissions SOx NOx etc.

Impact of Ship Voyage Monitoring

Type	Brief description	Impact	Comments
Economic	Decision making capability	+1	Better information on performance can help to improve decision making
Economic	Time savings	+1	Better information on performance can help to improve efficiency of vessel operation and lead to better planning in port including faster turnaround times
Environmental	Emissions	+1	Better emissions data will ensure compliance with regulations and could lead to reduced emissions

Policy Implications

The regulation relating to emissions already exists. However, this technology and information exchange could ensure better monitoring.

6.2 e-Crewing/e-Recruitment (Awaiting comments from Pilot Leader)

The Crewing process/application provides support for the crewing department and the crewing related tasks of the Master. The main activities consist of:

- Crew Information Management
- Recruitment
- Crew scheduling
- Handling crewing requests
- Making travel arrangements
- Competence management
- Training

The main objects are:

- Crew Records
- Candidate Crew Application
- Recruitment Request
- Crew Schedule
- Crew list
- Crew Training Plan

The maritime e-Recruitment service, implemented over the eMar Platform utilises Access Points technology. Maritime e-Recruitment facilitates the procedure of matching the Recruitment Request (RR) to the Candidate Crew Application (CCA) which satisfies the Recruitment criteria.

The eMAR platform offers a user interface that allows the users to submit their requests or applications to eRecruitment and view the matching results.

Impact of eRecruitment

Type	Brief description	Impact	Comments
Economic	Cost savings	+1	Potential to reduce advertising spend
	Time savings	+1	Shorten time-to-hire and time to offer acceptance.
	Better hiring decisions	+1	Potential for widening the pool of applicants and better information
Societal	Widening participation	0	Widen participation in the recruitment process
	Jobs reductions	-1	Reduction is staff required in recruitment process

Note that With Cloud-based e-Recruitment, a company can deploy and automate processes that scale up or down with the number of participants (HR personnel, recruitment agencies, applicants etc.). This is achieved effortlessly, without the need to invest in additional infrastructure.

Policy Implications

A good system will be used by the industry as it will provide the benefits highlighted above. There may be a need to promote the system and encourage its use.

6.3 e-Purchasing (Awaiting comments from Pilot Leader)

Ship managers are required to procure and deliver to the vessel various products and services needed for the safe, efficient operation of the vessel. The purchasing process involves the following activities:

- Raising Requisition;
- Request for quotation;
- Quotations;
- Purchase ordering;
- Order Confirmation;
- Tracking Purchase Status;
- Supplies receipt notification;
- Approval and payment of invoices;
- Audit purchase trail;
- Manage inventory;
- Management of suppliers and sub-contractors list.

The main objects are:

- Requisition;
- Quotations Summary;
- Purchase order;
- Invoice;
- Supplies receipt;
- Inventory Status.

The pilot e-purchasing study provides a platform to publish software services related to shipping and also simulates the implementation of the applications identified above. The platform acts as a node in the eMaritime Network and offers a directory of e-Maritime services that are used already by a number of shipping companies for day to day operations.

The supplier is notified by e-mail to go on the Danaos platform and fill in the quotation form. The prices are sent to a buyers database. The system also caters for e-invoice submission and statement of accounts.

Impact of e-Purchasing

Type	Description	Impact	Comments
Economic	Cost	+1	Through obtaining more competitive prices
Economic	Decision making capability	+1	Ability to see a wider range of services in one place.
Economic	Time saving	+1	Allows for more efficient processing saving

			time.
Economic	Competitiveness	+1	Ability to obtain more competitive prices.

Policy implications

This is a market driven solution and would not need any specific policy. Again promotion of the benefits may be required.

6.4 Shipping Service Descriptions & Benchmarking (Awaiting comments from Pilot Leader)

The purpose of the shipping service description pilot study was to assist both ends of the shipping business, i.e. the service clients and service providers, to find the most convenient or otherwise most suitable companies with which to do business. The two central concepts of the pilot study are:

Descriptions - To allow Shipping Service Providers to describe their services & products in a fashion that can be searched by Shipping Service Clients to select an appropriate provider;

Benchmarking - A forum where Shipping Service Clients can rate the services & products of Shipping Service Providers, forming a library of customer reviews to guide clients in selecting a suitable provider.

Type	Brief description	Impact	Comments
Economic	Cost reduction	+1	Reduced marketing spend for shipping service providers
Economic	Time saving		Through having information in one place
Economic	Better decision making capability	+1	Ability to see a wider range of services in one place.
Economic	Competitiveness	+1	Improvement in quality and competitiveness through the reviewing process

Policy Implications

This is a market driven solution and would not need any specific policy. It relies on a high level of take up so promotion of the benefits may be required.

6.5 Survey Status Message

The pilot makes information about ship classification and survey status available as a web service using the CRS. Intended users are anyone that needs to find this information about a particular ship, which could be many stakeholders in the maritime industries.

Type	Brief description	Level of impact	Comments
Economic	Better decision making capability	+2	Leads to greater efficiency
Economic	Time savings	+1	Leads to greater efficiency
Societal	Improved safety	+1	

Policy Implications

Successful adoption of this technology would require standardization of the CRS, or adoption of another standard.

6.6 eMAR ecosystem access to PCS Services (Awaiting comments from Pilot Leader)

Type	Brief description	Impact	Comments
Economic	Costs		
	Revenue		
	Decision making capability		
	Work load		
	Time savings		
	Competitiveness		
Societal	Safety		
	Security		
	Job creation		
Environmental	Emissions		
	Noise		

6.7 Paperless environment for export container release at ports (Awaiting comments from Pilot leader)

This creates a paperless environment for the transmission of vessel loading lists and customs verification and goods/container release process for export flows. Electronic vessel loading list will be matched with single administrative documents allowing paperless customs release.

Impacts

Type	Brief description	Impact	Comments
Economic	Costs	+3	Paperless procedures will potentially increase the productivity of the shipping market segment, and hence, reduce overall trade-logistics costs for manufacturers.
Economic	Work load	+1	Has the potential to reduce administrative burden
Economic	Time savings	+3	Paperless environment has the ability to reduce waiting times and delivery times
Economic	Competitiveness	+1	Potential for improved competitiveness through more efficient processing of information
Societal	Security	+1	Paperless environment can improve the accuracy of information which could have security implications
Societal	Jobs	0	Different skill sets may be required

Policy Implications

This is an area where policy would be required to facilitate this process as it involves B2A information flows.

6.8 PCS Service (Awaiting comments from Pilot Leader)

This involves the production and distribution of electronic versions of port services documentation, such as Port Clearance and Notice of Readiness. The concept is for real-time data to be presented in an information terminal, for use by vessel personnel, port personnel and regulators.

Impacts of PCS Service

Type	Description	Impact	Comments
Economic	Time saving	+1	Improved information exchange between Port Container Terminal and Customs, related to export containers gate-in operations leading to time savings
Economic	Better decision making capability	+1	Improved information exchange between Shipping and the Port Authority and/or Concessionaires providing specific services
Societal	Security	+1	Currently Customs do not have real time information about the arrival of goods/container into the port terminal. The risk analysis and assignment of the level of control is done without this information – reduction of risk

Policy Implications

This is an area where policy would be required to facilitate this process as it involves B2A information flows.

6.9 Logistics Integration

The purpose of the pilot was to contribute to the integration of shipping and maritime services in a complete “door - to – door” logistics chain. Exploiting the capabilities of IBI platform for Corridor and Transport Chain Management, the maritime actors and services will be integrated with the hinterland actors and services, tackling the fragmentation of intermodal transport with emphasis on the maritime.

The pilot addressed the following:

- Use of eMAR reference model for corridor and supply chain management.
- Integration of IBI and eMAR platform allowing the exchange of information at both planning and execution stages of the maritime transport and sea terminal.
- Compliance with Access point for the interfacing, thus supporting the “flexible interoperability and interconnectivity”
- Adopting the Common Framework information architecture
- Implementation of TSD for maritime transport services
- Publishing/discovery of the transport services

The business scenario in the pilot study relates to the corridor use case described for the hinterland transportation between Port of Hamburg and port of Vienna. In this corridor there are several intermodal routing options possible which can be considered for the intermodal planning calculation. The technical solution with possible user interfaces and interrelation to external systems e.g. eFreight framework respectively e-maritime strategic framework should meet the

different stakeholder requirements and support better planning and control processes for multi-modal transport chains. With regard to the EMSF application areas and eMAR processes this pilot is focusing on the transport planning and management between seaport and hinterland transport network respectively final destination. It is related to the eFreight framework and the related standardised messages. Intended users are mainly stakeholders which are involved in multi-modal transport planning, service providers but also port community systems and network information services.

Impacts

Type	Description	Level of impact	Comments
Economic	Cost	+1	better planning and optimization results given by the pilot system can contribute to more effective processes and faster provision of services
	Revenue	+1	better available services can be found easier and could be alternative to traditional chains only on road
	Decision making capability	+2	More transparent routing and intermodal options in the network highly contribute to better management of intermodal transport chains
	Work load		depending on the effort to handle data and realisation of interfaces, once realised and the manual efforts are done workload will be decreasing.
	Time savings	+1	depending on the effort to handle data and realisation of interfaces, once realised and the manual efforts are done workload will be decreasing
	Competitiveness	+2	interconnected services and integrated IT solutions contribute to innovative company processes an enhanced competitiveness.
Societal	Jobs		Job descriptions may change and different skill sets may be required.
Environmental	Emissions	+1	more effective logistic chains can save km and therefore emissions

Policy Implications

This is a need for further development of the standardised interfaces. With regard to containerised transport tracking and tracing, real time transport management and more accurate an advanced planning will become more and more important. There are still there barriers to transparent and controllable logistic processes over the whole supply chain between different stakeholders. This would have to be addressed through policy

6.10 eMAR-enabled Optimisation and Simulation (EOS) system

The optimisation services developed in eMAR use the EMSF models to address multimodal logistics optimisation encompassing the end to end maritime logistics process i.e. including ship, port, truck, train and terminal operations.

The optimisation services have been designed to use the data and information made available through the eMAR platform to create an integrated multimodal logistics model addressing detailed planning & scheduling of ship, rail, barge and truck operations in conjunction with corresponding port activity and container inventory management and repositioning.

This highly complex logistics optimisation solution has never been attempted before and has been made possible by the combination of the datafeeds available through the EMSF coupled with highly advanced scheduling algorithms that form part of the eMAR optimisation solution.

The eMAR optimisation system has been tested using real data for an operation centered on the Port of Valencia and the Valencia-Madrid corridor (but also looking at Barcelona operations).

eMAR-enabled Optimisation and Simulation (EOS) system can be used to plan the container logistics operation to deliver cost savings for operators, faster turn-round times and reduced vehicle emissions (for more detailed information see Deliverable 2.4)

Most ports offer some form of Terminal Operating System which sometimes incorporates optimization. This new system offers integration between ship and port and onward transportation. It therefore provides better planning of ship to vehicles which has the potential to save on operational costs.

The optimisation solution has been designed taking into account the data that will be made available through the EMSF model, thus enabling visualisation of end-to-end transport chain services, and taking advantage of the increased levels of automation in information exchanges between different stakeholders to provide decision support services for optimisation of existing, new and upgraded services.

The EOS system can display information such as planned routes/corridors, resource allocation, container inventory levels, port activity and current/expected schedule of ships in the terminal.

Real-time information is available from eMAR-enabled systems, containing details such as consignments, current ship locations, availability of resources, etc.

The EOS uses this information to optimise the integrated multimodal operation:

- Port/dock activity
- Rail movements
- Truck movements
- Container repositioning
- Ship schedules

The capabilities of the EOS have been demonstrated by using the maritime logistics operation in the port of Valencia. A simulated dataset, derived from real data but extended and enhanced to cover a

two-month analysis window was created. It includes 17,000 consignments, distributed among 160 ship visits, and a further 30 feeder vessel visits:

- The port logistics optimisation/simulation algorithm takes **less than a tenth of a second**.
- Multimodal optimisation for a single day takes **~0.5 seconds** for a day's worth of container movements
- The full integrated multimodal optimisation (including land-based operations) takes less than **2 minutes** (i.e. to create a detailed schedule for 2 months of activity).

The system also contains a tool for finding cost-saving pairings of movements to reduce wasted transport activity.

Using this tool, the total road distance can be reduced dramatically (in our dataset, from 5,812,000 km to 4,337,000 km) i.e. a saving of 25%. This optimisation takes around **5 seconds** for a day, so allows real-time replanning of such activity in response to changes to ship arrival schedules, port problems, etc.

Issues and costs

There needs to be a critical mass of users for information sharing

System costs:

- Under 1m Euro for cost of the system
- Who bears the costs – depends on the modules as it is a multi-user system
- Training (although software is very intuitive so training is minimal (about 2 hours))

Impact of EOS

Type	Description	impact	Comments
Economic	Cost saving	+3	Approximately 10% cost savings can be achieved for large multimodal logistics operations.
Economic	Increased revenue	+3	Reduced costs for the operator can be used to reduce costs to the customer and therefore attract more business. In particular eMAR makes the multimodal option (including a main waterborne leg) even more attractive compared to truck.
Economic	Better decision making capability	+3	The eMAR platform can be used to model new services and corridors e.g. "what is the benefit of adding a rail link from port A to city B?" or "what is the benefit of increasing port capacity to X?"
	Workload	+3	Current logistics planning processes are very manual and labour intensive. eMAR streamlines the flow of information, greatly enhancing automatic data transfer. Furthermore the optimisation system uses the newly available data to automatically plan the logistics operation rather than relying on planners to make every single decision.
	Time saving	+3	Three "types" of time saving are achieved: - faster turnaround time in ports means less wasted time for ships - better integration of multimodal logistics services

			means shorter end-to-end transit - automation means greatly reduced admin effort
	Competitiveness	+3	The reduced cost, faster end-to-end service and increased automation result in the European shipping industry being able to offer lower cost, more flexible and more reliable services.
Societal	Safety	+2	Better visibility of maritime operations (especially in busy ports) reduces the risk of accidents.
Societal	Security	+2	Increased visibility and the existence at all times of a clearly defined optimised schedule means that it is easier to monitor activity to look for suspicious behaviour.
Societal	Job Creation	+2	Increased competitiveness of ports, especially in regional centres will lead to increased employment. Routine admin jobs will be replaced by more interesting and satisfying tasks such as tactical planning, strategic optimisation, etc.
Environmental	Emissions	+3	eMAR will drive a massive shift away from truck to ship (and rail). Even those movements that will remain on trucks will be optimised to further reduce emissions. Slots on ships and rail will be better utilised reducing "wasted space" and therefore reducing emissions per useful movement. Reduction in total road distance travelled from 5,812,000 km to 2,919,000 km demonstrating that the eMAR tools support modal shift away from truck movements.
Environmental	Noise	+1	eMAR could open the possibility of planning port operations taking into account noise restrictions. However this possibility has not been explored in this project.

Note that the pilot study focused on container cargo as the benefits are higher as it is a harder problem to solve

Policy Implications

The obvious financial and operational benefits of implementing this eMAR solution should ensure that the market does adopt the technology. The response from the market has been positive. However, there may be a need to promote in order to increase awareness as unless there is a critical mass of users then the system will not operate effectively.

6.11 NMSW -National Maritime Single Window (Awaiting comments from Pilot Leader)

eMar aims to provide facilities to assist Member States in developing their own solutions, making best use of existing investments. It will offer Ship Masters/Agents and other stakeholders solutions for efficient communications with Single Windows.

1. Submissions are made using a standard data model - the *Common Reporting Schema (CRS)* - to a **National Maritime Single Window (NMSW)** using a reporting application called the **Common Reporting Gateway (CRG)**; they also receive related response messages (authorisations and clearances) from authorities through the CRG.
2. The NMSW is comprised of two components, the Common Reporting Gateway (CRG) and Information Exchange (IE) that manages communications with National Authorities and SafeSeaNet.
3. Both components can be updated from a central module in the EU Maritime Single Window (EU MSW) Support Services. When regulations change, the changes to CRG and IE components are handled by a Manage Regulatory Information Changes module in the EU MSW Support Services.
4. The EU MSW also provides a Central Register of CRGs which acts as an address book for businesses to locate reporting gateways. This will be integrated in a future Common Authentication and Credential System that can be operated by Member States.
5. Via the EU Services and Databases module, the EU MSW may also provide services (e.g. the provision of statistical information to authorities or business) as well as databases, such as an EU ships database or a database of registered operators within the EU.

Impacts

Type	Brief description	Impact	Comments
Economic	Work load	+3	Ease of reporting has implications for accuracy and efficiency.
Economic	Better decision making capability	+2	Via the EU Services and Databases module, the EU MSW may also provide services (e.g. the provision of statistical information to authorities or business) as well as databases, such as an EU ships database or a database of registered operators within the EU.

Policy implications

This would require a Common Reporting Schema and a Common Reporting Gateway.

6.12 Statement of Fact (Awaiting response from Pilot Leader)

An application to produce and distribute an electronic version of the Statement of Fact (SoF). The proposed benefits include standard entry requirements, aimed at ensuring all relevant information is included to a satisfactory level, and the expeditious distribution of a common SoF document to all relevant parties.

Type	Brief description	Impact	Comments
Economic	Costs		
	Revenue		
	Decision making capability		
	Work load		
	Time savings		
	Competitiveness		
Societal	Safety		
	Security		
	Job creation		
Environmental	Emissions		
	Noise		

6.13 DNV Navigator (Awaiting response from Pilot Leader)

Impact

Type	Brief description	Impact	Comments
Economic	Costs		
	Revenue		
	Decision making capability		
	Work load		
	Time savings		
	Competitiveness		
Societal	Safety		
	Security		
	Job creation		
Environmental	Emissions		
	Noise		

Policy implications o/s

Better and more timely information leads to economic, societal and environmental benefits which are all evident from the pilot projects. These suggest significant economic benefits in terms of cost savings, time savings and decision making capability. There are some smaller societal benefits relating to safety and security as a result of better information as well as the potential for improved environmental monitoring.

Table 3 summarises the policy implications that emanate from the pilot studies. These are discussed further in Section 8.

Table 3: Summary of Policy Implications

Study	Policy Implications
Ship Voyage Monitoring (see Section 1)	The regulation relating to emissions already exists. However, this technology and information exchange could ensure better monitoring.
e-Recruitment / e-Crewing (see Section 2)	A good system will be used by the industry as it will provide the benefits highlighted above. There may be a need to promote the system and encourage its use.
e-Purchasing (see Section 3)	This is a market driven solution and would not need any specific policy. Again promotion of the benefits may be required.
Shipping Service Descriptions & Benchmarking (see Section 4)	This is a market driven solution and would not need any specific policy. It relies on a high level of take up so promotion of the benefits may be required.
Survey Status Message (see Section 5)	Successful adoption of this technology would require standardization of the CRS, or adoption of another standard.
eMAR ecosystem access to PCS Services (see Section 6)	O/S
Paperless environment for export container release at ports (see Section 7)	This is an area where policy would be required to facilitate this process as it involves B2A information flows.
PCS Service (see Section 8)	This is an area where policy would be required to facilitate this process as it involves B2A information flows.
Logistics Integration (see Section 9)	This is a need for further development of the standardized interfaces. With regard to containerized transport tracking and tracing, real time transport management and more accurate an advanced planning will become more and more important. There are still there barriers to transparent and controllable logistic processes over the whole supply chain between different stakeholders. This would have to be addressed through policy
Multimodal Logistics Optimisation (Section 10)	The obvious financial and operational benefits of implementing this eMAR solution should ensure that the market does adopt the technology. The response from the market has been positive. However, there may be a need to promote in order to increase awareness as unless there is a critical mass of users then the system will not operate effectively.

Maritime Single Window (see Section 11)	This would require a Common Reporting Schema and a Common Reporting Gateway.
Statement of Fact (see Section 12)	O/S
DNV Navigator (see Section 13)	O/S

7 Stakeholder Views

Stakeholder views have been sought throughout the project via interviews and questionnaires and may be summarised as follows in the categories of operational and technical requirements.

The main areas of user requirements from operational and business point of view are:

- improvements in speed and efficiency in executing processes
- simplification of the procedures with the use of accessible and user- friendly systems
- minimisation of errors due to manual data entering
- reduction in reliance on paper
- cost reductions
- Communication and information retrieval/ sharing through e-MAR platform. This interest applies across shipping and port and terminal operations, and was particularly pronounced in areas where paper is still common.
- Integration of the e-MAR Platform with existing systems that can be either an information source or for information sharing.
- Information security is a major concern for most stakeholders and plays an important role in their willingness to share information.
- Transparency of information and actions taken place, lead to higher degrees of trust. Thus, all actions and processes must be registered and become easily traceable and available to the stakeholders.
- Quality of information is important for the stakeholders. While there is availability of information, sometimes it is difficult to be retrieved while other times are not reliable.

The main areas of user requirements from the technical point of view are:

- Security in all stages of the message transaction, i.e. access, establish of channel and throughout the exchange transactions.
- Cost of ownership and operation
- Maximize Interoperability and Interconnectivity
- Allow the use of standards relative to the logistics/ maritime services industry for information exchange
- Use widely accepted communication protocols with straightforward and well documented guidelines or provide an API that can be used and incorporated into proprietary IT solutions.
- Usage of effective communication mechanisms that will allow the secure and efficient information exchange either using of the box solutions that can be found or can be easily implemented by the IT department of the involved stakeholders.
- A simple communication protocol (e.g. simple HTTPS-protected channel) can be used
- Utilize existing standards (message / communication) where appropriate / possible

- Lower the cost of entry for SME's and individuals.
- Be able to use interfacing mechanisms to message channels and relay services that will be provided by the platform infrastructure to support intermittently connected systems.
- There is no need for a system to be continuously connected in order to exchange data.
- Allow stakeholders to participate in a secure / efficient collaborative network by minimising cost of investment. The stakeholder can use the system without having to host an Access Point or develop expensive tools
- Delays in the processing of electronic information can have a direct effect on delays in cargo handling
- A solution should accommodate supply chain stakeholders with different level of IT maturity.
- Allowing parties to communicate using messages without the need for a centralised platform.
- User profile in address lists defines message standard that is used by the receiver
- Users do not need to handle transformations/ mappings.
- Support of common data specific for maritime sector that will allow the interfacing with other stakeholder within the maritime sector.

In addition, an eMAR techno-change survey of stakeholder (port users, shipping users and regulatory authorities) was done. The survey was sent to some 1000 contacts in the maritime and logistics field. It was also to be used to gauge wider economic, eMaritime diffusion, technical, regulatory, governance, inter-organisational, and social factors, as well as risks, affecting the potential adoption of eMAR projects.

To date (November 2014) 19 responses had been received. The survey was distributed again on the 19 November and additional responses will be analysed and incorporated into this document post review. Although this cannot be used for statistical analysis some of the themes were interesting and consistent and are presented in Section 7.1 below

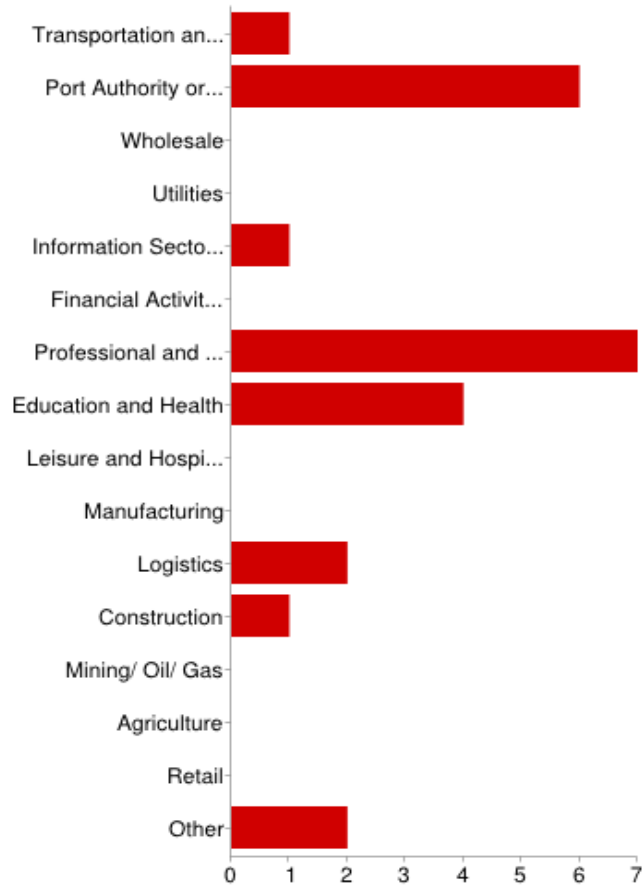
7.1 Survey Results

1. A profile of organisational respondents (n=19)

i. By annual turnover:

less than Euro 500,000	4	22%
between Euro 500,000 and 1 million	2	11%
Euro 1-2 million	2	11%
Euro 2+million	10	56%

ii. By business category/ sector:



iii. By number of organisational employees:

less than 10	4	22%
between 11 - 50	3	17%
between 51 - 250	4	22%
between 250 - 1000	1	6%
greater than 1000	6	33%

2. Problems and issues

In terms of commonly reported problems and issues associated with the adoption and diffusion of eMaritime innovations, initial survey findings suggest:

- 88% - concerned over data security, information exchange and confidentiality
- 83% - excessive bureaucracy and regulation inhibiting effective business to administration information exchange
- 78% - too much reliance on paper based communication
- 72% - a lack of open, transparent and consensual message standards in the maritime sector
- 66% - insufficient training or discussion about eMaritime
- 66% - insufficient investment in port electronic data systems (around Europe)

3. Planning/priority issues

The areas stakeholders consider a priority for planners (heading towards 2020):

- 78% -eMaritime projects should focus on harmonisation and simplification of standards and documentation for improved information exchange.
- 72% - prioritise a National Single Window in each European country.
- 72% - developing a European Single Window (ESW) across all countries over the medium to longer term.
- 66% -developing a standard messaging and common communications network architecture (eg common access points through eMAR).
- 66% - establishment of cooperative multi-modal transport networks and higher interoperability standards.

In relation to what stakeholder would like to see from EU eMaritime policy making over the next 3-5 years, 'free text' comments included:

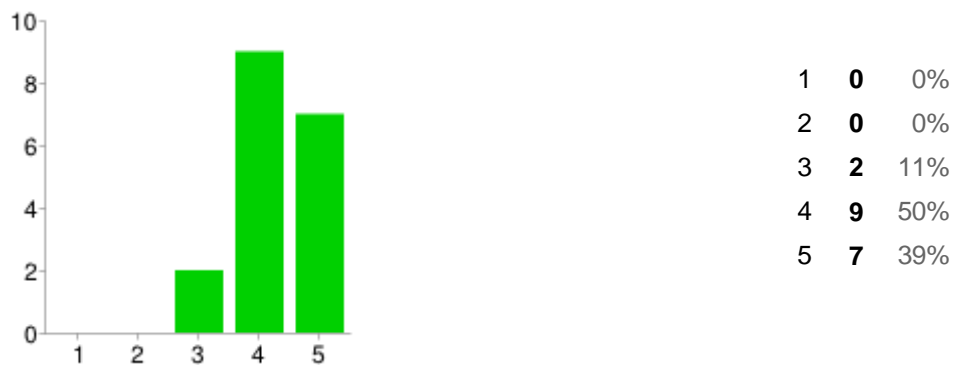
Comment example 1: "Standards for data exchanges, mainly on data models and message standards [are important]. Infrastructure otherwise is probably not so important as that will evolve based on available technology. On the policy side, it is important to support electronic exchanges instead of paper (port clearance, certificates, on-board documentation, log books etc). Policies could also address better cooperation between parties (owners, charterers, managers, ports, administration, agents etc) so that more optimized voyages can be executed. Other contract forms and commercial relationships are needed".

Comment example 2: “There is a need to ensure that the required infrastructures (including underlying geospatial information and communication infrastructures) are consistent with the requirements of eMaritime development. Developing regional solutions which are not applicable worldwide is of limited interest for international shipping”.

4. Further areas for future policy/planning attention

i. Benefits awareness, education and training

89% strongly agreed/agreed, that clearer communication of eMaritime benefits to stakeholders is required.



- In a related question, 66% agreed (combined measure of strongly agreed/ agreed) about the need to work with eMaritime stakeholder groups to provide further education, training and support.
- Stakeholder perceived large (benefit) realization gaps associated with: (a) information exchange between ship and port; (b) less bureaucracy and administration; (c) optimised logistics; (d) major transport efficiencies and savings; (e) Better safety, societal and environmental information.
- An implication is that more work needs to be conducted in relation to eMaritime benefits awareness/ education and training.

ii. **B2A versus B2B information exchange**

72% of respondents agreed (combined measure) that business-to-business (B2B) information exchange should also be included as part of eMaritime projects planning.



- In a related (control) question, 56% agreed (combined), that eMaritime projects should involve more than just Business to Administration (B2A) information exchange.
- From the eMaritime (2012) conference this was an issue raised, ie whether policymaking should focus on B2A only, or also include B2B. The consensus at the time was that future eMaritime projects and planning should focus on B2A. However, based upon these survey findings, perhaps further consideration should be given to including B2B (as well as B2A) as part of future policy/ projects planning.

iii. **Partnership between the public and private sector**

88% agreed (combined measure) that greater partnership between the private, public sectors and EU is necessary for effective promotion of eMaritime.



- In two further control questions, 44% of respondents agreed (combined) that eMaritime should be led by the public sector. In addition, only 50% agreed (combined) that eMaritime should be led by port authorities and the public sector.
- The implication from the survey is that respondents are more closely in favour of consideration of a partnership led policy/planning approach to eMaritime development.

8 Policy Options and Analysis

The role of the Commission in the maritime sector is to ensure a competitive market environment, maintain safety and security in shipping and ports, and protection of the environment from the harmful effects of all types of pollution.

In terms of policy options there is a whole range of possibilities which are listed below:

- Taking no action
- Providing information or guidance
- Using market based instruments
- Co-regulation
- Self-regulation
- Issuing recommendations
- Flexible Directives
- Regulation and Directives

The policy development process should systematically compare all the delivery options (regulatory and non-regulatory) at an early stage and choose the one that will successfully implement the policy in the most efficient and least burdensome way.

It should be noted that all forms of intervention, from 'classic regulation' to voluntary agreements, should adhere to the principles of proportionality, accountability, consistency, transparency and targeting. But consultation is key to effective delivery of policy goals regardless of delivery. Consulting at the right people at the right times will result in a better policy with more stakeholder buy-in and wider take up.

8.1 EU Regulation and Directives

This type of policy response is often appropriate where there is a serious risk to health or security. In such situations there can be no ambiguity and this might be the only way to get a market to respond in the required way.

Compliance rates can be better, often because directives have a higher profile. Traditionally, more publicity and focus is given to formal legal provisions than to alternatives, which are often implemented by less conventional means channels. If properly enforced such measures can lead to action even if there is a general reluctance to comply.

A major advantage of this policy approach is the security it provides for markets, consumers, and citizens, together with clear legal means of redress if the law is broken. Much of the regulation introduced by the EU is designed to provide this protection and security.

8.2 No action

The other extreme is to take no action. It is recognised that intervention can take up additional time and resource for those having to comply. In some cases, 'no action' can mean no new requirements or regulations but, instead, taking other non-regulatory steps such as clarifying the existing law, improving its enforcement or highlighting requirements already in place which are not being respected.

The Commission can publish interpretative communications to clarify existing provisions and so avoid the need for new laws. This use of existing laws is also a benefit to the Commission in terms of time and effort and reducing the rate of growth of legislation and the future need to simplify and consolidate it.

In its Impact Assessment Guidelines the Commission has recognised that an 'open method of co-ordination' can help achieve policy objectives without the need for legislative action. For example, Member States can co-operate by sharing best practice, peer reviews or agreeing common targets.

8.3 Providing information and guidance

Behaviour can be influenced by providing information or guidance. This information can be provided either by the EU itself or by industry or other bodies. This approach often works well for publicity campaigns, training, or guidance and can often be used in conjunction with other regulatory and non-regulatory options, so that stakeholders know what is expected of them.

This 'light-touch' approach is designed to provide information which enables the industry actors to make an informed decision. In order for information campaigns to be effective, it is vital that the right message reaches the target audience.

8.4 Market based instruments (MBIs)

MBIs seek to influence the behaviour of a market by using either positive or negative incentives. The potential of MBIs at EU level is restricted given that the usual incentives such as tax breaks and subsidies are dealt with at a national level. Sometimes, flexible EU level legislation allows and encourages MBIs to be implemented at Member State level, recognising that Member States are in a good position to decide what works best for their markets and jurisdictions.

8.5 Co regulation

Co regulation has been defined as "...the mechanism whereby a Community legislative act entrusts the attainment of the objectives defined by the legislative authority to parties which are recognised in the field (such as economic operators, the social partners, non-governmental

organisations, or associations)”. Co-regulation usually involves some sort of legal underpinning and can therefore be described as self-regulation with a legislative ‘back-stop’.

An important advantage of co-regulation is that it provides a degree of certainty due to the legal provisions whilst also encouraging innovation by allowing a flexible approach to implementation. The legislation can set out the framework - objective and relevant deadlines, together with the conditions for monitoring and enforcement, whilst the detailed means to achieve the objective is decided upon by the stakeholders.

8.6 Self regulation

Self regulation can be defined as “...the possibility for economic operators, the social partners, non-governmental organisations or associations to adopt amongst themselves and for themselves common guidelines at European level (particularly codes of practice or sectoral agreements)”.

Self-regulation requires markets to regulate their own activities, without any legal underpinning. EU involvement is usually limited to encouraging or facilitating this self regulatory process and usually involves voluntary agreements, codes of practice and codes of conduct.

This approach raises the issues about how to ensure implementation and consistency across Member States especially in fragmented markets. There is also a problem as to legal redress can be sought for any regulatory failure.

Self-regulation at Member State level can sometimes restrict markets and sometimes result in the need for more formal regulation to free up these markets.

8.7 Recommendations

Recommendations are official instruments produced by the Commission or Council that do not have legal force but set out suggested courses of action. They are commonly used by the Commission to encourage action in a particular sector and can be used as part of self-regulatory schemes.

Issuing a Recommendation can signal that the EU thinks action should be taken in an area and is often a warning to industry that it needs to act or face the likelihood of future legislation.

8.8 Flexible Directives

Traditional Directives are often criticised for being over-prescriptive and inflexible, creating complex requirements and compliance difficulties. However, Directives can be made more flexible by creating an overall framework that clearly sets out the objectives, then leaving open the means of achieving them. This gives Member States and operators the flexibility to implement provisions in ways suited to their markets and avoids the rigidity of a ‘one size fits all’ approach. In some respects this is like the co- regulation approach but with a more formal framework.

Whilst it can be difficult to measure and compare levels of implementation if Member States take different approaches, it also allows scope to compare them and test out new ideas. Sharing

experience and good practice may eventually lead to the most appropriate solution being adopted more widely. Indeed, different approaches may be the only means of achieving the desired objectives in different markets.

The Commission is encouraging the use of more flexible methods of implementation in its Directives. The Impact Assessment Guidelines state that content of a Directive should be limited to the essential aspects of legislation.

“...directives should, as far as possible, be general in nature and cover the objectives, periods of validity and essential aspects of legislation, while technicalities and details should be a matter of executive measures or be left to Member States.”

The European Commission has already introduced a number of policy measures and initiatives which facilitate a move towards an e-Maritime Policy. e-Maritime is, to a large extent about process improvements. Common standards and interoperability are a key part of this. eMar has addressed a number of these issues through a number of pilot studies which have indicated areas for policy development.

For much of the e-maritime agenda, competitive factors will provide the incentives to adopt these technologies. Policy should therefore focus on building more effective and widespread networks in the local regional economies, the removal of administrative barriers and the access to a common knowledge infrastructure and collaboration platforms. It should also take account of issues of transparency, monitoring, technical complexity, as well as potential risk. The stakeholder analysis and eMar pilot assessment suggest three main areas where policy is still needed:

1. To address areas of concern particularly over data security and protection.
2. To achieve the necessary level of standardisation and interoperability.
3. To persuade stakeholders of the benefits and thus ensure wide adoption of the e-maritime approach.

In terms of security of information and confidentiality, some formal regulation may be required to ensure that these issues are taken seriously and that there is some element of legal redress. Standardisation plays an important role in the uptake of new technologies. One of the key objectives of the EMSF is to reconcile the many standards and reference models that are already in use in the maritime domain. The emphasis has been on how to align stakeholders who are using different standards to alleviate the interoperability problems which exist in the collaborative processes. The EMSF has therefore focussed on creating a comprehensive, cohesive and unifying framework which supports all valid standards and models.

Many other aspects of e-maritime could be achieved effectively by promotion, information and guidance. This ‘light-touch’ approach is designed to provide the information which enables the industry actors to make an informed decision. In order for information campaigns to be effective, it is vital that the right message reaches the target audience. This approach could take a number of forms such as pilot studies, conferences and seminars and other promotional material. Industry

actors are focussed on commercial considerations. It is therefore important to make the benefits of e-Maritime very visible to companies.

The following table puts forward the areas where policy is required according to stakeholders and leaders of the eMar pilot projects, together with their implications.

Table 4: Policy Development

Priority	Implications	Policy options
Standards		
Harmonisation and simplification of standards and documentation for improved information exchange.	Need to investigate exactly which standards and the impact of harmonisation on the industry and its systems.	Regulation or Recommendations
Requirement for a Common Reporting Schema (CRS) for the countries of the European Union	This would probably require a policy change similar to above.	Regulation
Developing a standard messaging and common communications network architecture (e.g. common access points).	This would require cooperation of the member states	Regulation or Recommendations
Establish multi-modal transport networks and higher interoperability standards.	This would require buy in and consultation across the logistics chain	Regulation or Recommendations
Single Window		
Develop a European Single Window (ESW) across all countries over the medium to longer term.	This would be a natural extension of the National Single Windows requirement and would facilitate information exchange across Europe. There may be some specific issues/requirements for the member states which would have to be addressed. There may be additional process steps at individual ports that are non-standard and require consideration.	Potential Directive if the benefits are clearly demonstrated. 1. Agree a common architecture for the eMAR Maritime Single Window 2. Agree a single common reporting data model for use with MSW systems 3. Provide a

		common infrastructure for interconnection between MSWs and other EU Platforms
Training		
The need to work with eMaritime stakeholder groups to provide further education, training and support	New skills development will be required in order to implement and use the new technology. Some institutions do not have common guidelines for all the employees to enable them to handle changes in their working procedures.	Recommendations or Promotion and guidance provision
Greater partnership between the private, public sectors and EU is necessary for effective promotion of eMaritime	Much of the new technology will be taken up on the basis of improved efficiency but there is a need to promote the benefits of these systems. There is an issue in that there needs to be a critical mass of users in order for the systems to work effectively.	Promotion and guidance
Ship Voyage Monitoring		
This technology and information exchange could ensure better monitoring of emissions		Regulation relating to monitoring
e-Recruitment / e-Crewing		
A good system will be used by the industry as it will provide the benefits highlighted above.	There may be a need to promote the system to encourage its use. It will only be effective if there is a critical mass of users.	Promotion and Guidance
e-Purchasing		
This is a market driven solution and would not need any specific	Again promotion of the benefits	Promotion and

policy. .	may be required	Guidance
Shipping Service Descriptions & Benchmarking		
This is a market driven solution and would not need any specific policy	It relies on a high level of take up so promotion of the benefits may be required.	Promotion and Guidance
Survey Status Message		
Successful adoption of this technology would require standardisation of the CRS, or adoption of another standard.		Regulation or Recommendation
Paperless environment for export container release at ports		
This is an area where policy would be required to facilitate this process as it involves B2A information flows.		Regulation
PCS Service		
Again, this is an area where policy would be required to facilitate this process as it involves B2A information flows.		Regulation
Logistics Integration		
This is a need for further development of the standardised interfaces. With regard to containerized transport tracking and tracing, real time transport management and more accurate and advanced planning will become more and more important.	There are still there barriers to transparent and controllable logistic processes over the whole supply chain between different stakeholders. This would have to be addressed through policy	Policy/regulation to ensure transparent and controllable logistic processes
Multimodal Logistics		

Optimisation		
The obvious financial and operational benefits of implementing this eMAR solution should ensure that the market does adopt the technology.	The response from the market has been positive. However, there may be a need to promote in order to increase awareness as unless there is a critical mass of users then the system will not operate effectively.	Promotion and Guidance

9 Conclusions

This deliverable has considered the potential impact of eMar based on the pilot studies as well as stakeholder views. It has further suggested areas for policy development in the e-Maritime domain. eMar has the potential for considerable economic benefit. We know from recent research that time is a significant factor for international trade. Indeed, each additional day is equivalent to a country distancing itself from its trading partners by an average of 70km³. But there are also potential benefits from cost savings and decision making capability as a result of better and more timely information. Societal benefits include improved safety and security through tracking and monitoring. Equally, there may be environmental benefits as a result of better data.

Inevitably, technology calls for different skills sets and this could lead to some restructuring of the workforce and a requirement for more training.

Throughout its development, the e-maritime agenda has sought the views of a wide range of stakeholders and potential users of e-Maritime systems. The initial survey (D 1.1), the e-Maritime Conference (Section 5), and the e-Maritime Survey in this deliverable (Section 7) draw out some common themes which are important for policy development. In a number of areas, the market will drive e-maritime development, e.g. in logistics optimisation, e-recruitment, e-purchasing, ship services. Here the role of the Commission would be in promoting the benefits in order to establish a critical mass of users in order to ensure an effective system. In other areas, e.g. common standards to ensure interoperability, European Single Window, paperless trading, transparency information there is arguably a need for greater intervention.

The development of policy needs to take account of international practice as well as involve stakeholders in order to achieve sufficient buy-in.

³ Djankov S., Freund C., C. Pham (2010) "Trading on Time", Review of Economics & Statistics 92(1): 166

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Annex 1: Theoretical Background

1 Introduction

This report is a theoretical background paper in support of the impact assessment of the e-MAR project. A major objective of the project is to reduce complexities and improve competitiveness of the maritime industry as part of the overall improvement in the European logistics performance. As such the e-Mar technological advancement is an integral component of the e-Freight logistic platform.

The objective of the impact assessment is to analyse the expected effects from the implementation of the project's innovation for all stakeholders' groups and define a regulatory framework. This theoretical paper establishes the basis for measurement of the impact. It presents a number of academic findings that give a thorough understanding of the broader impact of e-Mar technology and will support the choice of business case studies in due course. It focuses on international best practices from Asia and America, which could be used for the EU policy benchmarking. It also presents the expectations of EU stakeholders, based on preliminary analysis of the e-Mar conference's presentations (2012) and other projects' outputs in the same domain that will support the policy and regulatory recommendations.

The theoretical analysis will shed light not only on the potential microeconomic effects (industry impact, productivity and firm optimisation), but also on the probable macro- and global impact such as competitiveness, growth, world trade and employment. Theoretically, any technological improvement in the market segments makes the population of a country or region better off. In other words, technology raises welfare almost everywhere. However, in practice the impact might be differentiated. Eaton and Kortum⁴ found that the magnitude of the technological gains abroad approaching those at home are limited in terms of geographical distances and flexibility of size. In this process, the role of international trade is significant in spreading the benefits of new technology. For instance, Canada benefits almost as much as the US from a US technological improvement. German neighbours experience more than half the gain from an improvement in German technology.

The economic analysis focuses on knowledge externalities to explain the need for public spending on R&D. The spread of new technology everywhere and its limitless impact justifies public spending. Usually private markets and global investors will invest less in research than is socially optimal for the society, thus governments try to cover this gap and develop an industrial policy to define a country's growth priorities. Gradually the empirical evidence accumulates in support of this hypothesis. Recent scientific research shows evidence that knowledge spillovers are statistically and economically significant⁵. Moreover, the large corporations that transfer technologies from advanced countries have made R&D more international than ever before⁶. In addition, the knowledge disseminates across borders via Internet and social media. The EU public spending on R&D is an example of a bloc subsidy to sustain the technological development of the region – Europe – as the effects spread all over the continent.

⁴ Eaton J., S. Kortum "Technology, geography, and trade" *Econometrica*, Vol.70, No5, 2002

⁵ Bloom, N., Schankerman M., J Van Reenen, "Technology spillovers and product market rivalry", Discussion Paper 675, CEP at LSE, London 2006

⁶ Freeman, R., "Does Globalization of the Scientific/Engineering workforce threaten US economic leadership?" *Innovation policy and the Economy* 6, 2006

The benefits of R&D or other innovations that improve one country's productivity are likely to spread to other countries too. The expansion of technological activity in the world improves the welfare of people worldwide. If the innovation lowers the price of goods and services, all people benefit. If the innovation leads to more new skilled-jobs and better products, we all benefit. R&D improves economic competitiveness not only of countries but also of whole continents.

2. Economic Perspectives

2.1 Macroeconomic perspective

2.1.1 Technological Advancement and Sustainable Growth

The impact of technological advancement upon competitiveness of a country is enormous, but the channels may vary depending on the specialisations of firms. For instance, the single market has made EU economies more open and more specialised. The demand for EU exports is a powerful driver of sustaining the regional competitiveness. The emerging economies are increasingly competing with Europe not only in traditional exports but also in knowledge-intensive industries. Fast-growing new industrial powers (BRICs and the newly formed MISTs)⁷ outside Europe present EU firms with both challenges and opportunities. Competitive factors provide the incentives to adopt new technologies in both very traditional (such as shipping industry) and knowledge-intensive (such as robotics, space industry) sectors of the EU economy, and help the market select the most productive firms.

The European Competitiveness Report 2012 provides new empirical evidence for understanding the drivers of competitiveness. It identifies opportunities that will make European industries more competitive by maximising the benefits of globalisation. The focus is on:

- Development of global value chains and their impact on the value added of exports;
- Energy efficiency as a determinant of export performance;
- The potential of FDI flows;
- The role of business networks;
- The potential of European neighbourhood policies.

Sustainable growth will be generated through technical progress and productivity growth. It is crucial to modernise the industrial base and remove any institutional barriers to entrepreneurship in order to maintain the competitive performance of Europe. Competitiveness is fostered by the institutional and regulatory environment as it creates the right framework for adopting and developing new ideas.

Globalisation and the shifting global trends have led to the adoption of the “network” approach that supports SMEs in the process of internalisation of the external effects. The difference with the previous “cluster” approach is that the network does not need to be concentrated in a specific area. Companies could be spread out, deriving competitive advantages from different regions, in

⁷ BRIC – Brazil, Russia, India and China; MIST – Mexico, Indonesia, South Korea and Turkey

order to share information or penetrate new markets and enlarge their industrial scope. To adjust their traditional specialisation, companies usually cooperate within their networks, and thus boost their competitiveness.

The task of the policy-makers is to provide incentives for building more effective and widespread networks in their local regional economies⁸. Any kind of public involvement has to show that it is more efficient to help the network than its individual members. The removal of administrative barriers and the access to a common knowledge infrastructure and collaboration platform could boost network activities in new areas that are fundamental to growth.

In the long-term, however, only technological change can sustain growth of income per head. Nowadays the connection between trade and growth has less to do with the mere exchange of goods and services and more with competitive pressures as well as the exchange of ideas that comes along with trade. Openness increases the exposure to foreign technology, equipment goods, and management techniques. Competitive factors provide the incentives to adopt these technologies. Thus growth is only possible through openness and reforms that change the ability and incentives to adopt and develop new technologies. Although the e-MAR technological advancement is in a very specialised and tiny market segment of the supply chain, it will support growth via the improvement of logistics chain performance in Europe in the long-term.

The other potential effect and positive spill-over from the e-MAR technology will be to facilitate and harmonise trade and technical standards. The e-MAR standards will promote interoperability between ship operations, transport applications and authorities' systems, which as a facilitator of trade will support the future policy. The project will create a Common Reporting Scheme (CRS) for the countries of the European Union, which will be part of the e-MAR Strategic Framework.

Empirical research shows that trade liberalisation leads to reallocation of resources within an industry as it raises the average industry productivity. What usually is observed low-productivity firms exit and high-productivity firms expand to enter export markets⁹. Moreover, the entry into export markets induced by trade liberalisation stimulates the adoption of new technologies¹⁰.

2.2. Technology to Improve Efficiency in International Trade

Recent research determined how time delays affect international trade by using data on the number of days it takes to move cargo from the factory to the ship in 98 countries. The analysis finds that each additional day is equivalent to a country distancing itself from its trading partners by about 70km on average. The results described below (see Table 1) shows that the required export time for goods from the EU is equal to 13 days on average as the maximum time it takes could be up to 29 days. Comparatively the EU and NAFTA - members have the same mean, but the range for min and max required days varies a great deal. The European countries lead the export league in terms of minimum days taken to export the cargo, as the only rivals are the ASEAN 4

⁸ Baldwin R., "Globalisation: the great unbundling(s)", background paper to the project: Globalisation challenges for Europe, Secretariat of the Economic Council, Finnish Prime Minister's Office, 2006

⁹ Lileeva A., Trefler D., "Does improved market access raise plant-level productivity", *Quarterly Journal of Economics*, 125(3): 1051-99, 2010

¹⁰ Bustos P., "Trade liberalization, exports and technology upgrading: evidence on the impact of MERCOSUR on Argentinean firms" *American Economic Review* 101(1): 304-340, 2011

countries (this includes Singapore). On average the export from Australia and New Zealand is relatively quick too, taking only 10 days. Summarising the developed countries and Asia are relatively efficient, in contrast, the former Soviet Union (CIS) countries and Africa are relatively slow, taking on average more than 40 days for the cargo to be moved. The variation across countries in Sub-Saharan Africa is also large.

Table 1: Descriptive Statistics by Geographic Region (Required time for Exports)

<i>Geographic Region</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Min</i>	<i>Max</i>	<i>No of Obs.</i>
Europe	22.29	17.95	5	93	34
European Union	13.00	8.35	5	29	14
CIS	46.43	24.67	29	93	7
Western Hemisphere	26.93	10.33	9	43	15
NAFTA	13.00	4.58	9	18	3
MERCOSUR	29.50	8.35	22	39	4
Asia	25.21	11.94	6	44	14
ASEAN 4 ¹¹	22.67	11.98	6	43	6
CER¹²	10.00	2.83	8	12	2
Africa and Middle East	41.83	20.41	10	116	35
COMESA ¹³	50.10	16.89	16	69	10
Euro-Med¹⁴	26.78	10.44	10	49	9
SADC ¹⁵	36.00	12.56	16	60	8

Source: Djankov S., Freund C., C. Pham (2010) "Trading on Time", Review of Economics & Statistics 92(1): 166

Overall, 345 trade facilitators participated in this survey of the World Bank, with at least two per country. Also port authorities and customs officials completed surveys in a third of the sample.

The results are an example of how delays in supply chain due to a variety of reasons affect international trade globally. Any decline in trade-logistics leads to a decline in the overall economic growth. Therefore, to increase growth in the EU, improvements in the logistics chain that will accelerate trade are essential and vital.

This first part of the theoretical background aimed to present the macroeconomic and global impact of the e-MAR technology, and support these hypotheses with existing scientific research.

¹¹ ASEAN 4 – Malaysia, Indonesia, Thailand and Singapore

¹² CER – Close Economic Relations, Australia and New Zealand

¹³ COMESA – Common Market for Eastern and Southern Africa

¹⁴ EUROMED – Euro-Mediterranean Partnership

¹⁵ SADC – Southern African Development Community

2.2 Microeconomic Perspective

2.2.1 Skill biased technological change

The intention is here to explain the microeconomic impact of the e-MAR technology. These effects are naturally expected to be on an industry level as well as a firm reorganisation level. Technological change leads to structural changes in the firm and the industry.

Theoretically, the Schumpeterian forces of “creative destruction”¹⁶ will put pressure on firms from the industry to become more efficient and dynamic via structural and organisational changes in order to adapt to the offered innovation. As Schumpeter suggested in his theory of economic innovation (1942), the old ways are destroyed endogenously by the new ways. In terms of modern economic theories, the forces of creative destruction have been associated with technological change.

In more detail, the specific technological advancement that the E-Mar project offers between ship operators, ports and forwarders in the countries of the European Union will induce the “skill-biased technological change” (SBTC) within the sector. This means an increase in relative demand for skilled workers within the industry in Europe, but also due to the international operations of shipping the skill upgrading will occur in other countries. Due to the complementarity between trade and technology, international trade alters the returns of different technologies and induce skill upgrading¹⁷ widely¹⁸.

In addition, economists have recently extended the traditional Heckscher-Ohlin (HO) model and shifted the focus away from trade in goods to trade in tasks and offshoring¹⁹. This shift makes skill upgrading within industry possible. The technological change within the industry, causes the firm to provide technology upgrading, which in turn increases the firm’s relative employment of skilled workers. Technology and trade lead to employment structure changes within industries and firms. If firms are heterogeneous in dimensions that affect their likelihood to grow, survive and update their production process, then a substantial part of skill upgrading within an industry may occur across a wide range of firms. These are the complementary reallocation mechanisms observable within an industry with heterogeneous firms.

From a labour perspective, the e-Mar technology will potentially change workers’ tasks. The striking feature of the academic results observed in many other industries as a result increased IT use, is a change in analytical (interactive and routine cognitive) occupational task intensity.²⁰ Many small-sized firms that lack necessary resources (financial, human, or software) to comply with analytical tasks and standards could be easily pressed to exit or merge.

¹⁶ Schumpeter J., “Capitalism, socialism and democracy”, London 1942

¹⁷ Acemoglu, D., “Patterns of skill premia”, *Review of Economic Studies* 70(2), 2003

¹⁸ Bloom, N., Draca M., van Reenen, J., “Trade induced technical change? The impact of Chinese imports on technology and employment”, Mimeo, 2008

¹⁹ Feenstra, R., G. Hanson, “The impact of outsourcing and high-technology capital on wages: estimates for the United States, 1979-1990”, *Quarterly Journal of Economics* 114 (3), 1999

²⁰ Ariu A., G. Mion, “Service Trade and Occupational Tasks: An Empirical investigation”, CEP Discussion Paper No 1107, LSE 2011

2.2.2 New market entry and higher productivity

In recent models of firms, firms self-select an entry into export markets depending on their productivity as only the most productive firms are able to absorb all costs of exporting²¹. Previous models, for instance Krugman's representative-firm model, assumed either all or no firms participated in trade, and that their level of trade responded to trade costs solely through the margin²². The relative costs of becoming an exporter to new markets influences the decisions of any firm in an industry. This gives relative importance to each margin.

Empirical evidence on the statistical relation between time and trade has defined two distinctive effects: first, it determines whether a manufacturer will enter a foreign market or not; second, time affects the volume of trade once a market entry is made. A detailed study of the US imports found that an increase in shipping time of just one day reduces the probability that a country will export manufactures to the USA by 1.5%²³. Similarly, delays due to other causes such as administrative procedures, waiting time for shipment, testing and certification, etc. will have the same effect on the probability of exporting from a country to the US market.

In general, transport costs that are independent of trade volume such as time for administrative procedures, waiting times, etc. mainly affect market entry of new foreign companies, while costs that are proportional to trade volume or value such as insurance, storage fees mainly affect trade volume²⁴. In this respect, any technological improvement that will reduce waiting times or the overall delivery times to the EU market will have a profound effect on new market entries or the openness of the European economy.

The paperless procedures will potentially increase the productivity of the shipping market segment, and hence, reduce overall trade-logistics costs for manufacturers.

2.2.3. Real time reliable information to enable optimisation

A 10% reduction in delays increases the volume of exports by about 4%²⁵. Any technological advancement that will lead to reducing the required days for exports will have a significant impact on the increase of trade. Results show that on average each additional day of delay reduces trade by at least 1%.

eMar technology offers real time available information to enable optimisation of transport related operations as well as facilitation of decision-making process on the job that will contribute to the overall reduction of the required export time.

Also real time reliable information will have an impact on the trade logistics costs. Recent research on the determinants of trade costs has found that logistics performance has a statistical

²¹ Melitz, M., "The impact of trade on intra-industry reallocations and aggregate industry productivity", *Econometrica*, Vol 71, November 2003

²² Krugman P., "Scale economies, product differentiation and the pattern of trade", *American Economic Review*, 70, 1980

²³ Hummels, D., "Time as a trade barrier", Mimeo, Purdue University, July, 2001

²⁴ "Logistics and time as a trade barrier", OECD Trade Policy Working Paper No 35, 2006

²⁵ The World Bank Analysis

significance²⁶. The logistics performance in the importing country is more than three times as strong for parts and components as for final goods²⁷ – this is particularly the case for vertically integrated global production networks. This means that any improvement in logistics performance would be associated with relatively larger trade gains in parts and components than in final goods. Statistical results also show that half-point increases in the exporter and importer logistics performance indexes are likely to bring trade increases of about 35% and 16% respectively.

Within the European Union, member-countries have a free access to the market, so in order to improve the intra-trade performance policy measures taken would have to be associated with improving the logistics performance – empirical analysis of the World Bank suggests that measures that facilitate trade have the greatest positive effect on the country trade²⁸.

2.2.4 Impact of EU Policy Framework on Businesses

Any industry operates within a certain framework usually predetermined by policy, regulations and technical standards. Governments and public institutions work together with the private firms to develop policies and regulatory systems. From a microeconomic perspective, the policy framework defines the business environment in which firms operate and also delineates the boundaries of the industry. Firms have boundaries too and not all transactions take place within a single firm. To analyse costs and benefits of integration within an industry, Grossman and Hart developed the incomplete contracts approach²⁹, which is applied in the case of specifying firms' ownership, boundaries and internal organisation. Industrial organisation analyzes economic policy and regulations, antitrust law, contracts and property rights³⁰. It gives a good understanding of how an industry is structured and operates within the existing framework.

Particularly, e-Maritime Strategic Framework (EMSF) as such will specify and define a coherent view of how the maritime transport would operate to achieve its mission and strategic goals by 2020. It will consist of a reference process model and standard messages and services derived from the model. An important component will be the e-Mar standards to promote interoperability between ship systems - transport applications – authorities. To achieve the necessary integration among these three systems a Common Reporting Scheme will be established. The integration of the shipping market segment into the logistic chain is of utmost importance for improving the logistics efficiency in Europe. As discussed above, in an open market where the trade barriers have been dismantled, the only way to increase efficiency is by improving the logistic performance. Additionally, during the e-Mar conference in 2012, the European stakeholders of the shipping industry expressed their expectations about the technology and any concerns about the strategic

²⁶ Arvis, J., Duval Y., Shepherd B., C. Utoktham, “Trade Costs in the developing world 1995-2010”, WB Working Paper, Forthcoming (2013)

²⁷ Saslavsky D., B. Shepherd, “Facilitating international production networks: the role of trade logistics”, WB Policy Research Working Paper 6224, 2012

²⁸ Hoekman, B., N. Alessandro., “Trade Policy, Trade Costs and Developing country trade” WB policy Research Working Paper, 2008

²⁹ Grossman S.J., O. Hart, “The costs and benefits of ownership: A theory of vertical and lateral integration”, The Journal of Political Economy, 1986, p.691-719

³⁰ Industrial organization analyzes the structure of any industry, the perfectly and imperfectly competitive markets, and organizational infrastructure.

framework³¹. The preliminary screening of stakeholders' views presented a broader understanding of the strategic goals that the industry should be achieving within the framework.

The EU maritime transport strategy 2018 recommends actions that will sustain the long-term competitiveness of the European shipping industry and cost-effective services offered to the European citizens³². Its strategic goals support also the developments of the EU integrated maritime policy³³.

Moreover, "The sustainable future for transport: Towards an integrated, technology-led and user-friendly system"³⁴ defines actions for the establishment of an intelligent and integrated logistics system, where development of ports and intermodal terminals as a key element becomes a reality.

Also the EU Maritime Transport Space without Barriers aims to simplify administrative procedures for maritime transport³⁵ and will be further developed into a "Blue Belt" of free maritime movement in and around Europe.

More policy developments that will support the blue economy and the e-MAR technology will facilitate the necessary changes are as follows:

1. A Commission initiative on maritime spatial planning and integrated coastal zone management;
2. A Common Information Sharing Environment (CISE)³⁶ for the surveillance of the EU maritime domain;
3. The Marine Strategy Framework Directive³⁷ which introduces an ecosystem-based approach;
4. Actions in education and training financed by "Erasmus for All programmes" such as Knowledge Alliances and Sector Skills Alliances. It refers to instruments for facilitating the mutual recognition of skills and qualifications such as European Qualifications Framework (EQF)³⁸, and better anticipation of skills and labour market needs through European Sector Skills Councils and the EU Skills Panorama;
5. At a research level – the Horizon 2020 programme will target research and innovation on green transport, climate action and resource efficiency.

All these initiatives support further the development and progress of the Integrated Maritime Policy in the European Union and launch a process, which places the "blue belt" firmly on the agenda of the Member States. The technological advancement that will facilitate the information sharing and partially contribute to achieving the goals of this integrated policy will be implemented under the e-Mar project.

³¹ A summary of the topics discussed during the e-Maritime two-day conference in November 2012 is presented in Annex 1 of this document.

³² http://ec.europa.eu/transport/themes/strategies/2018_maritime_transport_strategy_en.htm

³³ Conclusions on integrated maritime policy at: Press Release, General Affairs and External Relations, 2008 http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/gena/104617.pdf

³⁴ COM (2009) 279

³⁵ COM (2009) 10

³⁶ COM (2010) 584

³⁷ Directive 2008/56/EC

³⁸ http://ec.europa.eu/education/lifelong-learning-policy/eqf_en.htm

2.2.5 Regulatory framework for the e-MAR market segments

The regulatory framework adds value to the industry policy framework and defines properly the rules and standards. It usually:

- Identifies critical issues to be considered;
- Provides an understanding of current practices;
- Defines any possible exemptions;
- Presents implementation cases;
- Summarises conclusions from a consultation process.

Specifically the regulatory issues will relate to the implementation of:

- The e-MAR strategic framework;
- The operation of the National Single Windows;
- The Single Electronic Transport Document – a component of the e-Freight platform;
- The integration of a Common Reporting Scheme;
- E-mar technical standards;
- Information security.

The eMar project is based on past and ongoing research projects that focus on developing integrated ICT solutions for the maritime sector³⁹. It will be a vital component of the bigger e-Freight platform in order to achieve the recommendations of The Freight Transport Logistics Action Plan (2007). It will provide services B2B and B2A, utilising the information exchange between Businesses and Administrations. It will replace the paper-based services with ICT solutions.

As part of the already existing legislation, some of the directives, regulations and decisions are as follows:

1. Establishing a Community vessel traffic monitoring and information system – Commission Directive 2011/15/EU and Directive 2009/17/EC (amending Directive 2002/59/EC, repealing Council Directive 93/75/EEC)⁴⁰;
2. On reporting formalities for ships arriving in and/or departing from ports of the Member States – Directive 2010/65/EC (repealing Directive 2002/6/EC)⁴¹; Exemptions only for ships, which are within the scope of Directive 2002/59/EC and which operate between ports situated in the customs territory of the EU;
3. Laying down the Community Customs Code – Regulation (EC) No 450/2008, relating to the centralised clearance of goods⁴²;
4. The e-Customs initiative: paperless environment for customs and trade – Decision No 70/2008/EC⁴³.

³⁹ A summary of existing projects in the domain of e-Mar is presented in this document as ANNEX 2

⁴⁰ <http://eur-lex.europa.eu/en/legis/20100901/chap0730.htm>

⁴¹ http://europa.eu/legislation_summaries/transport/waterborne_transport/tr0047_en.htm

⁴² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:145:0001:0064:En:PDF>

⁴³ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:023:0021:0026:en:PDF>

All EU members will have to accept electronic reports via a single window, at the latest, by June 2015. The single window is the place where all information is reported once and made available to various authorities. Now EU members have to ensure that information received in accordance with reporting formalities is available in their national SafeSeaNet systems and it is accessible by other EU countries too.

In this respect, *Digital Agenda for Europe* (DAE) aims to help citizens and businesses of Europe to get the most out of digital technologies and deliver smart sustainable and inclusive growth. It contains 101 actions that are grouped in seven priority areas; encourages the use of digital technology and its business applications; creates new public service infrastructures through Connecting Europe Facility Fund⁴⁴. It also addresses the issues of data security in the case of information flow exchanges between businesses and authorities.

Intelligent Transport Systems (ITS) Action Plan and Directive 2010/40/EU accelerate the deployment of innovative transport technologies across Europe. The aim is to establish interoperable and seamless ITS services for road transport and its interfaces with other modes of transport. Commission Regulation (EU) No 305/2013 supplements Directive 2010/40/EU to establish a harmonised provision for an interoperable EU-wide eCall⁴⁵. The offered innovative solutions of e-Mar project will take into consideration the requirements of the ITS action plan.

All issues of security are very important to the EU authorities and businesses. Therefore *Security Directives* will be part of the e-Mar regulatory framework and particularly communication COM (2010) 673 on strengthening EU internal security through border management.

Also all *international standards* of International Maritime Organisation (IMO), World Customs Organisation (WCO) and other institutions of the United Nations that the industry have to comply with, will be fully considered and standardised as part of the e-Mar solutions. The reporting requirements for different modes of transport to submit information using the Single Transport Document will allow the clearance process to be authorised from the points of view of safety, security and customs. Further legal international developments are discussed in more details in Section II of this report.

Finally, the industry perspective overview aimed to explain the microeconomic impact of the e-Mar project technology advancement in terms of entry and exit, productivity and efficiency of the firm and the maritime industry. It also considered EU policy developments that support the e-Mar environment and discussed the existing regulatory requirements. The EU and international legal developments will further shape the regulatory framework of the e-Mar market segments.

3. Paperless Trade

3.1. Characteristics of Paperless Trade

In 2005, the UN Economic Commission for Europe held a Forum entitled “Paperless Trade in the International Supply Chains: Enhancing Efficiency and Security”. The objective was to find a consensus on what needs to be done to make paperless trade a worldwide reality. The Forum

⁴⁴ <http://ec.europa.eu/digital-agenda/digital-agenda-europe>

⁴⁵ http://ec.europa.eu/transport/themes/its/road/action_plan/

drafted a roadmap to paperless trade, which set out the key issues and recommendations on what governments and business needed to do to move towards paper-free trading.

Electronic information is easy to process and reliable. It reduces costs and delays all along the supply chain. Any improvements that speed up the exchange of information and the coordination of all electronic transactions make trading more competitive and efficient.

Overall benefits of switching from paper to electronic solutions can lead to savings of billions of dollars. APEC has run exact estimations for the Asia-Pacific area and UNECE for Europe. Particularly for the public sector it increases revenues from the international trade and improves security. For the private sector, it improves the logistics performance and provides new value-added services. Companies usually identify their benefits to ensure that these outweigh the initial investment costs and fees. For smaller companies, the effects are more difficult to measure and may require governments to offer them incentives for participating in the paperless trade.

The paperless trade has characteristics of a public good – marginal social costs are higher than the marginal private costs. This means that its implementation will imply externalities; therefore governments must be prepared to contribute. The impact goes beyond the private industry benefits – observable social, environmental effects too – which justifies public spending. Market mechanisms alone will not be enough to see paperless trade in operation. Public bodies and organisations need to take a leading role in the implementation.

Another characteristic is that the actual implementation carries technology and market-driven risks. It requires the integration of cross-sector business processes and standards, and the integration of different e-Business technologies. These paperless trade projects are usually very complex and strategic. The transition to electronic documents is a long-term process that requires the strong involvement of many international stakeholders. Most of the logistics platforms and customs electronic documents are confined to a specific geographical area, so much more work is expected before the information can be accessible throughout the entire supply chain. The UN/CEFACT⁴⁶ adopted the United Nations electronic trade documents project (UNeDocs) as a global standard for digital trade documents. The project provided a migration path from a paper-based to a paperless system.

The table below summarises key characteristics of paperless trade for the major key stakeholders and the support that each of them is expected to offer.

Table 2: Key Characteristics of Paperless Trade

Key characteristics	Activities in support
I. For National Governments: to increase security; development and revenues from international trade	<ol style="list-style-type: none"> 1. New technologies to meet both security and efficiency targets; 2. Good governance of the implementation by establishing shared

⁴⁶ UN/CEFACT is an organisation that makes the international electronic data interchange standards for electronic trade documents in XML. More details at www.unece.org

	<p>ownership of the project by private and public stakeholders;</p> <ol style="list-style-type: none"> 3. Involvement of other governmental organisations, as well as Customs, in the implementation; 4. Collaboration on the development of “Single Window” systems that address both regulatory-requirements and business processes.
II. For the private sector: to increase efficiency of supply-chains and provide new value-added services	<ol style="list-style-type: none"> 1. Top-level management of the private sector’s support is vital for the implementation; 2. Maintaining transparency and clear division of responsibility among all stakeholders; 3. Creation of public-private enterprises; 4. Support of SMEs that can provide value-added services;
III. For companies: they will adopt it if they see a clear net benefit	<ol style="list-style-type: none"> 1. Reduction in delays, paper errors and risks is the major benefit for companies; 2. Reduction of access costs for paperless trade; 3. Reduced fees, reduced clearance times, facilitated & simplified procedures provide clear benefits; 4. Adapting supply chain of SMEs to fit into the global supply chain; 5. Using policies, standards and best international practices to build managers’ confidence and trust.
IV. Paperless trade as a public good	<ol style="list-style-type: none"> 1. Quantification of specific externalities; 2. Involvement of all stakeholders when analysing the bottlenecks; 3. Internalisation of the external effects such as: <ul style="list-style-type: none"> - Rewarding companies for electronic submission of documents; - Providing specific measures to encourage participation of SMEs; - Funding the setting-up of paperless trade projects.
V. Implementation carries technology and market-driven risks	<ol style="list-style-type: none"> 1. Recognition of new challenges from paperless trade relating to data security; privacy and confidentiality. Data integrity and audit trails are essential; 2. Provision of training to reduce technology risks; 3. Establishment of sustained government

	<p>leadership to reduce market risks;</p> <p>4. Identification of projects to reduce market risks;</p> <p>5. Focus on usability of the solution, not the technology itself.</p>
VI. Governments should take a lead role in initiating the transition to paperless trade	<p>1. Establishment of a policy and legislative framework, legal and regulatory environment;</p> <p>2. Development of low-cost software tools for use of electronic signatures or other security technologies;</p> <p>3. Coordination between different governmental bodies;</p> <p>4. Contribution to the initial funding of implementation projects;</p> <p>5. Creation of incentives for the private sector;</p> <p>6. Creation of a healthy business environment to better align ICT and business processes; implementation of best business practices.</p>
VII. Paperless systems should not only be based on international standards, but should also take into account regional specificities	<p>1. Relevant regional organisations to initiate a regional process for capacity building and exchange of experience;</p> <p>2. Coordination of information requirements at the international level to make the supply-chain efficient;</p> <p>3. Regional involvement in the development of international standards;</p> <p>4. Development of harmonized standardized data, based on the UN/CEFACT framework as a prerequisite for a Single Window environment</p>

Source: UN Economic Commission for Europe "A roadmap towards paperless trade", New York and Geneva, 2006

3.2 Asia-Pacific Experience

Members of the Asia-Pacific Economic Cooperation (APEC) agreed to begin the introduction of paperless trading in 1999 on a voluntary basis. The goal is to eliminate the requirement for mandated paper-based documents in cross-border trade. Each country now produces individual action plans (IAP) with periodic updates to chart the progress on efforts to promote and realise paperless trading. This plan also keeps all members informed of the relevant stages each economy has reached. It is based on the following guidelines⁴⁷:

- (a) Establish a timetable for reducing or eliminating paper documents;
- (b) Establish a sound legal and regulatory framework for the delivery of paperless trading systems;
- (c) Ensure security and interoperability of electronic equivalents with and between all parties involved in the international supply chain;
- (d) Note the important role the business sector plays in using e-commerce technology, applications, practices and services;
- (e) Enhance the capability of other APEC economies to implement paperless trading systems.

Table 3 below presents all economies that have developed individual action plans and their status.

Table 3: APEC Individual Plans on paperless trade

<i>Economy</i>	<i>IAP</i>	<i>Last updated</i>
Australia	Yes	2002
Canada	Yes	2007
Chile	Yes	2002
China	Yes	2002
Hong Kong, (China)	Yes	2007
Indonesia	Yes	2002
Japan	Yes	2002
Korea	Yes	2007
Malaysia	Yes	2010
Mexico	Yes	2010
Peru	Yes	2008
Philippines	Yes	2009
Singapore	Yes	2005
Chinese Taipei (Taiwan)	Yes	2011
Thailand	Yes	2011
United States	Yes	2007
Vietnam	Yes	2007

Source: www.apec.org

Official reports of the APEC highlighted the direct and indirect economic benefits of removing the mandatory requirements for paper-based international trade. One of the reports “Paperless trading: benefits to APEC” provided evidence of firms gaining access to new opportunities to

⁴⁷ APEC E-commerce Steering Group Guidelines

participate in cross-border supply chains, production processes and innovation in new product design as a result of more efficient freight movements and trade administration arrangements across the Asia-Pacific region⁴⁸.

The experience of Singapore and Hong Kong in the region demonstrated how to reduce trade costs and delays throughout the supply chain by using the application of e-commerce in customs, quarantine, health, and port services. Singapore introduced TradeNet⁴⁹, which required a completion of only two electronic forms and the waiting time was 15 min for all necessary approvals granted by the Singaporean government. In Hong Kong, the government created a new agency – Tradelink Electronic Commerce Limited⁵⁰ - to provide online trade administration services. Initially these systems were based on older Electronic Data Interchange (EDI) technologies, but recently they have been updated and expanded, allowing even the smallest firms to participate in the paperless trading. The advanced technology creates new opportunities.

The developed economies in APEC – Canada, the US, New Zealand, Australia and Japan – commenced using e-commerce technologies across government trade-related services last decade. However, there is no standard or protocol used for this purpose across the various economies and this limited the scope for individual traders to access the entire range of services via a single electronic window.

The legal issues between the Paperless trading and the Single Window (SW)⁵¹ still exists not only within the Asian region, but also internationally. While the paperless trade facilitates quickly all trade transactions, it is a platform where the national law intersects with the ICT law. The international law has developed new conventions and legislation in order to accept and verify electronic transactions, signatures and electronic evidence. The SW enables national law to provide the legal framework for the interaction of government trade-related services⁵². To establish an international single window, it will require many bilateral and multilateral arrangements among governments. A great deal of legal work is expected for years ahead. The list of topics is as follows⁵³:

- Legal basis in state law for the implementation of a SW facility;
- Establishment of an appropriate organisational structure for the implementation and operation of a SW facility;
- Implementation of proper identification, authentication and authorisation procedures;
- Legal framework for proper data protection mechanisms;
- Procedures for electronic archiving and the creation of audit trails in electronic systems;
- Relevant measures to be put in place to ensure the accuracy and integrity of data, for instance by electronic signatures, combined with rules designing the responsibility of actors for the accuracy and integrity of such data;

⁴⁸ Commonwealth of Australia, “Paperless trading: benefits to APEC”, 2001

⁴⁹ www.customs.gov.sg

⁵⁰ www.tradelink.com.hk

⁵¹ Ponten J., “Single Window – Best Practice and the Way Forward”, available at www.uncitral.org, 2011

⁵² See also Symposium Conclusions, UN/CEFACT Symposium on Single Window Standards and Interoperability, 2006 Geneva

⁵³ Schermer B.W., “Legal Issues of Single Window Facilities for International Trade” www.uncitral.org/pdf/english/congress/Schermer.pdf, 2007

- Rules on electronic contracting and execution of transactions;
- Rules on liability issues derived from activities in the context of SW operations;
- Rules on database ownership and on other intellectual property issues;
- Measures avoiding of anticompetitive effects of SW operations;
- Mechanisms for dispute resolution.

As it can be seen, there are a broad range of topics that need to be discussed and therefore it is difficult to consider all of them in detail, but we will mention key legal developments further below.

3.3 International Legal Developments

1. UNCITRAL (United Nations Commission on International Trade Law)⁵⁴ – the Electronic Commerce has worked on new conventions to develop laws of e-commerce. These are: UN Electronic Communications Convention⁵⁵; UN Convention on International Contracts for the Carriage of goods wholly or partly by Sea (“Rotterdam Rules”) and Electronic Transferability of Rights in Goods.

2. WCO (World Customs Organisation)⁵⁶ collaborates with UNCITRAL on much of the legal work. Recently it has revised the Convention Establishing a Customs Cooperation Council (1952); International Convention on the Simplification and Harmonisation of customs procedures “Kyoto Convention”, and Protocol amending International convention on the Simplification and Harmonisation of customs procedures, “Nairobi Convention” (2010). Also to ensure that the WCO Members are well equipped to meet the challenges of the global trading environment, the WCO Council adopted Customs in the 21st century strategic vision in 2008. It comprises ten building blocks, of which Globally Networked Customs (GNC) is the first. GNC provides a framework through which WCO Members can apply a common and coordinated methodology to develop and perfect strategic and operational blueprints based on WCO tools and instruments.

3. UN/CEFACT (United Nations Centre for Trade Facilitation and Electronic Business)⁵⁷ is an intergovernmental body of the UNECE Committee on Trade that aims to achieve worldwide cooperation and coordination in the field of trade. It has revised Recommendation 18 (Facilitation measures related to International Trade Procedures, 2001); developed Recommendation 35 (Establishing a Legal framework for international trade Single Window, 2010) and Recommendation 36 (Single Windows Interoperability, 2011).

4. UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) is the regional development arm of the United Nations. It has worked on the legal and regulatory systems for e-commerce in Asia and the Pacific⁵⁸. It has addressed the legal issues for single window implementation and interoperability.

⁵⁴ www.uncitral.org

⁵⁵ Jose A.E. Faria “*The United Nations Convention on the use of Electronic Communications in International contracts – An Introductory Note*”, *International and Comparative Law Quarterly* 55, 2006

⁵⁶ www.wcoomd.org

⁵⁷ www.unece.org/cefact

⁵⁸ www.unescap.org

5. ASEAN Single Window Legal Framework – the ASEAN Secretariat has developed a broad ASEAN Single Window (ASW) model for simplifying and streamlining customs processing while taking into account the needs of all stakeholders. The ASW is one of the key elements in the ASEAN member states efforts to create an integrated economic community by 2015. The Secretariat has no legal authority. All legal issues are resolved in accordance with the terms of the ASEAN Protocols that define the mechanisms.

6. IMO (International Maritime Organisation)⁵⁹ – considers and revises Conventions that address the current and future needs of the shipping industry as well as modernises its provisions taking into account new developments in the field of transmission of information and data by electronic means and the Single Window concept.

In summary, the emerging legal framework of the Single Window has been already delineated by conventions and protocols produced by the institutional bodies of the United Nations. More work is expected in the field of international law, particularly on the side of e-commerce legislation. Furthermore, solutions on paperless trading (legal and operational) that come together as a bundle will improve information sharing between different stakeholders to provide a seamless flow of information with external logistics partners, governmental authorities and also within each company's business process flow by minimising the need for repeated data entry on the same piece of cargo information.

4. International Best Practice

In a globalised world, a country's ability to trade globally depends on its traders' access to freight and logistics networks. Better overall logistics performance and trade facilitation are strongly associated with trade expansion, export diversification, attractiveness to FDI, and economic growth as already discussed. To measure the impact of logistics performance, the World Bank has developed a Logistics Performance Index (LPI) of a country that indicates the level of logistics efficiency, now widely recognised as vital for trade and growth. The LPI compares the trade logistics profiles of 155 countries and rates them on a scale of 1 (worst) to 5 (best). The LPI's six components include:

- The efficiency of the clearance process (speed, simplicity, predictability of formalities) by border control agencies incl. customs;
- The quality of trade and transport-related infrastructure (ports, railroads, roads, IT);
- The ease of arranging competitively priced shipments;
- The competence and quality of logistics services (operators, customs brokers);
- The ability to track and trace consignments;
- The frequency with which shipments reach the consignee within the scheduled or expected delivery time.

We present only the top ten performers in the LPI's list 2012, where 60% of the countries represent the European Union, 30% - Asia and 10% - North America (see Table 4). As such the

⁵⁹ www.imo.org

best practices that we will focus on will be internationally recognised examples of paperless trade that give a good understanding of the developments in this area.

Table 4: 2012 Logistics Performance Index ranking and scores (Top Ten)

Economy	Rank	Score	% of highest performer
Singapore	1	4.13	100.0
Hong Kong	2	4.12	99.9
Finland	3	4.05	97.6
Germany	4	4.03	97.0
Netherlands	5	4.02	96.7
Denmark	6	4.02	96.6
Belgium	7	3.98	95.3
Japan	8	3.93	93.8
United States	9	3.93	93.7
United Kingdom	10	3.90	92.7

Source: The World Bank, International Trade Department, "Connecting to Compete 2012: Trade Logistics in the Global Economy" 2012

4.1 Singapore

Singapore is a pioneer with the paperless trade experiences – the so-called TradeNet system – that has greatly streamlined the trade process. TradeNet is the world's first nationwide electronic trade documentation system. As a result the Singapore's economy has accomplished:

- Faster response to facilitate dynamic enforcement and implementation of rules and regulations, so that urgent implementation of regulatory and policy changes can be done quickly and with accurate enforcement assisted by the system;
- Improvement of accurate and prompt collection of trade statistics, leading to an effective and timely trade-base fostering analysis of trading-developments and forecasting of trends;
- Improved customer service with 24/7 service-accessibility so that users can gain access to the system from any location;
- User-friendly web portals and increased efficiency due to the shortened turnaround time for the processing of trade declarations;
- Maintenance and easy deployment – processing and rules are tied to political, social and environmental changes;
- Cost effectiveness for users and service providers;
- Ease of integration and connectivity based on the use of leading-edge technology allows integration with trading partners and authorities;
- Ease of future development to cater for local trade growth and international trade information exchange based on (i) hardware scalability depending on the processing performance expectation and transaction volume; (ii) software portability and reusability.

The initial phase began in 1989 with a group of 50 pilot users and then the system was extended to the rest. Electronic permit application submission was not made mandatory on day 1 of its

operation. The operational model offered a submission of declarations using the Front-End (FE) TradeNet software that was provided by any software company approved by Singapore Customs or the simple web-based application provided by the Government. The FE software offers a variety of data submission methods via internet/web application; client based input or host-to-host connection. After that the FE system sends the data for automated processing by the various authorities via TradeNet.

Web portal services are provided for traders to process their permits, check on the transaction status and make billing enquiries. It also allows download of permit listing, and code tables. The portal also enables the authorities to process the declarations and to make enquiry.

In 2007, TradeNet was revamped and TradeXchange platform was implemented on a public-private partnership basis. TradeXchange is a neutral IT platform that facilitates the exchange of commercial and regulatory information for the trading and logistic communities⁶⁰. TradeNet is a core application of this platform, and was revamped to provide a more streamlined and simplified trade declaration system and value-added services to users. CrimsonLogic Pte Ltd, a private company, was selected to operate and maintain TradeXchange and TradeNet⁶¹. It is able to recover its capital investments and operating expenses through the collection of process fees from all users. Whereas Singapore Customs are able to leverage on the expertise of this IT company to operate the systems.

The revenue collected from TradeNet is used to maintain and enhance the system including routine technical upgrades and incorporation of new rules and regulations from the government. Duties, fees and taxes are collected accurately from the traders. The payment system is directly interfaced with the banks to facilitate the respective direct debiting and crediting of companies and governments bank accounts.

The electronic submission via TradeNet is mandated by the Singapore Government with the statutory fees legislated. The information submitted is restricted for use only by the respective authorised users. Authorised users of the Singapore Customs and controlling agencies can also view and download these declarations for approval, reporting and record keeping purposes.

The biggest challenge of this system is to align the interests of IT service providers, including community platform operators, so that they all integrate with TradeXchange. CrimsonLogic has further provided other useful trade-related solutions such as logistics, trade insurance and finance, purchasing and warehouse solutions to the trading community as a bundle together with a web-based front end TradeNet permit preparation module.

The platform operates on the Unix Platform. It utilises:

* Java & J2EE – J2EE, EJB 2.0, Core Java, Java Servlets, JSP, JMS, RMI, Java Applets, JDBC, Struts, Hybermate, Spring

* XML Tools – XML, XSL, XSLT, JAXP, Apaches' Xerces Parcer, SAX & DOM APIs

⁶⁰ See www.tradexchange.gov.sg

⁶¹ See www.crimsonlogic.com

- * Object Oriented Methodologies – UML object-oriented analysis and design
- * Communications – SMS, Email (SMTP), Secure Email (S-MIME), Secure FTP (S-MIME) and Fax

The data is submitted electronically in UN/EDIFACT standards format or Extensible Markup Language (XML). The other option is for users to submit in other formats and the approved software providers then translates the information into that required by TradeNet.

TradeNet system has turn Singapore into a global city of international trade. It completely revolutionised the documentation processing by Singapore authorities and private companies in relation to export/import. It has been a subject of Harvard Business School case studies as an incredible success story and a strategic force for the competitiveness of Singapore.

4.2 Hong Kong

Tradelink Electronic Commerce Ltd is a leading e-commerce service provider in Hong Kong and another internationally successful example of paperless trading. It was established in 1988 as a joint venture between some key players in Hong Kong to foster productivity and competitiveness. These included two container terminal operators, an air cargo terminal operator, two of the largest banks and important trade associations. In 1992, the Hong Kong Government via the Financial Secretary Inc. became its largest single shareholder. Since October 2005, it has become a publicly listed company on the stock exchange.

Tradelink functions as an “electronic gateway” between the private trading companies and the government for the provision of Government Electronic Trading Services (GETS) in respect of a number of specified Government-related trade transactions. It has been appointed by the government to continue offering of GETS until 2016⁶².

In 2005, Tradelink acquired and further developed the Digital Trade and Transportation Network (DTTN), which led to a rapid expansion of the company base to more than 54,000 companies. The DTTN is the Hong Kong government endorsed community platform that facilitates information flow among the trade, logistics and finance industries. It is one of the first electronic logistics infrastructure in the world. DTTN Co became a wholly owned subsidiary of Tradelink in 2009. In addition, Tradelink set up another subsidiary – Digi Sign Certification Services Ltd. – to provide customers with security solutions in the full recognition of the importance of data security to businesses of all sizes⁶³.

The DTTN is designed to enable companies of any size to optimise their logistics processes and cut operating costs by reducing delays, double handling, data entry time and errors. It provides an open and reliable single window, connecting all different parties along the supply chain. The DTTN covers the whole logistic network including buyers/importers, sellers/exporters, freight-forwarders incl. third party logistics service providers, freight carriers/import-export portals,

⁶² See www.tradelink.com.hk

⁶³ Tradelink, Corporate Brochure “People Building Successful E-commerce”, 2010

terminal facilities, government and its agencies, banks and financial institutions, insurance companies and trade inspection agencies.

Traditionally Tradelink operated a process based on Microsoft Excel templates utilising macros, which was time-consuming and required programming knowledge. Document manipulation was expected with time spent on editing and revision. Maintaining document consistency proved to be difficult. The most common documents that customers of Tradelink utilise are:

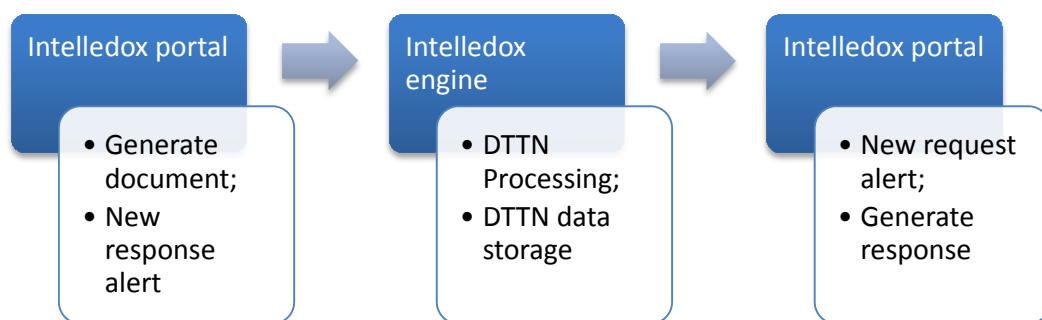
- Shipping orders;
- Sales orders;
- Purchase orders;
- Packing lists;
- Commercial invoices;
- Insurance certificates;
- Bills of lading;
- Bills of exchange;
- Certificates of origin;
- Payment confirmations

Intelledox offered Tradelink a document automation solution that transformed their processes into an intelligent model – a custom portal was created to handle custom requirements, including generic Intelledox features, and a dedicated Inbox/Outbox for the communications between parties⁶⁴. Intelledox is a 4th generation document creation system and specifically addresses what analysts refer to as “content chaos” caused by a lack of a structured and centralised approach to document generation.

In order to create a document, any user is led through a simple wizard-style interface by answering simple questions. Corporate data is fully leveraged, and drawn from a range of Tradelink line of business systems to populate required document fields. Once the document is finished, it is delivered back to the user in the Word or PDF format, or can be sent to any authorised party via the DTTN in the CXML format.

⁶⁴ www.intelledox.com

Fig. 1: Tradelink Process Flow



Source: Intelledox

This model delivered a range of transformation benefits to Tradelink and its customers such as:

- 1) Business user-driven template development
- 2) Increased productivity
- 3) Simple solution that does not require computing proficiency of users
- 4) Dramatic increase in the accuracy of the shipping documentation
- 5) Document can be easily customised
- 6) Increased security – access to shipping document templates is permission-driven by the DTTN

This improved e-commerce platform benefited the entire trade community and strengthened overall competitiveness of Hong Kong's economy. Tradelink has relied on its extensive experience in e-commerce to establish a strategic presence in China too. In 2008, the company set up a branch office in Beijing to promote cross-border e-commerce business between Hong Kong and China. Dedicated to its mission to become the most influential electronic trade service provider in Asia, the company is committed to contributing to the higher productivity and efficiency of the regional economy.

4.3 The United States of America

The US example of electronic documentation and processing presents a system that began in 1996 as the US International Trade Data System (ITDS). ITDS establishment was recommended by a special task force known as "Report of the future automated commercial environment team"⁶⁵. This report had recommendations specific to Single Window about the use of same data for import and export, and integrated government oversight of international trade. Later in 2006, the Single Window concept was further supported by the SAFE Port Act, which mandated federal agencies with an admissibility or licensing mission in international trade to participate in ITDS.

⁶⁵ www.itds.gov

Initially ITDS conducted a limited prototype under NAFTA, which was called North American Trade Automation Prototype, including Canada and Mexico. It involved Customs, Immigration and Transportation. Since that time, ITDS has become a business requirement gathering process, feeding those requirements into the Automated Commercial Environment (ACE)⁶⁶. ITDS requirements were being developed within ACE.

The US Single Window is basically operating through ACE with the incorporation of ITDS requirements. It provides one electronic interface through which the trade submits all required information for all government agencies. This covers all processes from advance screening and targeting, release of goods, payment of duties, taxes, fees and post declaration processing. ACE is expected to validate licenses and permits issued by the appropriate Participating Government Agencies (PGAs). In addition to the federal trade agencies, participants include the trade community consisting of exporters, carriers, importers, custom brokers, freight forwarders, ports, etc.

ITDS data is submitted electronically using several message exchange standards: proprietary, EDIFACT, X12 and an Internet-based web portal. XML is being considered too. Various entities submit data. The US law is very specific on who can submit the information – the carrier or carrier’s agent submits transport data; importer or agent submits goods data.

The participation in this automated process requires trade participants to sign a letter of intent. Participants may develop their own in-house interface or purchase a software package from private vendors. However, all interfaces have to be tested rigorously to guarantee their ability to successfully interface with the government system. Any Participating Government Agency is responsible to review the existing regulations and determine whether changes to mandate electronic data collections are needed.

The security of data is critical and all measures have been taken internally within the government and externally with trade users. Agencies must cite both their authority to collect and view the information. Agencies are able to access only the information they have the authority to see. Trade users can access only the information from their transactions. For this purpose, safeguards are built into ITDS to insure that users view only that information they are authorised to see.

Plans for further technological development of ITDS in 2010 were:

- Completion of ITDS Standard Data Set (SDS);
- Completion of ITDS message set for trade use (ABI format);
- ACE Releases for ocean, and rail e-Manifest;
- ACE Release for additional Entry Summaries types.

In 2012, the US Coast Guard and the US CBP announced the test of the Automated Commercial Environment Rail e-Manifest (ACE M1) system, in partnership with the South Carolina Ports Authority and major ocean carriers APL, Orient Overseas Container Line and Maersk. ACE M1 is an

⁶⁶ ACE is a phased implementation for Customs and Border Protection and Single Window participants. See www.cbp.gov

Internet system that processes rail and sea cargo trade manifest data collected by 48 regulatory agencies⁶⁷.

ITDS is funded through appropriations as part of the development of the Automated Commercial Environment of CBP. No user fees are collected to finance this system, as preliminary estimations demonstrated savings and benefits. The evaluated benefits for the US government and trade are:

- In terms of costs – building one system involves less cost. There is also decreased cost of system development and maintenance all together;
- Providing data electronically only once reduces costs to the taxpayers and the burden of reporting to the private companies;
- One system improves the accuracy as the probability of data transferring errors diminishes;
- All these factors mentioned above will increase the efficiency of facilitating export/import;
- A Single Window reduces over-complication and simplifies compliance.

This integrated system of processing electronically trade data will improve security. The coordinated approach between different government agencies increases the public's confidence in their own government.

The US continues to dialogue with Mexico and Canada to contribute to the development of the Single Window in North America, and promote the international standards. ITDS is developed within the World Customs Organisation Framework and does not require an additional implementation of a regional Single window.

These three best practice examples from top logistic performing countries present two scenarios that exist on the international arena. One scenario is when the governments play a leading role in pushing the application of paperless trading; another is when the focus is on the enterprises and the government only creates a good regulatory environment. In some of the APEC member economies – the United States and Japan – the governments only eliminate barriers to enterprises' application of paperless trading by making macro-policy and smoothing the regulations. The presented US example clearly demonstrates how all government/ federal agencies are involved in defining only the standards, requirements and regulations, but they do not lead the application of paperless trade. In some other countries such as Singapore, Hong Kong, China and Australia, governments push the application and make investments in Internet trading service institutions. Paperless trading started with the government's administrative examination and approval, and usually authorised an institution to implement the authentication, definitions, data exchange and other applications. For instance, China International Electronic Commerce Center is a service institution owned by the government⁶⁸. The KTNET of Korea was established wholly by Korea's international trade association⁶⁹. In 1992, the Korean government designated KTNET as National Paperless Trade Infrastructure Provider.

⁶⁷ www.itds.gov/features

⁶⁸ China International Electronic Commerce Center operates under the Ministry of Commerce

<http://www.mofcom.gov.cn>

⁶⁹ See <http://homepage.ktnet.co.kr/KTNET>

Concluding, there are basically three models of introducing the application of paperless trading: enterprise-led model or industry-led model; government-led model and government-backed model. In the government-backed model, the government is not directly involved, but it is an important participant. The Australian government, for example, does not directly interfere in the application of electronic customs clearance, which is instead pushed by the relevant industry associations. In 1999, Australia introduced the Electronic Transaction Act, which ensured technology neutrality (no form of technology is favoured over another) and media neutrality (paper-based commerce and e-commerce should be treated equally by the law)⁷⁰.

In the enterprise-led model, the government is less involved in the specific applications, instead, the industry and large corporations push forward the application. The US example represents this model. However, it is difficult to conclude which of the three models is better for implementation than others, because paperless trading requires coordination and integration between sectors of the economy as well as technological innovation and reorganisation of the relation between institutions.

This section demonstrated the international best practice of paperless trading in Asia and North America. While the developments vary from region to region, there is an international attempt to push forward with all applications in order to boost trade and promote efficiency. Public and private service partners cooperate in various degrees and create new value-added services. Governments build and support long-term paperless trade development mechanism. As a result, the integration of logistic systems and the cross-border data exchange began and is to accomplish the final goal of having available information throughout the whole global supply chain.

Moreover, the paperless trading cooperation has achieved outstanding results in the regions with similar culture, trade or geographical proximity. For instance, the single window in ASEAN economies has been launched and developed rapidly. Other economies or blocs, in their negotiation of free trade agreements, consider trade facilitation and harmonisation of paperless standards and regulations. The negotiation process between the EU and the US will reflect upon such integration trends in the development of paperless trade.

5. Conclusions

This theoretical background study proves that the implementation of the e-Mar technology could be highly beneficial for both governments and trade communities. For national governments, it will improve the level of border security and increase customs revenues. For the trading communities, it will provide a transparent and predictable environment, new technologies as well as better utilisation of financial and human resources. Plus as a public good the paperless trading will create external benefits such as social and environmental effects that will improve the standards of life.

As discussed the global impact from e-Mar technology will be materialised in reducing the required time for exports/imports, which will boost the world trade and economic growth. This will be beneficial to the expected economic recovery of the European Union in a medium term.

⁷⁰ See <http://www.law.gov.au/ecommerce>

The microeconomic impact will materialise in inducing the skill-biased technological change that will shift the structure of industry's employment towards highly technical skilled workers. The shift will be observed in Europe, but also internationally due to the international nature of the industry. Also the occupational tasks will increase their analytical intensity, which will require new skills and training. Overall, the e-Mar technology as a subsection of the e-Freight platform will introduce new best practices in Europe that will boost both the competitiveness of the maritime industry and the logistics performance. The international best practices referred to in this report demonstrated the advantages and disadvantages of existing models worldwide and presented good business case studies for the European Union to use for benchmarking.

In this aspect, the e-Mar Strategic Framework will delineate the policy and regulatory requirements, and technical standards for the maritime industry to comply with. This will create also the necessary connectivity infrastructure to support the online-based interactions between industry stakeholders. All digital resources that will be accessible to operators of the supply-chain and state administration will be guaranteed – its privacy and confidentiality – via the single window legislation.

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Annex 2: Indicators used for evaluation in Freightwise

GENERAL

Improve speed	Km/h
Increase frequency	Number
Task size of shipments	Number
Shipment size	Number
Value of shipment	Number
Density of shipment	Number
Punctuality of trains	Number
Competitiveness	Qualitative
Connection to international and national transport network	Qualitative

TECHNICAL ASPECTS

Decrease of queue time	Minutes
Decrease of queue length	Meters
Increase of reliability (of the system)	Number
Increase of overview	Qualitative
Improved use of infrastructure	Relative number
Increase of better services	Qualitative
Increase of just-in-time service	Number
Reaction time measure	Minutes
Nature of reaction	Number
Quality of reaction	Relative number
Technology obsolete	Relative number
Dependency on meteorological conditions	Relative number
Weather sensitivity	Relative number
Terminal efficiency	Minutes
Wagon availability	Number

INFORMATION ASPECTS

Scale of information	Relative number
Capacity of information	Relative number
Quality of information flows	Relative number
Quantity of information flows	Number
Visibility of information segregation	Qualitative
Traceability of information	Relative number
Data storage technology	Relative number
Duration of data storage	Minutes
Procedure for data retrieval	Qualitative
Strength of EDI technology	Relative number
IT-supplier dependency	Relative number
Dependency on third parties	Relative number

Time gain in detecting and tracking vessels/vehicles	Minutes
Use of portal for intermodal transport management	Number
Electronic tracking capability	Qualitative
Contribution to FWF	Qualitative
Contribution to STS	Qualitative

ORGANISATIONAL PERFORMANCE

Decrease of men hours in route planning	Minutes
Time gain in sending reports	Minutes
Time gain in receiving authorisation	Minutes
Decrease of number of contacts with authorities	Minutes
Decrease of men hours on information collection	Minutes
Decrease of men hours on information exchange	Minutes
Decrease of men hours on navigation/driving hours	Minutes
Training, education	Minutes
HMI, increase of comfort caused by the system	Relative number
HMI, decrease of procedures and data handling	Relative number
Language adaptability	Relative number
Operation and management of the terminal	Qualitative
Administrative time savings	Minutes
Planning & management time savings	Minutes
Control time savings	Minutes
Proactive notification of problem	Qualitative
Electronic booking/ payment capability	Qualitative

EFFICIENCY

Time gain in port's arrival and departure processes	Minutes
Time gain in adjusting logistics activities	Minutes
Travel time reduction in door-to-door time	Minutes
Decrease of transport time	Minutes
Improved transport efficiency	Qualitative
Time gain in collecting the right information	Minutes
Time gain in processing the right information	Minutes
Decrease of delays	Number
Decrease of waiting time	Minutes
Innovation	Relative number
Harmonisation / complementarities	Relative number
Development, flexibility	Relative number
Success rate of information transmission	Relative number
Transmission time	Minutes
Improve lead times	Minutes
Reduce handling	Minutes

Reduce waiting time for trucks at port entrance	Minutes
Better use of electronic message exchange	Qualitative
Transshipment process less dependent on staff expertise	Qualitative

CONTEXT/LEGAL ISSUES

Legal aspects	Qualitative
Reduce waiting time for trucks at border crossings	Minutes
Planning security	Qualitative
Availability of land	Qualitative
Governmental policy on freight transport	Qualitative
Regional access to markets	Qualitative
Freight transport market transparency	Qualitative
Impact on international trade	Qualitative
Impact on cross-border investments	Qualitative

COMMERCIAL ASPECTS

Increase business activities	Number
Market	Relative number
Autonomous developments: demand for freight transport	Relative number
Increase orders	Number
Ability to respond to customer needs	Qualitative
Availability of equipment to meet user needs	Qualitative

ECONOMIC ASPECTS

Increase of goods transported	Amount
Increase of occupancy rate	Relative number
Benefits of additional loads	Amount
Decrease of costs	Euro
Investment costs	Euro
Operating costs	Euro
Maintenance costs	Euro
Cost of legislation	Euro
Avoided investment costs	Euro
Occupancy rate vessels	Number
Transport costs	Euro
Costs of enforcement	Euro
Pay back period	Months
Net cash flows	Euro
Autonomous developments: economic growth	Number
Mutations in number of employees	Number

Increase RoRo and Rail services	Number
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SOCIETAL ASPECTS

Decrease of environmental damages	Extent & nature
Decrease of oil spills	Extent &nature
Increase of quality	Qualitative
Reduction of illegal and threatening activities	Number
Modal shift from road to rail/water	Amount/percentage
Emission reduction of CO2	Amount
Emission reduction (air quality of port district)	Amount
Use of cleaner and alternative fuels	Amount
Reduction of covered mileages and related emissions	Mileages & grams
Decrease of accidents	Number & nature
Decrease of collision	Number & nature
Decrease of injuries	Number & nature
Decrease of fatalities	Number & nature
Decrease of emergency response time	Minutes
Decrease of emergency activities	Number
Improved feeling of personal safety	Qualitative
Prevent damage	Number