KEYSTONE

D1.2

Focus groups report including stakeholder requirements and expectations.

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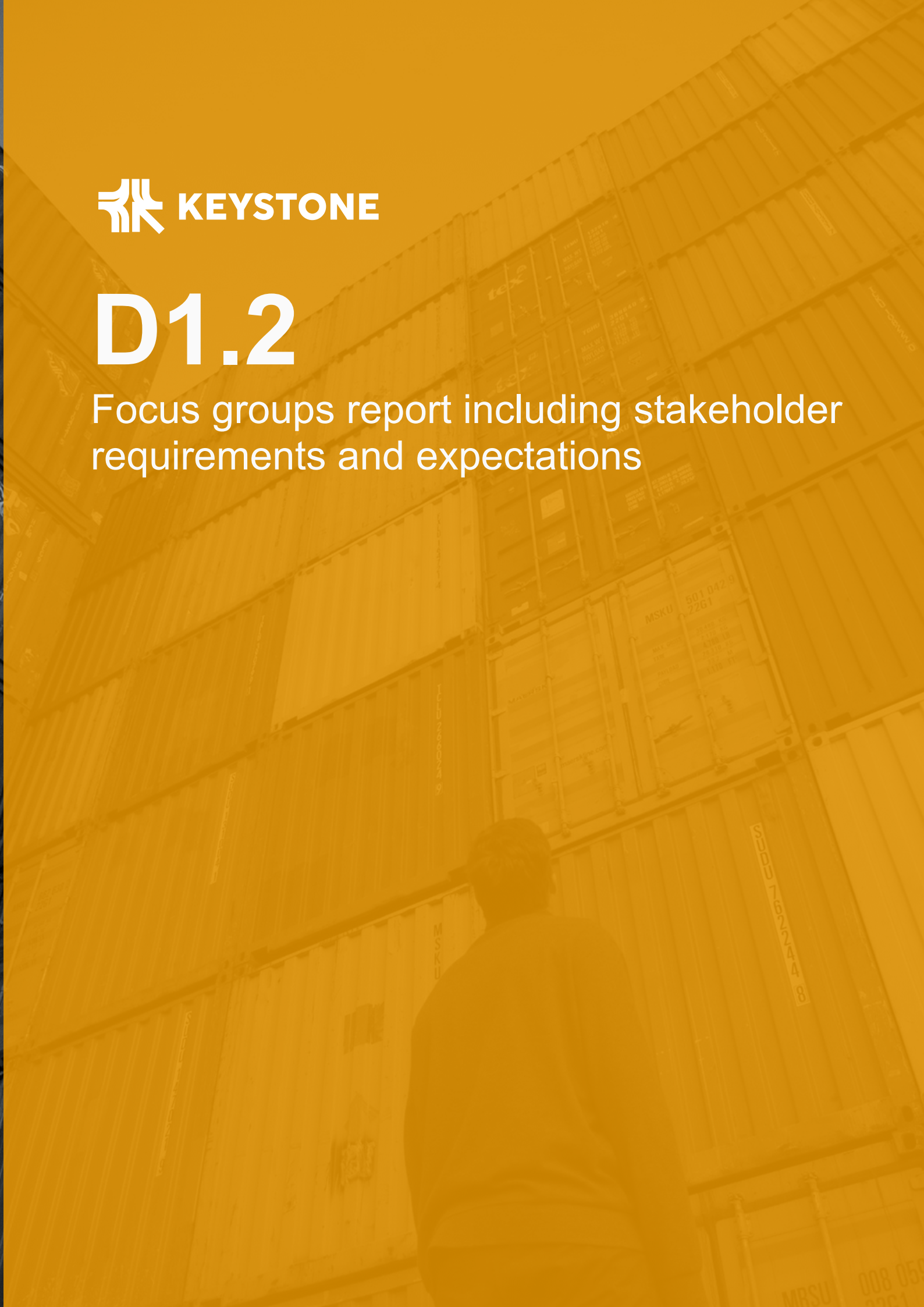

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Acronyms

Acronym	Meaning
AES	Advanced Encryption Standard
API	Application Programming Interface
B2G	Business to Government interactions
CBiS	Centre for Business in Society
CIM	Centro Interportuale Merci S.p.A
CMR	Convention on the Contract for the International Carriage of Goods by Road
DTLF	Digital Transport and Logistics Forum
e-CMR	Electronic version of Convention on the Contract for International Carriage of Goods by Road
EEA	European Economic Area
eFTI	European Freight Transport Information
eIDAS	Electronic Identification and Trust Services
ESG	Environmental, Social and Governance Standards
EUCARIS	European Car and Driving License Information System
GDPR	General Data Protection Regulations
ICOOR	Interuniversity Consortium for Optimisation and Operational Research
IPAFFS	Import of products, animals, food and feed systems
MFA	Multi-Factor Authentication
SME	Small and Medium-Sized Enterprise
TLS	Transport Layer Security
UN	United Nations
UNECE	United Nations Economic Commission for Europe
USP	Unique Selling Point
WP	Work Package (of the KEYSTONE project)

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Annex V1	29 May 2024	Sabino Metta and Gloria Re Calegari	Cefriel	Final version of Annex 1

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1. Executive Summary

This report serves as Deliverable D1.2 for Task 1.2 of the KEYSTONE project. This task, integral to Work Package 1 (Gap Analysis and State of the Art), aims to identify and prioritise the requirements for the KEYSTONE solution, which is essential to enhancing the digitalisation of cross-border EU transport and logistics. The report develops insights gathered through a series of data collection methods including a review of existing secondary data sources (documents, literature), the stakeholder survey findings (D1.1), a focus group, a round table and 13 semi-structured interviews (see Section 2). This report synthesises the stakeholder requirements for KEYSTONE from a range of European socio-economic environments.

The data collection methods were structured to capture comprehensive stakeholder perspectives. These have revealed key insights into the complex interplay of regulatory and technical challenges faced within the logistics sector (see Section 3). Stakeholders from diverse backgrounds provided input that has been crucial in outlining the necessary requirements and expectations for the KEYSTONE solution (see Section 4). This input is fundamental in addressing the challenges of digitalisation, such as the need for improved data sharing across stakeholders, adherence to information security standards, and compliance with data protection principles as stipulated by GDPR.

Task 1.2 is key in defining how the KEYSTONE solution should be designed to interact securely with existing transport ecosystems and their stakeholders. The rigorous process involved bespoke questionnaires and the creation of stimulus material based on themes agreed with other partners involved in WPs 1 and 2. This structured approach not only refined the project's methodological framework but also ensured the capturing of authentic stakeholder values and priorities.

Key findings from the task include a shared recognition of the pivotal role of technology and data in optimising logistics processes and enhancing transport sustainability. However, stakeholders also highlighted significant barriers such as complex legislation, the variety of tools already available, geopolitical concerns and the need for enhanced cooperation across member states. These findings must guide the development of the KEYSTONE solution, ensuring they are robust, user-friendly and capable of fostering the digital transformation of the European transport and logistics sector.

The insights from this D1.2 deliverable will directly influence subsequent Work Package activities within the KEYSTONE project, ensuring that the solutions developed are not only technologically advanced but also align with real-world needs and regulatory frameworks, facilitating smoother and more efficient cross-border logistics operations.

2. Introduction and Methodology

The Centre for Business in Society (CBiS) at Coventry has delivered Task 1.2 of the KEYSTONE project. Task 1.2 is concerned with understanding stakeholder requirements for a prospective KEYSTONE solution to enhancing digitalisation of cross-border EU transport and logistics. These requirements aim to inform various Work Package activities that will take place throughout the remainder of the KEYSTONE project. Informed by relevant findings from the key stakeholder survey within D1.1[1], this D1.2 report presents the findings of the analysis of stakeholder requirements for the KEYSTONE project. Here, the report will first introduce an overview of the D1.1 survey relevant findings, followed by the secondary and primary data collection approach used to achieve the purpose of D1.2. Second, it will identify key challenges faced by actors involved in the logistics sector, focusing on regulatory and technical aspects (Section 3). Based on the data gathered from key stakeholders, the 'requirements' for the KEYSTONE solution will be proposed (Section 4). The report then concludes with Section 5.

2.1 Overview of the D1.1 Key Stakeholder Survey

Between 13 September 2023 and 24 April 2024 (7 months), Task 1.1 undertook a survey of transport and logistics operators, freight terminals and enforcement authorities across the EU and the UK. The survey asked members of these three target groups about their views on the digitalisation of EU cross-border transport and logistics. In total, 131 respondents fully completed the survey, from across 20 EU countries, and the UK. Within the full completion total, there were 84 transport and logistics operators, 11 freight terminals and 36 enforcement authorities that responded, thus it should be noted that nearly two-thirds of respondents are logistics operators. Comprehensive details of the findings of this survey can be found in Deliverable Report D1.1 and the separate Annex to this D1.2 Report (D1.1 Survey Update Report). Here, we outline the relevant findings that assist in informing and guiding the remit of this D1.2 Report.

2.1.1 Implications of D1.1 Survey findings that are relevant to this D1.2 Report

This section provides implications of the survey findings that are relevant to D1.2.

Overall, a substantial majority of stakeholders (operators, freight terminals and enforcement authorities) are, in principle, 'on the same page' as the KEYSTONE project; there was widespread agreement that data and technology play a pivotal role in improving and enhancing compliance checks, optimizing logistics processes and enhancing transport sustainability. The following challenges raised by respondents (below) suggest the realities of digitalisation is complex.

It is notable that 25% of operator respondents believe that other aspects *beyond* the technological and data requirements of digitalisation also needed to be considered. These issues can inform the research for Task 1.2 and, with the technological and data aspects of digitalisation, can assist with the development of requirements for a KEYSTONE solution. A significant share of respondents, especially operators, identified challenges primarily regarding the ***legislative / regulatory frameworks*** in which they operated, including:

- 'Complex legislation': Whilst this is a generic statement, this survey findings suggest that the broader Legislative Framework arena (including global, EU-wide, Brexit-related, and at the level of national Member States) requires further investigation as to why stakeholders find legislation 'complex'.

[1] [1] An 'Update' to the original survey findings of D1.1 can be found in the Appendix of this report D1.2.

- The 'geo-political context' (e.g. 'non-EU borders', 'Brexit', 'uncertainty around regulations'), was also raised by survey respondents and involves a range of challenges. This suggests that the wider geo-political context needs to be considered and discussed with key stakeholders, in terms of impacts.

- 'Co-operation between member states': this finding suggests that national level Member State legislative frameworks and their integration (e.g. through national level agreements) also warrant further investigation regarding why such co-operation is required for key stakeholders. In relation to this, there was also the barrier of 'different languages' in undertaking business activity across national borders.

- A specific challenge stated by some enforcement authorities is the increasing complexity of the legal bases for enforcement - a particular problem for the road haulage sector. Further identification and understandings of the specific issues facing key stakeholders regarding enforcement legislation, at Member State and EU levels (as well as globally), are thus required.

- Regulations in relation to 'the type of shipping' (e.g. 'dangerous or perishable goods' and 'project cargo') were also specified as key issues where digitalisation was a challenge. More research into these specific areas is thus needed in relation to exactly what issues are faced by key stakeholders.

All respondents also identified a comprehensive range of ***technological or data challenges*** (the primary focus of the survey) regarding digitalisation of EU cross-border logistics / transport, which inform Task 1.2 (and Task 1.3) and thus inform with the development of requirements for a KEYSTONE solution, including:

- Survey findings suggest 'a lack of appropriate digital tools for sharing data' is a major barrier to progressing digitalization. Therefore, further investigation is needed into why digital tools for sharing data are perceived, or actually experienced, as being inappropriate by key stakeholders.

- Findings also claimed that there are no 'standard' platforms (national and/or international) that currently exist. Again, more investigation is needed into perceptions or real experiences of key stakeholders regarding IT platforms apparently having no or limited 'standardization' or 'interoperability'.

- Survey respondents also suggested that EU platforms are not widely used currently, claiming that limitations involve poor accessibility and a lack of integration. For example, the survey findings suggest that only 15% of responding operators have exchanged information on EU-wide platforms (mainly IMI and eFTI) and in only half of those cases are EU platforms integrated with national level platforms. Furthermore, none of the freight terminals responding to the survey has ever exchanged information with an EU-wide platform designed to facilitate cross-border compliance checks (i.e. ERRU, IMI, TACHOnet, Resper and eFTI platforms). However, 70% of responding enforcement authorities stated they used one or more EU platforms for compliance processes (e.g. TECHOnet, IMI and ERRU) – but 20% of authorities are not even aware they exist whilst 10% are aware but do not utilise them. Thus, more investigation is required into why EU platforms (a) are not widely used by key stakeholders generally and (b) are claimed to have 'poor accessibility' and 'a lack of integration in these platforms', according to the perceptions and/or real experiences from key stakeholders.

- In relation to B2G data sharing, 60% of operator respondents have digitally shared data with at least one enforcement authority - (e.g. Customs at 72% of cases; Port Authorities at 44%). Data shared includes cargo, vehicle, driver and operation data. However, the survey findings identified reasons for

operators not sharing data, primarily: 'lack of suitable digital tools', 'lack of trust', 'lack of legal security' and 'no obligation to share data'. Regarding B2B data sharing, 50% of respondent operators share data with other actors (and 50% of these share that information automatically through 'validated' digital integrated platforms – primarily 'validated' cargo, vehicle and driver data). Around 25% of operators did not share data but are interested in doing so. The remaining 25% of operators said they did not share data and were not interested in doing so – primarily due to reasons of 'confidentiality', 'competition' and 'lack of trust'. Based on these findings, more research appears to be needed into the specific issues behind 'lack of trust', 'legal security', 'confidentiality' and 'competition' as key reasons why operators are not sharing data, and how these barriers might be overcome.

- In terms of freight terminal respondents, around 60% stated they also shared data with at least one enforcement authority (e.g. cargo, vehicle and operation data). The main challenge stated by freight terminal respondents was that of a 'lack of suitable tools and platforms' - in fact, in some cases the sharing of data is undertaken directly by the terminal's own customers and shipping companies, not the freight terminal. Also, 50% of freight terminal respondents stated that they shared data with other actors 'automatically' through digital means (primarily cargo, transport status, vehicle and yard situation data, and primarily through digital platforms. IT platforms used include: the 'Hupac Suite' (i.e. WOLF, GOAL and EDIGES). However, 20% still share data with other actors 'manually' and the remaining 30% of freight terminals do not share data with other actors at all. Given these findings, more investigation is also needed regarding why key stakeholders believe there is a lack of suitable platforms, and what potential there may be for greater sharing of data (digitally) to enhance efficiency at terminals, for example.

- IT platforms used by Enforcement Authorities include: Port Community Systems, IT systems provided by national ministries and national customs agencies (e.g. Sistema Telematico Doganale in Italy), police systems, card issuing auhorities and licencing authorities. On a positive note, respondents provided examples where some enforcement authorities do collaborate to utilise digital infrastructure and ecosystems within ports / freight terminals – for example, 'Portbase' in the Netherlands and the 'Logistic Single Window (or 'JUL') in Portugal. Furthermore, it is notable that 69% of enforcement authorities stated they used one or more EU-wide platforms (e.g. ERRU, TACHOnet, Resper, IMI and eFTI) to carry out controls. Some enforcement authorities also utilise 'Eucaris' (European Car and Driving Licence Information System) which is a European-wide platform designed to promote the exchange of vehicle and driving licence information amongst Member States, and to combat international vehicle crime and driving licence tourism. However, 23% of enforcement authorities claimed to be unaware of these platforms, whilst 8% said they were aware but did not use them. Specific examples of platforms for road transport mentioned include TachoScan Control and AETERControl. Other enforcement authority respondents also stated they use 'Octet' and 'DSRC-RP' platforms for analysing tachograph data during road checks. Another platform utilised is 'TRAZA', which enables the presenting of all necessary documents to carry out procedures relating to special traffic authorisations (as defined by the General Directorate of Traffic), such as road transport exceeding normal limits of shape, mass and/or safety (as defined by the highway code).

- Clearly, given the above, there is a complex picture of stakeholders using of multiple platforms, whilst at the same time appropriate examples of platform integration and collaboration at the member state and/or European level also exist. And there are calls for more integration and better accessibility of EU-wide platforms. This complex area suggests that further investigations with key stakeholders are required into the characteristics, application, effectiveness and challenges involved in EU-wide platforms that show potential for moving towards more effective interoperability, standardisation and intra-European collaboration.

- The survey, specifically, also found that 88% of enforcement authorities wanted IT platforms to be improved through integrating new data sources within them - specifically, the need to 'integrate' those commonly used EU-wide platforms that enforcement authorities utilized (e.g. ERRU, TACHOnet, Resper and IMI etc) into *one* unique platform, as well as improving EU platforms' accessibility generally. Furthermore, they suggest integrating the following datasets into such platforms: cross-border freight/logistics data; technograph card register for field control tasks (e.g. direct access to TACHOnet); data on EU-wide Periodic Technical Inspections (or 'PTI') to verify the validity of PTI during roadside checks of vehicles; geolocation of transport vehicle data from origin to destination; information/documentation about dangerous goods and waste, networked across the EU; and data on the National Registry of Resident Population (e.g. for Italy, this is the ANPR system that is also used in the UK). Such suggestions need further examination with key stakeholders into how such integration of datasets might be achieved and what barriers exist to overcome.

- Regarding 'data needs' of the target group respondents, 60% of operator respondents need more data to improve their productivity and efficiency; whilst 70% of freight terminals need more data and 88% of enforcement authorities need for data to improve productivity and efficiency.

- Specific data needs by '*operators'* include: data on port waiting times, terminal congestion, loading and unloading windows at terminal, customs inspections and authorisations, road traffic, road accidents, closed roads or planned closures, train and/or ship delays, bad weather conditions on routes, occupation of parking areas, height limits, drivers and more data on the vehicles.

- Specific data requirements of '*freight terminals'* involve: customs data, estimated time of arrival (ETA), estimated time for loading and unloading, delays, cargo volume, types of transported goods, shipments, data to assist in enforcement authority inspections, and data about digital documents for ADR ('Accord Dangereux Routier' or 'Road Dangerous Goods Agreement').

- Finally, suggested data needs from '*enforcement authorities'* are numerous and cover the whole range of data available. For example: vehicle information and status, e.g. last road side inspection (RSI) and periodical technical inspection (PTI), to help avoid the same truck being checked numerous times on the same trip, and potential mutual recognition of PTI results across Member States. Suggestions for sharing data across Member States included: driving licence data, operator licensing data, inspection procedure / protocol information for each country and suggestions that *all* Member States should utilise the ERRU system to share data on drivers and transport company documentation. Examples of EU-wide systems that could be a model include that for the Certificate of Conformity (CoC). Data needs that would assist in fraud prevention include: GPS vehicle tracking data, traffic data and tolling data to verify tachograph data and shipping manifest data which includes personnel on ferries. Data needs to improve checks include: data on: loads, timesheets, mileages or driven kilometres, shipping order forms, weighting-in documents, accurate traffic information, etc. Various other data needs suggested included: data on loading / leaving time stamped on CMR documents; data about goods imported/exported for risk-based inspection (to reduce inspection time at customs), data about Logistics Service Provider (LSP) and shippers; data about planned driver stops and distance travelled (for carbon footprint calculation).

- Given such findings above on suggested *data needs*, clearly more research is needed into how such data needs may be able to be shared, both from a legal / legislative perspective as well as a digital technology perspective.

The above challenges and case examples identified in the D1.1 survey findings, and the proposed further research into the regulatory, technological and data-related issues they involve for key stakeholders, are thus explored in the remainder of this report, with the intention of offering requirements to a KEYSTONE solution. It should also be noted that the research undertaken for D1.2 identified further issues (in addition to those regarding legal / regulatory frameworks) in addition to those captured in the D1.1 survey, including ***cyber security*** and the ***implications of digitalization for SMEs***, which are also examined in this Report.

2.2 Data Collection Process for D1.2

In completing Task 1.2 the research team at CBiS, Coventry University, employed a mixed-method approach to data collection utilising both primary and secondary sources to generate an overview of the existing legislative framework, key technological challenges, and to identify stakeholder 'requirements' to be considered during the design stages of the prospective KEYSTONE solution. The first phase of data collection involved completing a desk-based review of key secondary data sources relevant to the use of digital documents and processes in the EU cross-border transport and logistics arena. Evidence collected during this stage of the study included Impact Assessments and policy-related studies produced on behalf of, or by, the European Commission concerning: the proposed implementation of electronic documents and 'eFTI'; work developed by DTLF SG1 on paperless documents in transport; and other studies and insights commissioned by bodies such as CLECAT[2] and IRU[3]. This documentary evidence provided a comprehensive overview of the debates surrounding the usage of electronic documents and processes in transport and logistics within and outside of the EU, including identification of the legislative and regulatory frameworks and key challenges faced by key stakeholders including operators, freight terminals and enforcement agencies. This review also helped to inform the next stage of data collection, principally in relation to 'question design' for the qualitative data collection approaches with key stakeholders.

Qualitative insights from key stakeholders were captured and developed through two broad means of qualitative data collection. First, roundtable and focus group sessions were undertaken with key stakeholders in Novara in Italy and Madrid in Spain. All informants were asked for their consent before recording started (in addition to the previous completion of the Informed Consent form, following the provision of a Participant Information document). This was a component of the ethical guidelines underpinning this activity, with the interviews authorised by the Coventry University ethics team prior to the research commencing.

The first of these two sessions was completed in Novara during November 2023 and was characterised as a 'roundtable' due to the presence of an invited audience which included members of the KEYSTONE consortium alongside a panel of key stakeholder informants. The event was organised by ICOOR and CIM, with the panel of informants combining policy and enforcement perspectives with those from commercial transport / logistics businesses. In total the panel contained nine informants and the discussion lasted 1 hour and 50 minutes. The roundtable approach was appropriate for capturing Italian stakeholders' perceptions due to its interactive and inclusive format. This setup allowed for a comprehensive discussion among diverse informants including government officials, industry leaders and technical experts. It facilitated an open exchange of ideas and concerns, ensuring that all voices were heard, to discuss and address the complex, multifaceted challenges of digitalising transport and logistics within diverse regulatory and operational landscapes across Europe.

[2] Source: https://www.clecat.org/media/Position%20paper%20CLECAT%20Digital%20Transport%20and%20Logistics_1.pdf
[3] Source: https://www.iru.org/

Subsequent to the roundtable session in Novara, a focus group was organised in Madrid. This session was organised by the Technical University of Madrid and took place in January 2024. A total of 9 respondents drawn from enforcement authorities and logistics / transport businesses constituted the panel of informants for this event. Using a focus group to gather insights from Spanish stakeholders was highly effective as it enabled a dynamic and structured dialogue among informants who shared similar contexts but potentially divergent views. This method allowed for deeper exploration of specific issues relevant to the Spanish segment of the EU logistics and transportation sectors, facilitating an understanding of their unique challenges and perspectives. The interactive nature of the focus group also encouraged active participation and collaboration, ensuring that a diverse range of opinions and experiences were captured and discussed. Within both sessions - the round table and the focus group - the same questions and topics were raised as discussion points. These concerned key challenges in adopting digital technologies, identifying the opportunities to digitally transform the transport and logistics sector, and outlining requirements suggested by the key informants.

Second, a series of semi-structured interviews took place with stakeholders drawn from the logistics arena in both the EU and the UK. These individuals represented operators, enforcement agencies, regulators, platform developers, and consultants. As indicated in Table 1 below they were drawn from eight EU Member States and the UK. Most respondents were currently or recently involved in cross-border logistics activities, so had knowledge of multiple national settings as well as broader activity at the European level. Respondents were recruited through various channels including utilising networks and contacts within the KEYSTONE consortium, social media invitations through LinkedIn, posts on the KEYSTONE website, and 'snowball' recommendations from interviewed stakeholders.

Table 1. Stakeholder Interviewees

Participant	Nation	Expertise
Participant 1	Estonia	Operator/Consultant
Participant 2	Finland	Platform Developer
Participant 3	UK	Platform Developer
Participant 4	Austria	Regulator
Participant 5	Lithuania	Platform Developer
Participant 6	Germany	Operator/Consultant
Participant 7	Netherlands	Consultant
Participant 8	Netherlands	Platform Developer
Participant 9	UK	Enforcement Agency
Participant 10	Belgium	Operator
Participant 12	Netherlands	Regulator/Enforcement
Participant 13	Netherlands	Regulator/Enforcement

Typically, each interview began with the participant providing an overview of their background within transport and logistics before answering questions on key topics concerning platforms, legislation, key challenges, and potential requirements for the KEYSTONE solution. Interviews took place via MS Teams and, on average, lasted between 45-60 minutes. Each session was conducted in English with interviews recorded and

transcribed via the transcription option on MS Teams. Participants were asked for their consent before recording started (in addition to the previous completion of the Informed Consent form, following the provision of a Participant Information document). This was a component of the ethical guidelines underpinning this activity, with the interviews authorised by the Coventry University ethics team prior to commencing the research (project reference P166564).

Each interview was conducted by two members of the CBiS team. In each case, one of these individuals would take detailed notes of this discussion to support the data analysis activity. On completion of each interview, transcripts, as well as the detailed notes, were reviewed by each member of the CBiS team to enhance rigour and consistency. This activity was largely based upon the CBiS team identifying a set of themes guided by the key issues identified in the relevant findings of the D1.1 Stakeholder Survey, the initial review of secondary data and literature, and the key objectives of WP1.2 regarding the establishment of 'stakeholder requirements'. Examples of key themes included concepts such as 'interoperability', 'data sharing', 'cyber security', 'small and medium-sized enterprises' (SMEs) and 'regulation'. To ensure rigour and consistency, the reviews of the interviews were compared across the CBiS team, which minimised instances of erroneous interpretations.

3. Key Challenges of Digitalisation in Logistics

Section 3 of this report considers the key challenges concerning the use of digital documents and processes. First, an overview of the regulatory framework surrounding the use of electronic documents in transport and logistics will be presented, prior to an analysis of the current issues and challenges present within this legislative agenda. Second, this section of the report then discusses key challenges related to technology including interoperability, SMEs, and cyber security.

3.1 Legislative Framework

In reviewing the wider legislative picture, this report will first identify the state of play in relation to international and European-level frameworks and standards, prior to understanding some of the challenges present within the current regulatory sphere.

3.1.1 International and European-Level Frameworks: Current State of Play

There are myriad national and European legislation which shape the use of electronic documents and processes, however cross-border activity for contract of carriage is primarily shaped by a suite of *global* conventions based upon the specific requirements for different modes of transport. These frameworks are illustrated in Table 2 below.

Table 2. Key Conventions in Contract of Carriage

Mode	Convention
Road	Convention on the Contract for the International Carriage of Goods by Road (CMR) (1956) e-CMR Protocol (2008)
Rail	Uniform rules concerning the Contract of International Carriage of Goods by Rail (CIM) (2006) Appendix B to Convention concerning International Carriage by Rail (COTIF) (1999)
Air	Montreal Convention (1999) ATA Resolution 672 (2013)
Maritime	Hague Rules (Visby Rules, 1968 and SDR Protocol, 1979). Hamburg Rules (1978) Rotterdam Rules (2008)
Inland Waterway	Budapest Convention on the Contract for the Carriage of Goods by Inland Waterway (CMNI) (2000) Strasbourg Convention on the limitation of Liability in Inland Navigation (CLNI) (2012)

(Source: DTLF, 2018)

Currently this broader regulatory framework does not have a standalone protocol for *multimodal* transport, although the Rotterdam Rules have been suggested as a means of capturing electronic documents when a

shipment utilises sea freight for a leg of its journey[4]. Whilst a UN Protocol on Multimodal Transport was proposed it was never adopted formally, and this framework would not provide an obligation to use or accept electronic documents even if this came into operation. As noted in the State of Play and Barriers Report[5], these protocols generally do not oblige operators to use electronic documents or mandate enforcement authorities to accept them. Furthermore, acceptance of the Conventions illustrated in Table 2 is varied, with Member States adopting different approaches to the ratification of treaties across different transport modes, with some nations ratifying conventions rapidly and others lagging in this regard.

In terms of the type of documents required, shipment of goods on a cross-border basis requires a variety of documentation, with these documents issued by businesses, authorities and/or certification bodies. This documentation may convey contractual information surrounding a shipment and may be utilised by enforcement authorities as a means of establishing regulatory compliance (EU Commission, 2018). For example, the typical documentation used within the process of completing a shipment was highlighted by DTLF Steering Group 1 *(DTLF, 2018):*
:

- Documents concerning goods (freight documents): Contain information surrounding the goods and their transport (e.g. waybills, consignment notes, bills of lading, customs declarations).

- Documents concerning means of transport: Contain information surrounding the means of transport from a safety perspective, usage, nationality, registration, insurance etc.

- Documents concerning personnel: Contain information on qualifications and nationality of persons operating transport or handling the shipment.

The report now specifically examines a key focus of Task 1.2 – that of the legal and regulatory frameworks for EU cross-border road transport freight and logistics.

3.1.2 Road Transport: CMR and e-CMR

Most relevant to the KEYSTONE project are the frameworks governing the use of electronic documents with road transportation. The Convention for the International Carriage of Goods by Road (CMR) establishes the rules for the carriage of goods cross-border and harmonises contractual conditions for goods transport via road[6]. The CMR Convention (E/ECE/TRANS/489, Geneva, May 1956) applies to all cross-border commercial shipments by road and requires the production of a CMR note detailing various aspects of the shipment including[7]:

- Name and address of the sender
- Name and address of the carrier
- Place and date of taking over the goods and designated place for delivery
- Requisite instructions for customs and other formalities.

CMRs are, therefore, principally used for commercial transport contract purposes and B2B activity. Additionally, CMRs are utilised by law enforcement and customs authorities as one way to check details such

[4] Source: https://unctad.org/topic/transport-and-trade-logistics/policy-and-legislation/international-maritime-transport-law/rotterdam-rules
[5] Source: https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1
[6] Source: https://www.iru.org/what-we-do/facilitating-trade-and-transit/e-cmr
[7] Source: https://unece.org/DAM/trans/conventn/cmr_e.pdf

as carrier, consignor, and consignee information (UNECE, 2018). The system is paper-based, with the UN establishing the Additional Protocol to the CMR concerning the usage of electronic consignment notes in 2008[8] – the e-CMR. The e-CMR protocol requires electronic consignment notes to be authenticated by relevant parties concerned with the contract of carriage. This is completed via electronic signature to establish a link with the consignment note[9]. However, as noted by the European Commission (2018) the presence of the e-CMR protocol does not oblige businesses and operators to use electronic documentation, and it does not regulate the usage of these interventions for B2G activities.

As noted with the key informant interviews, and within the broader policy literature, ratification of the e-CMR protocol has varied – for example, Participant 4 stated that its adoption in Austria was "imminent", but Participant 12 termed its use in the Netherlands as "well established":

"*In the Netherlands it has been, a very long-time, possible to make use of e-CMRs based on the convention we have ratified…And also we have a number of e-CMR providers who are providing digital solutions to enable economic operators to make use of e-CMR"* (Participant 12).

However, despite this statement it was also suggested that the usage of e-CMRs generally is low, with interviewees outlining that only an estimated 1% of total CMRs being in electronic format[10]. This low rate of e-CMR adoption is driven by various factors such as complexities surrounding standards and interoperability, the regulatory framework not compelling the usage of electronic documents, and varied levels of adoption across Member States. These challenges were summarised by Participant 10:

"A digital CMR exists, but unfortunately not every country has well advanced with that. So there are different software solutions to it, but the sending country, the country of arrival and all the countries you're driving through need to recognise and accept the digital CMR. Belgium, for example, it's under the trial officially. So that means that you can use it, but it's not recognised yet. [In the] UK it's already recognised, but in reality every 'delivery place' prints their own paperwork and has their own version of the truth". (Participant 10)

As alluded to by Participant 10 there are a variety of e-CMR solutions available, and, as a result, some respondents viewed e-CMR as a 'commodity' (Participants 7, 11):

"And also one of the issues is you see, for instance, e-CMR is just becoming a commodity and that also makes it difficult for companies to find providers in order to find their role in this whole platform [development] thing" (Participant 7).

This complexity was seen by some as a deterrent, particularly for SMEs, as it creates issues in terms of interoperability and standards. As such, it was stated that there needs to be greater incentivisation for businesses to transition towards using this Protocol. There are also potential knowledge deficits for enforcement authorities, particularly surrounding inspection regimes, which act as a further deterrent to the use of e-CMR. Whilst adoption of this protocol is a positive step, it should not be equated with resolving *all* issues concerning the adoption of digital documents:

"There will be a lot of difficulties…Ratificiation of the e-CMR protocol doesn't mean in the inspecting organisations, like government, on the ground, that they know how this works. So it's not that easy [for enforcement]" (Participant 7).

[8] Source: https://unece.org/DAM/trans/conventn/cmr_e.pdf
[9] Source: https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/615673/EPRS_BRI(2018)615673_EN.pdf
[10] Source: https://cargoon.eu/en/community/blog/other/join-the-e-cmr-revolution/

In summary, activity in transport and logistics globally is governed by the suite of initiatives highlighted in Table 2 with many of these protocols and conventions dependent on the use of paper-based documentation and processes. For road transport the key intervention is the CMR protocol, which has now been extended through the introduction of the e-CMR to enable the use of electronic documentation. Despite this positive step there are enduring concerns surrounding acceptance, enforcement regimes, and inspections. Additionally, the variety of available e-CMR tools on the market adds a further layer of complexity, specifically in relation to interoperability, which can act as a deterrent for adoption.

3.1.3 eFTI (Electronic Freight Transport Information) and European-Level Interventions

Previous work commissioned by the EU has noted the absence of European-level regulations concerning the use of digital documents in transport and logistics[11]. Crucially, this study reflected that existing EU rules do not determine how transport documents should be inspected, what requirements are needed for forms to be completed, and what should be the volume of the checks undertaken. However, there are key European-level frameworks and databases in operation, including eIDAS (EU) 910/2014, which facilitates EU cross-border transactions through the creation of digital identity and authentication[12]. This legislation[13]:

- Lays down the conditions under which Member States recognise electronic identification means of natural and legal persons falling under a notified electronic identification scheme of another Member State.
- Lays down rules for trust services, in particular for electronic transactions.
- Establishes a legal framework for electronic signatures, electronic seals, electronic time stamps, electronic documents, electronic registered delivery services and certificate services for website authentication.

In relation to the scope of the regulation, eIDAS:

- Applies to electronic identification schemes notified by a Member State and to trust service providers established in the EU.
- Does not apply to the provision of trust services that are used exclusively within closed systems resulting from national law or agreements between a defined set of participants.
- Does not affect national or EU law related to the conclusion and validity of contracts or any other legal obligations relating to forms.

However, as stated in the previously mentioned State of Play and Barriers Report, the full application of eIDAS will 'not substantially' impact the acceptance of electronic documents by enforcement authorities and courts as it does not compel these bodies to accept digital versions of transport and logistics documents. Alongside eIDAS, 'EUCARIS' enables the sharing of information related to driving licenses and vehicles across Member States. Rather than a database, EUCARIS is regarded as an information exchange mechanism, which is based upon cooperation between relevant enforcement authorities in Europe[14]. As reflected by Participant 13, EUCARIS is based upon European-level legal frameworks as well as bilateral and multilateral agreements between nations. Such cross-border cooperation is regarded as being vital in supporting police, and other enforcement agencies, in combating criminal activity.

[11] Source: https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1
[12] Source: https://digital-strategy.ec.europa.eu/en/policies/eidas-regulation
[13] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0910#:~:text=This%20Regulation%20seeks%20to%20enhance,services%2C%20electronic%20business%20and%20electronic
[14] Source: https://www.eucaris.net/general-information/legal-basis/

Alongside these interventions are broader goals related to environmental sustainability and smart mobility; the European Commission has developed a Sustainable and Smart Mobility Strategy, which establishes ambitious targets as a means of securing a resilient and sustainable transport system. These goals include aims, by 2030, to rapidly expand the number of zero-emission vehicles on European roads as well as progressing towards an expansion of rail traffic and automation, and by 2050, a target of nearly all new vehicles, irrespective of personal or commercial usage, being zero-emission[15]. Key drivers in achieving these goals are decarbonisation and digitalisation, which also contribute towards the European Green Deal and Digital Strategy[16]. Additionally, the European Strategy for Data aims to create a single market for data to ensure the EU has 'global competitiveness and data sovereignty[17]. Through this strategy it is anticipated that an environment will emerge whereby there is the creation of federated data spaces as opposed to a system which is dominated by large players such as Google who are able to monetise data:

"And broadly speaking, or to make it very simple, we don't we want to deal with platforms [such as] Google and Facebook, who monetise our data. We want an environment, 'data spaces', where federated data sharing is where everybody can monetise his or her own data" (Participant 12).

Therefore, the European Commission is seeking to establish Common European Data Spaces within key strategic sectors which includes mobility and transport[18]. It is hoped that this agenda will help to support the standardisation of data sharing between different stakeholders, potentially leading to service improvements and innovation:

"In an ideal world, business and government can share data in a standardised way irrespective of the data models [they use]. They can then find other partners in large data space networks, and if we realise that world, like we have seen with the internet or Apple App Store, it will allow development of new services and innovation" (Participant 12).

At the European level, attempts to promote the usage of electronic documentation in the logistics field are being enhanced by the implementation of the Electronic Freight Transport Information (eFTI) framework. The eFTI Regulation EU 2020/1056 establishes a legal framework for the electronic exchange of data between operators and enforcement agencies in Member States[19]. As noted in D1.1, eFTI will also complement existing initiatives in the EU, such as the Single Window Environment for customs and the European Maritime Single Window Environment[20]. According to DTLF the benefits of this regulation include[21]:

- Reduced administrative costs in transport and logistics estimated at €27bn over the next twenty years.

[15] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0789
[16] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023DC0751
[17] Source: https://digital-strategy.ec.europa.eu/en/policies/strategy-data

[18] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52023DC0751

[19] Source: https://transport.ec.europa.eu/transport-themes/digital-transport-and-logistics-forum-dtlf_en#efti--electronic-freight-transport-information-regulation

[20] Source: https://taxation-customs.ec.europa.eu/eu-single-window-environment-customs_en#:~:text=The%20EU%20Single%20Window%20Environment%20for%20Customs%20is%20designed%20to,the%20European%20Union%20Customs%20Single

[21] Source: https://transport.ec.europa.eu/transport-themes/digital-transport-and-logistics-forum-dtlf_en#efti--electronic-freight-transport-information-regulation

- Improved efficiency in logistics through the facilitation of the electronic exchange of information between operators.
- More efficient enforcement of freight transport rules and ensuring the availability of more standardised and high-quality data.

The European Commission[22] believes that there will be annual savings of €1bn across the EU transport and logistics sector, whilst instantaneous data sharing will support the creation of a more efficient system in terms of planning, vehicle loading, and routing. Meanwhile for enforcement authorities the key benefits, according to the Commission, include streamlined compliance checks which positively impact efficiency, lower enforcement costs due to a reduced number of inspections, and provide a higher quality of data due to enhanced monitoring of how policy is implemented. During the Madrid Focus Group, participants viewed developments such as eFTI as being 'pivotal' in establishing standards for data sharing and ensuring that digital platforms can align with broader national government and EU-level objectives. Whilst eFTI does not compel operators to share data electronically, it establishes a set of conditions for operators and competent authorities, for example[23]:

- Operators must use data processed on a certified eFTI platform, and if applicable a certified eFTI service provider.
- Make data available in machine-readable format via an authenticated and secure connection to the data source of an eFTI platform and make a link available to the data when inspection is requested.
- Present data in a human-readable format if requested.
- Authorities must accept electronic regulatory information made available by operators, accept waste shipment regulatory information, electronically access and process data provided by operators, and provide official validation electronically.

Relevant data flows for eFTI include those concerning cargo, and logistics and transportation related activities such as the tracking of shipments, customs checks, and regulatory compliance. As indicated by Chountalas et al (2023) key stakeholders within this system include:

- Freight forwarders and logistics providers responsible for moving goods between locations.
- Carriers that physically transport goods and who provide updates on the status of shipments.
- Customs and Border Protection Agencies who ensure compliance and clearance.
- Government agencies who set and enforce regulatory standards.
- Technology providers who develop the software and technologies that support the eFTI system.

Given the importance of incoming regulations around eFTI, the interviews with key informants discussed the impact of this legislation in detail. Participants offered largely positive views about the eFTI framework, suggesting that it will enable greater standardisation and simplification of the ecosystem surrounding the use of digital documents in transport and logistics. The framework was also seen as a means of enabling enhanced data exchange in the transport and logistics field, with these data potentially being used as a component of further activity in relation to capturing carbon emissions data, as well obtaining information about the transportation of goods:

[22] Source: https://transport.ec.europa.eu/transport-themes/logistics-and-multimodal-transport/efti-regulation_en?prefLang=it#:~:text=Key%20benefits&text=Instant%20sharing%20of%20data%20with,a%20more%20dependable%20supply%20chain.
[23] Source: https://eur-lex.europa.eu/EN/legal-content/summary/electronic-freight-transport-information.html

"This initiative is very ambitious and quite necessary and the whole interest and buzz around it proves it. So apart from implementing it, for exchanging free transport information, data between businesses and governments, there are already lots of discussions surrounding how this data can become the basis for other things as well, such as calculating CO2 emissions….So by reading the number plate, in relation to eFTI, you could already retrieve some information about what's travelling in the vehicle…Emergency services could read get the data from the vehicle and resolve situations concerning accidents as they will be aware if there is dangerous cargo [or not]" (Participant 5).

Moreover, the implementation of eFTI was expected to enable data sharing without one central entity controlling all of this data, such as the government of a Member State. As such data is still 'at source', it will also provide advantages in terms of establishing connections between the electronic freight data coming from operators and enforcement authorities (Participant 12). However, eFTI was widely regarded as a 'new area' for authorities as this will enable greater enforcement, through digital means, of B2G activity:

"To start with eFTI is a bit of a new area especially for [enforcement] authorities because it is about compliance checks by national authorities, and one of the reasons for that is that national inspections still require paper documents. So eFTI has now set a legal framework to enable the national inspections to have access to electronic freight information coming from economic operators. So from a B2G perspective, and as national inspections are going to be able to process electronic freight data, that's a bit new for national inspections" (Participant, 12).

Therefore, although eFTI was viewed as a positive intervention, in the sense that a legal framework was now being established to facilitate the exchange of documents, there remained concerns surrounding enforcement and the expertise of authorities in dealing with this form of inspection regime.

Whilst interview participants believe that the eFTI framework will enable improved standardisation within this space, they suggested it will do so though establishing minimum standards for platforms and creating a means of certification. However, they also suggested this does not prevent platforms from utilising additional tools as part of their operation. Furthermore, respondents noted how existing platforms (including transport and fleet management systems) can be utilised as part of the eFTI system, should they comply with the legal standards outlined by the EU. As such, it was noted that the e-CMR could also be connected to the eFTI framework to add further simplification for operators – for example, activity in the ADMIRAL Project[24] is seeking to develop an e-CMR tool which is compliant for eFTI (Participant 5). These comments indicated that eFTI should be regarded as a 'mega integrator' enabling further standardisation, but at the same time it should be considered as a 'part of the puzzle rather than the entire puzzle' (Participant 6).

Unlike with e-CMR, as this is an EU-led initiative, Member States must integrate this framework into their technical ecosystem as per the timetable of the legislation (Participant 1). As such, this may create challenges regarding variations in the rate of technical development between different EU nations (Participant 8) and the progress of establishing interventions such as 'eFTI Gates' (Participant 2). These processes are likely to need the involvement of a variety of national bodies, such as agencies operating primary road highway networks, to ensure that the relevant infrastructure is developed to meet this transition. Moreover, the complexity of establishing infrastructure to support eFTI, and the use of electronic documentation more broadly, may be influenced by factors such as a Member State's size and/or the nature of its legal structures. For example, Lithuania was seen as having a less complex structure in terms of policing when compared to other countries (e.g. Germany's federative state police system), which makes it more straightforward to engage this enforcement authority in the process:

[24] Source: https://www.admiral-project.eu/

"But what makes it easy is that we [Lithuania] are a small country, so all of our competent authorities are using [electronic documents] well. Most of them are using the same platform to log in. We already have some national platforms in place and for us it's much less of a challenge there compared to Germany who have 17" (Participant 5).

This is advantageous in terms of the pace of technical and legal development, enabling a potentially more rapid adoption of eFTI by operators. Participant 5 also noted how the police system in Lithuania was more centralised than other countries, which also supported an easier adoption for enforcement agencies as there are fewer bodies with which this technology needs to be disseminated.

The pace of transition was also discussed in the interviews – some participants believed that the timetable for implementation of eFTI was 'smart' as key institutions (such as customs authorities) would be obliged to utilise these systems, yet this would not overburden operators and businesses, particularly SMEs:

"Another good thing is that they [enforcement authorities] are quite smart with how they want to deploy it, making it first obligatory for their own institutions for example customs. So if a truck driver wants to provide data using eFTI they [enforcement authorities] need to be able to accept it. There is no obligation for eFTI platforms or the transport management systems [to be used by business] so that is quite a good and smart adoption cycle" (Participant 8).

In relation to future-proofing, Participant 8 noted that in the longer-term eFTI could be a mechanism to share 'different kinds of data' and enable better communication at the B2B level. Similarly, Participant 5 noted how eFTI would help to accelerate businesses in adopting electronic documents, whilst also providing an opportunity to 'add value' to organisational routines:

"Businesses will have to adopt at least one digital tool, and if they choose a platform that is also capable of calculating CO2, maybe it would be capable of routing. Maybe it would be capable of fleet management. So depending on what tool they choose, they might adopt multiple digitisation solutions at the same time, so it will be a not-so-gentle push towards digitising, even if they would have not done it on their own… I think that is critical for success…We have the opportunity to create something that brings a lot of additional value or can even be customised for certain groups of companies" (Participant 5).

Critically, a view expressed from the Madrid Focus Group was that regulatory interventions must be agile and dynamic, and thus able to keep pace with any technological advancements. As such, the nature of the eFTI regulations may need to evolve over time to capture the latest market and technological developments. Already, it was felt that these regulations alone are not yet sufficient to drive behavioural changes in relation to the use of digital documents:

"... it needs continuous work. There are so many aspects to it that I think we have only seen the beginning. And clearly, even if you have done something [create eFTI], we need to make the next version of it, I mean the first version is not good enough and we have already realised that, so this work will continue … We are here in our own corner of Europe building this kind of pre-emptive approach to the regulation" (Participant 2).

In summary, this section has identified the key European-level initiatives, focusing on the forthcoming introduction of the eFTI framework as well as discussing existing interventions such as EUCARIS and eIDAS. The introduction of eFTI framework is viewed positively by participants because it will enable the establishment of clearer guidelines surrounding the acceptance of digital documents and processes by authorities. However, eFTI alone will not resolve some of the existing legislative and technical challenges

surrounding digitalisation, and there are further concerns related to the capabilities of enforcement authorities in being able to provide an effective regime in terms of inspections.

3.2 National Rules and Regulatory Fragmentation

Alongside the presence of the international and European-level frameworks presented in Section 3.1 there are also national-level rules determining the usage of electronic documents in transport and logistics, which adds a further layer of complexity to digitalisation activity in this space. Therefore, the regulatory framework can be described currently as highly fragmented[25]. According to the European Commission this existing fragmentation occurs in two ways[26]:

- Fragmented legal frameworks result in setting inconsistent obligations for enforcement authorities surrounding the acceptance of electronic documents and enables different practices related to implementation.
- Fragmented IT environments which are shaped by a variety of non-interoperable systems for the transfer of electronic transport information and the exchange of documents in B2G and B2B contexts.

This fragmentation is viewed by the European Commission as 'mutually reinforcing'[27], as the legislative framework results in a lack of electronic document acceptance by authorities, which impacts investment in digital tools. Meanwhile fragmentation in the IT environment is driven by the vast array of potential digital solutions available, creating issues in both interoperability and trust for both B2G and B2B exchanges. Challenges within the current legal framework include divergence between national and European-level legislation, an absence of harmonised inspection requirements between Member States, differences between inspection requirements within Member States, and concerns surrounding legal acceptance of electronic documents by the courts[28]. For operators within the sector there were concerns expressed surrounding differences in legal frameworks and standards between Member States with a more developed IT infrastructure and those Member States which were yet to develop such an environment (Participant 8). Such differences could impact trust:

"If we have a core layer of trust that would be sufficient to implement [digitalisation] in other European states…But if a Dutch truck driver goes across the border, especially if it gets into Eastern Europe, for one it will be a little bit more difficult if you want to compare digital readiness to what we have in the Netherlands" (Participant 8).

Broadly, the discrepancy between different national regulations within Member States was viewed by stakeholders in Novara as a prominent concern. These differences generate both time and cost implications for operators, impacting the efficiency of transactions and the flow of goods throughout the Single Market. An example of these discrepancies was identified in terms of the frequency of checks that occur in some Member States compared to others – for example, the Netherlands was argued to have fewer inspections than some other Member States (Participant 11). Similarly, it was also argued that some Member States require different levels of data in relation to shipments, with some data contingent on business needs rather than regulatory demands:

[25]: Source: https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1
[26] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018PC0279
[27] Source: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018PC0279
[28] Source: https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1

"We only need eight-to-ten fields [completing] in e-CMR. The rest is on the businesses if they need it [to be completed] or not. If you talk to other organisations they say 'no, the e-CMR form as it is with twenty-five fields should be filled out in this way'. So we have different points of view on how to do this, and it makes it rather difficult in the end" (Participant 7).

Another challenge identified during discussions surrounding inspection regimes was a concern surrounding the rigour of some of these checks due to resource constraints, but data transparency was seen as a means of improving the efficiency of this process:

"If you look at it from an authority point of view, let's say customs, they can't manage that load [of freight]. You must have heard about Rotterdam and all those containers and how few they are actually able to deal with. That means a lot of stuff is not getting checked, and the resources are not at the level needed to sort this successfully…If you get the transparency in data there will be less need to stop the 'nice guys', and at the same time, those that need to be controlled will be controlled and resources well used" (Participant 2).

Inspections can also vary per transport mode with authorised checks occurring for enforcement of:

- Safety rules
- Fiscal rules
- Customs rules
- Environmental rules
- Security rules
- Rules related to working conditions
- Rules related to cabotage[29].

Given the breadth of these checks, a wide variety of authorities are involved the inspection process ranging from police through to customs and Transport Ministries. However, as there is no standardised approach between Member States and transport modes, this creates various challenges for operators. These challenges are apparent when dealing with multimodal transport as there is currently an absence of processes enabling effective data sharing between stakeholders involved in inspections:

"Once you start to talk about multimodality then then you don't have it in your hands anymore and I think that this is a big challenge not only for border crossing but for for logistics in general. There is not the kind of trust in place, or processes in place, which allow data sharing from one modality, or one sort of stakeholder, to another" (Participant 2).

As a result, operators may need to send or re-input data to multiple systems despite this information actually being the same:

"And ideally you want to have one standard message regardless of which country you're sending something, or to which system. Otherwise you need to have a translation, and then you need to send the the same data to different systems" (Participant 10).

[29] Source: [29] https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1

Alongside the specific conditions presented by multimodal transport, another key concern emerged relating to the lack of regulatory harmonisation across Member States. A specific issue was raised in relation to the calculation of cabotage:

"I think that is something that was underestimated because they need to harmonise to a degree that you could say we have the same control mechanisms all over Europe, [but] they might slightly differ due to different interpretations. For example, cabotage in Germany could mean you have one shipper or one sender. The sender and shipment might be different entities. Here you have one sender and you have one recipient. Then you can have different loading and unloading places. But that is not a common interpretation of counting cabotage in Europe, you have other countries, even in Britain for example, I think what you have is you're counting loading places and unloading places and then you take the smaller number" (Participant 6).

There were also variations in terms of standards, acceptance, trust, and verification procedures that can create confusion for operators. Whilst, for example, in relation to verification processes, operators are compelled to use 'their own device' to share documents in some nations but not others:

"I told him [a colleague from Lithuania], because he was under the impression that in Germany it wasn't possible to work with an e-CMR. I told him 'Yes, it is possible, the only thing is that you have to bring your own device'. So you can't expect our [German] authorities to have a device reading any QR code" (Participant 6).

Additionally, there were also further concerns relating to trust surrounding signatures and how electronic versions are verified:

"Why would I trust a digital record? It's like fake news isn't it? People have confidence in paper documents that are stamped and signed because it is what we are used to [like] paper money. But in the same way that we now trust digital money, we have to be able to trust the digital equivalent [for logistics]…So the trust framework needs to be there" (Participant 3).

Potentially, this raises questions over the legal basis of such documents and whether they could be used within court settings if required. Critically, the European Commission had already reported that in some Member States there remained a requirement for handwritten signatures, implying that all transport-related documentation must be completed via paper-based solutions. Conversely, in other Member States there were no such rules, but there was still an absence of a framework outlining the conditions of acceptance for digital documents[30].

Another key challenge concerning the implementation of eFTI, as well as the broader regulatory framework surrounding transport and logistics data, is the difficulty in devising a set of legislation and standards which are compatible across all 27 Member States. Evidence from the interviews suggested that within some Member States there are differences relating to the number of document copies and formats when compared with EU requirements and the approaches adopted in other Member States. These inconsistencies create challenges for operators as the differing standards can impact the acceptance of documentation and the usage of electronic platforms. Repeatedly, respondents returned to questions related to the standardisation of documentation and data flows as being a substantial blocker to digitalisation. For example, it was highlighted that there were a wide variety of legal standards governing information requirements, but a

[30] Source: https://op.europa.eu/en/publication-detail/-/publication/b187493e-0349-11e9-adde-01aa75ed71a1

shortage of legislation enabling the exchange of information thus impacting the ability of operators and enforcement agencies to share data:

"There are many laws and regulations with information requirements, but there is not as much legislation provided to enable economic operators and authorities to exchange information. Most of the technology [requirements] or the data model is not being set by the legislation itself" (Participant 12).

This impacts on standardisation, creating further uncertainties for operators in terms of utilising electronic documents, and these concerns are enhanced further by legislation largely being framed as 'technology and standard neutral' which opens usage to a wide variety of platforms and interpretations impacting interoperability.

The above issues reflected a broad concern surrounding the 'level playing field' which relates to both legal and technological standards. A level-playing field, as noted by SG2 of the DTLF, will encourage the development of an inclusive market, allowing SMEs to participate and, for common agreements on trust, standards and security to emerge (DTLF, 2023)

There is not a singular standard across Member States in relation to compliance checks, which adds complexity for operators and businesses seeking to utilise digital documents as part of their activities. Challenges related to the level playing field are further impacted by a perception that Member States are 'doing their own thing' (Participant 10) in establishing databases or systems for activities where, already, there are existing and operational EU-level equivalents. For instance, there is a widely utilised platform for animal and plant product certification, TRACES[31], which covers imports of animals, animal products, food and feed of non-animal origin, and plants into the EU. However, it was noted by one interviewee (Participant 10) that a project establishing a similar system for Belgium had been undertaken, effectively replicating the work of TRACES, with such investment regarded as being inefficient due to the presence of an already functioning EU-level platform.

Outside of issues at the EU and national levels, respondents also reflected on the broader international environment. For enforcement agencies, specifically those dealing with dangerous goods, the use of the CMR is the globally accepted standard, meaning that any European level intervention might be of limited use as other states outside of Europe can reject utilising this system:

"Our regulations [for dangerous goods] are set at the UN level. So China, USA, Canada they all have a say on it as well. So even if we developed [a digital tool] we couldn't actually use it [for all transport and freight]" (Participant 9).

Operators also felt that the EU system needed to be closely tied to global frameworks and systems as a means of enhancing standardisation of both technology and regulations:

"If you go to China, it's China that says what needs to be on the paperwork or what the documents are. If you go to UK, it's UK government saying it. Why would you want different systems to create that paperwork?" (Participant 10).

Another concern was how eFTI would impact other European countries who were not members of the EU, but were inside the EEA, or had a specific deal with the EU like the UK:

[31] Source: https://food.ec.europa.eu/horizontal-topics/traces_en

"What do we do with countries with external borders [to the EU]? What do we do with countries in the EEA like Norway? If they are not [EU] members, like the UK, but are still very good buddies do they have to adopt eFTI? So what do we do with their documents? How do we collaborate? Are they supposed to adopt the same solutions?" (Participant 5).

Alongside, the awareness of international standards, respondents also discussed some of the implications of Brexit, which have added further layers of complexity for operators in the UK and those in the EU who trade extensively with the UK. In this regard there were now issues in relation to customs, checks, and compliance which added cost and complexity to this process where previously there had been few issues:

"The big hit [of Brexit] has definitely been in the SME sector and then the food and livestock sector where legislation is more challenging and so we have, for example, lots of case studies of wholesalers and small meat and fruit and vegetable producers, etc. They cannot now serve the EU market because a pallet, or half a pallet, is just not viable anymore. And [it's the same for] lots of wholesalers and smaller retailers who wanted to bring a box of essential oils or tea tree oil and stuff like that. You cannot do it anymore because the cost of checking and certifying that package is just not viable" (Participant 3).

As reflected by Participant 3, the result of this added complexity was the decision for some firms to withdraw from supplying the EU market as they have been unable to cover the increased costs of UK-EU shipments. Additionally, for operators, frequent changes or delays to the proposed implementation of Brexit-related border checks from the UK Government were also problematic, leading to increased costs potentially reaching into the 'millions' for larger operators:

"Having to prepare, and then the rules of the game change as the game is being played, because people don't believe you [the UK Government] anymore. They keep on postponing everything and that's exactly what we have seen for the deadline [for physical inspections] … A lot of money has been spent by us as a company. We've spent millions and in the end that all needs to be paid by customers because you don't pay everything out of your pocket" (Participant 10).

New regulations at the EU-UK border have also placed greater strain on specific resources, such as veterinary checks of animals:

"We're heavily reliant on road transport in the UK because of our geography [and] that's going to be another hit later in the year. Then there is the implication of health certificates and the costs and the demand on resources like vets, etc. What's facing us in the next few months is going to be another kind of stepping stone for us. So I what I see from industry is Brexit has been very negative" (Participant 3).

To minimise complexity, the UK is developing its own Single Trade Window, as a means of simplifying the connections between businesses and the UK border[32]. For one participant, the impact of Brexit had encouraged an expansion of their digital activities:

"Since the very first day of Brexit [we have been] completely digitised. We're doing more than 1,000 [customs entries] per day…We have no paperwork anymore except for an emergency procedure when the Belgian customs system is down and it gets stamped" (Participant 10).

[32] Source: https://www.gov.uk/government/publications/overview-of-the-single-trade-window/introduction-to-the-single-trade-window#:~:text=The%20Single%20Trade%20Window%20will%20be%20introduced%20through%20a%20series,for%20public%20use%20in%202024.

Finally, there were concerns expressed by participants surrounding rules related to driver hours, which have diverged between the UK and EU since Brexit, as well as the availability of drivers. Divergence in this space poses further challenges for business as it adds further complexity, for example, in terms of the regulated time that drivers can spend within one jurisdiction:

"There is more change coming, particularly with the implications of people movement and borders which will affect drivers and cargo" (Participant 3).

In summary, this section of the report has identified that, alongside the international and European-level frameworks and interventions, there are also many challenges surrounding the alignment of national rules that govern transport and logistics activity. Discrepancies across these diverse national rules present another challenge for business and these issues sustain a perceived and real fragmentation regarding regulatory frameworks in the EU cross-border transport and logistics sector. As much of the legislation does not determine technologies or standards, this raises doubts surrounding the wider acceptance and adoption of electronic documentation across (and beyond) the EU. Whilst KEYSTONE is focused on an EU-level solution, participants also considered how Member States should engage with other countries who are *not* party to eFTI or other European-level interventions. Given the importance of cross-border trade, there needs be greater consideration of how the EU can connect with digitalisation developments in non-Member States, particularly those within the EEA like Norway. In relation to the UK, there were concerns surrounding Brexit arrangements, viewed as being particularly damaging for SMEs with fewer resources to mitigate the cost and impacts of new rules surrounding trade with the EU. For larger operators, Brexit did allow them to expand into new fields, particularly in terms of customs, in order to provide support for clients - but this still came at a substantial cost to those operators.

3.3 Technological Challenges

The current issues surrounding the legislative framework concerning digital documents have now been outlined. In Section 3.3, the Report identifies some of the key *technological challenges*, focusing on issues such as interoperability, adoption by SMEs, and cyber security and resilience.

3.3.1 IT Platforms and Interoperability

As implied during the discussion surrounding legislation, a key concern for stakeholders is that surrounding the technical elements of the digitalisation process, such as the wide variety of IT platforms and the problems this creates in terms of interoperability. Whilst D1.3 presents an overview of some of the key platforms active in the logistics space, interviewees to Task 1.2 highlighted a variety of systems used across the sector. Examples included Vedia[33], IOTA[34], USYNCRO[35], Gaia-X[36] and Project 44[37]. These platforms have relatively diverse functionalities, with some centred on the core activity of logistics and others, such as Gaia-X, focused on data spaces and data sharing. Additionally, it was noted by several participants that there are other platforms which exist for specific modes of transportation, adding a layer of complexity for multimodal shipments. As different modes of transport also have different requirements, in terms of data and

[33] Source: https://www.vedia.fi/
[34] Source: https://www.iota.org/
[35] Source: https://www.usyncro.com/en/
[36] Source: https://gaia-x.eu/
[37] Source: https://www.project44.com/

documentation, there were concerns surrounding enforcement and interoperability as these shipments will need to pass through multiple systems and databases. As such, platforms emerging around modality create a vast number of plausible solutions for operators and businesses:

"In logistics that there are so many platforms is a good indication that it is not so easy to monopolise. And there are thousands of players worldwide who together with the logistics industry need to find common ground which they mainly do, based on the means of transport … And so you you've got different communities and even within those different communities you have various platforms, and a platform in the logistics field can be anything. It can be a spot market for capacity, it can be a data platform, it can be a platform that wants to bring together traffic and weather information…So a platform cannot be properly defined" (Participant 6).

In some cases, the platforms used by operators were not commercially available due to specific functions being customised towards the specific needs of the business. For example, this customisation may refer to specific messages sent during the progress of a shipment which are designed by the operator to meet their purposes, however, other software that forms part of this platform is readily available:

"We have two custom software systems that we use, one in Europe, one in the UK. The whole logic behind the system, the whole triggering of messages, the follow up, that's completely bespoke, written in house and manages everything. But for the bulk of messages going into the community systems, messages going backwards and forwards, that's with available software that everybody can use in the market" (Participant 10).

For enforcement, one participant stated how a central government portal, in this case eAusweise in Austria, was used as a component of the policing activity in relation to compliance. This was made available to Austrian enforcement agencies through the Apple platform:

"In the last two legislation periods [the Austrian government] has decided to invest a lot of money in infrastructure for police officers so each of them has a smartphone. They only use the Apple platform, so it has to be an iPhone … They have a good communication to the Austrian 'backbone' which is the government portal [eAusweise]" (Participant 4).

As such, the policy response to the challenges posed by electronic documents was to expand provision of both hardware and software, but communication challenges were still noted between the "intersections of different authorities like customs and tax" (Participant 4). As such, it was argued that there needed to be greater "synchronising" of platforms and communication, connecting the "components that don't work well together" (Participant 8). Enhancing the connections between platforms was, however, seen as a significant challenge for enforcement authorities due to the variety of systems currently available. For B2B activities alone, one participant estimated that there were 400-500 possible platforms available in Austria (Participant 4), whilst other respondents believed that there were "hundreds" or even "thousands" of potential IT solutions available in this arena. These solutions ranged from those produced by small specialist firms through to systems being utilised by larger operators. As businesses and developers wish to make these systems distinct, and establish their own USP, it was argued by respondents that there is an absence of common standards in terms of IT architecture or data models:

"None of them [larger platform providers] are interested in having the same building blocks and IT architecture because they would lose their USP. They would be 'exchangeable' and nobody wants to be exchanged. The big five, for example IBM and SAP, are mighty enough that you can't force them to standardise or harmonise [their technologies]" (Participant 4).

Furthermore, the primacy of the major players in the sector creates issues in terms of standards being imposed through regulation, which limits the effectiveness that policymakers can have in this space. However, interviewees suggested that if these issues were not addressed then this would lead to 'functional islands' whereby individual firms and operators utilise their own solutions which are largely non-interoperable with other businesses and particularly enforcement authorities. One such example was highlighted regarding the e-CMR:

"There are different solutions and there are different standards, so they're not really interoperable, and there are many connections between players within the logistics chain. For one part of the chain you use e-CMR and for the other it is another solution, so it is quite difficult to use it [e-CMR] within the complete chain of parties [involved]" (Participant 12).

Another issue concerning platforms emerged in terms of different enforcement authorities utilising alternative systems, which posed further challenges related to interoperability and the implications for operators:

"So I don't quite understand. In Zeebrugge I am only 30 kilometres away from Netherlands but I have to use a completely different system [to Belgium]. Because I'm 30 kilometres further down South, why would you have to do that? Why not just one platform and the fact that you then use a private vet or a government vet?" (Participant 10).

In summary, as reflected with the e-CMR protocol, concerns around interoperability are a major factor in deterring businesses from utilising digital documents. Given the plethora of platforms available on the market, issues were raised surrounding how they would interact with national-level systems. However, for the major players in the platform market there was a sense that these organisations would be somewhat unwilling to accept standardisation requirements due to a belief that their 'USP' could be impacted. Larger operators were also better equipped to customise their platforms, utilising a combination of bespoke development with existing 'off the shelf' technologies. Finally, multimodal transport presented a particular challenge due to the use of different standards and systems, which would mean that operators are forced to input the same data to multiple databases, creating drawbacks in terms of efficiency. This, in addition to variances in national systems, was seen as a drawback for operators.

3.3.2 Technological Challenges for SMEs

A key concern expressed by a variety of respondents concerned the future development of the IT platform market with an expectation that larger players (developers, operators etc) will simply come to dominate the sector effectively forcing SMEs to adopt the same systems to secure business contracts. Whilst this view may contradict the perception that there are currently a high number of platforms available on the market, a suggestion was that some of the larger players may simply acquire smaller providers in what were phrased by one respondent as "aggressive acquisitions" (Participant 6). Regarding SMEs involved in the development of platforms there were concerns surrounding the cost of creating APIs, but the impact on SMEs also extends to operators and businesses involved in the logistics chain. Although reduced costs were believed to be a key advantage arising from eFTI, costs for platforms, as well as uncertainties surrounding the regulatory framework, were regarded as key blockers from an SME perspective. Different rates of technological progress were viewed as being particularly problematic:

"I would assume that if some countries are not ready then eFTI will not function. We cannot have half of Europe accepting digital data and then the other half of Europe being very surprised about what this QR code is supposed to mean. So for businesses it would be impossible to adapt" (Participant 5).

Alongside differences in technological standards between Member States, it was also highlighted that SMEs would face particular challenges related to resources when adopting digital systems:

"If you're a 'one man band', have you got time to do that [to engage with digital systems]? How much is it going to cost me to use a digital system? Who am I going to have to pay? And today I don't pay for e-mail so why should I pay again? So you're going to get challenges like that" (Participant 3).

Some respondents also noted that it was a 'big leap' for some members of the logistics community to go from "old style" operations to a new world of data sharing (Participant 11). Moreover, in relation to eFTI, there was a view suggesting that SMEs may face additional challenges related to accessing 'corridors'. Participant 5 noted that SMEs could utilise bodies such as trade associations as a means of pooling efforts to develop solutions, which would shift the sector towards a 'collaborative logistics' model and would enable, for example, firms to find appropriate digital transport and logistics IT service providers:

"Alternatively, there could be [trade] associations providing some solutions for their members…Another more research-orientated approach is collaborative logistics. Collaborating [can occur] with similar platforms used for brokerage or finding logistics providers. It can also be used for emissions reporting" (Participant 5).

In summary, SMEs specifically face substantial challenges in adopting digital documents and processes due to resource constraints. For these firms an unevenness in the progress of digitalisation across Member States is particularly impactful as they cannot afford to invest in solutions that are recognisable across multiple Member States. However, engaging in *collaborative* activity, particularly through trade associations or other groups, may encourage SMEs to expand their engagement with digitalisation in a more low-risk environment.

3.3.3 Data Exchange, Data Sharing, Cyber Security and KEYSTONE

Mechanisms surrounding 'data exchange' were highlighted by several respondents as being an area of concern. A key component of these debates centred on 'trust', and how this may impact firms from engaging in the digitalisation process. Whilst it was argued that some of the infrastructure to support digitalisation can be easily established, it was seen as critically important to ensure that appropriate cyber security and trust mechanisms were implemented. However, one enforcement authority's concerns around security and trust were largely viewed through a 'psychological' rather than technological lens:

"Already in the logistics world [sharing data] is something that's the last thing you do because if you share data then you potentially risk your contract with your customer because somebody else will run away with it and say 'look, I can do it cheaper'. So the psychological aspect is one which is potentially as important, or maybe even more, important than the technological aspect which fundamentally we can fix. Organisations like banks, we transfer money from one bank to the other. They've fixed that that aspect. So again for me it's not technology, but we need to focus also on the psychological aspects" (Participant 11).

In this sense there was a belief that the technology to establish trustworthy and secure data exchanges was readily available but the desire to engage in this activity was dependent on firms shifting their mindset away from an embedded 'protective' view.

As the logistics and transport sectors increasingly embrace digitalisation, the imperative to secure data sharing and exchange has never been more critical. With the proliferation of cyber threats, from sophisticated ransomware to intricate phishing schemes, feedback from most participants suggests that it is essential to implement robust cybersecurity measures to safeguard sensitive information crucial for the smooth operation of cross-border logistics.

A review of the literature and secondary data, along with insights from the qualitative data collection, shows that the significance of *cybersecurity* in this context cannot be overstated, and this section now offers key findings from these data sources regarding requirements that are relevant to the prospective KEYSTONE solution.

Cyberattacks not only threaten the integrity and confidentiality of data of relevance for enforcement authorities, but also disrupt the operations of logistics systems, potentially leading to significant financial losses and erosion of trust among stakeholders. Therefore, it is vital for the KEYSTONE solution to help embed strong cybersecurity practices into the digital transformation efforts in the logistics sector.

To ensure the resilience of data sharing and exchange systems against cyber threats, a cybersecurity strategy should be developed and implemented as part of the subsequent WPs which consider at least the following elements:

- Adopting advanced encryption standards is crucial. Data at rest should be secured using algorithms such as Advanced Encryption Standard (AES), which provides robust encryption and is widely acknowledged for its effectiveness. For data in transit, protocols such as Transport Layer Security (TLS) should be employed by WP3 to ensure that data remains encrypted and secure as it moves across networks, thereby protecting it from interception and tampering.

- Multi-Factor Authentication (MFA) adds an additional layer of security by requiring multiple forms of verification from users before access to data is granted. By implementing MFA, transport authority and logistics systems can mitigate the risk of unauthorised access, ensuring that only authenticated users can access sensitive information. This practice is particularly important in environments such as cross-border checks, where the potential for identity theft and data breaches is high.

Conducting periodic security assessments and compliance checks of the KEYSTONE solution should also be considered as part of the strategy. This helps to identify vulnerabilities within the system before they can be exploited by malicious actors. These audits ensure that the logistics network and its associated data handling practices adhere to the latest cybersecurity standards and best practices, maintaining a strong defence against potential cyber threats.

Although not necessarily embedded in the technological solution, KEYSTONE must accompany its technology with principles to be followed for the development of a comprehensive incident response plan. In the event of a cyber breach, having a well-defined incident response plan is essential. This plan should outline the immediate steps to be taken to mitigate damage, including how to isolate affected systems, inform stakeholders across the European transport and logistics network, and restore operations back to optimal conditions. A swift and effective response can significantly reduce the impact of cyberattacks on logistics operations.

The same applies to education and training. The KEYSTONE solution should aim to inform the European authorities with their efforts to develop and implement ongoing education and training programs for all stakeholders involved in the transport and logistics chain. These programmes should cover the recognition of cyber threats, adherence to security best practices, and the importance of cybersecurity measures. Educating personnel on the frontline of data handling can dramatically reduce the likelihood of breaches due to human error. Similarly, the proposed policies should inform third-party risk management efforts; given logistics chains often involve multiple third-party services, it is crucial to ensure that these external entities adhere to stringent cybersecurity standards. Assessing and monitoring the security measures of third-party

vendors helps prevent breaches that may originate from less secure systems integrated into the logistics network.

In addition to these specific measures, KEYSTONE should aim to highlight the importance of fostering a culture of cybersecurity awareness across the sector, as it will further reinforce the importance of protecting sensitive data. We would also advise all partners to participate in industry-wide cybersecurity initiatives and partnerships which can provide additional resources and intelligence, improving the impact of the KEYSTONE project in the European transport and logistics ecosystem.

By integrating these cybersecurity practices into the data sharing and exchange mechanisms of the logistics sector, KEYSTONE would help organisations throughout Europe not only protect themselves against current cyber threats but also prepare for future challenges in an increasingly interconnected world. This proactive approach to cybersecurity would ensure that the impact of KEYSTONE on the transport and logistics sector is underpinned by a secure and resilient technological infrastructure.

In summary, this section has examined some of the key the technological challenges that are likely to impact the design and deployment of the KEYSTONE solution across various European jurisdictions. Key issues highlighted include the integration complexities of disparate IT systems currently in use, the need for enhanced data interoperability, the specific challenges of digitalisation for SMEs, and the ongoing requirement to address cybersecurity threats. Additionally, and importantly, the section has discussed the legal and regulatory contexts and challenges in which those technological challenges reside, in particular the difficulties in scaling solutions to meet diverse regulatory and operational environments without compromising functionality or data security. These challenges underscore the necessity for a robust, adaptive framework that can meet the evolving demands of digital transport and logistics infrastructure.

4. Keystone Requirements

Participants were also asked to consider the nature of the KEYSTONE project and outline possible requirements for a 'solution' or tool which could be utilised to improve experiences surrounding the usage of digital documents and processes in the cross-border freight and logistics sector. These requirements are divided into two broad themes - 'regulation' and 'technology'.

4.1 Regulatory Requirements

Alongside the discussion of regulatory frameworks there were suggestions from respondents concerning how these interventions could be improved to address the key challenges surrounding the current fragmentation of the rules governing the use of electronic documents and processes. As reflected in the review of legislative frameworks in Sections 3.1 and 3.2, an overarching concern is that the current regime does not enable the exchange of data between enforcement authorities and businesses / operators. For example, the failure to specify technologies, standards or data models was seen as having a negative impact on standardisation:

"I am working at the moment on changing the 'Civil Code' with respect to the use of the electronic bill of lading in sea shipping, but it is not going to provide the standard that the electronic bill of lading needs, to be exchanged. It's technology and standard neutral. It's up to the industry to make use of different standards…That is different from the eFTI regulation that is being set by the Commission. To make use of electronic freight data you have to use that data model. But most of the time in legislation, it's just technology neutral and so that, and the standard itself, are not being set by legislation at the moment" (Participant 12).

eFTI may present an opportunity to address some of the concerns related to standardisation through providing the data model to facilitate exchange between businesses and authorities. This would establish a 'level playing field' surrounding the acceptance of digital documents, which should ultimately lead to increased business confidence in utilising these solutions.

As the eFTI proposals do not compel businesses to utilise digital documents in freight, there are concerns that some firms may continue to utilise paper-based alternatives, but it was also suggested that national governments must seek to incentivise firms, specifically SMEs, to transition towards a digitalised future in this space. Therefore, governments should seek to demonstrate the benefits of digitalisation to businesses through highlighting use cases and supporting pilot projects. Additionally, respondents felt that incentivisation would have greater effect in encouraging the adoption of digital documents when compared to measures that would penalise firms. Specifically, such criteria could be applied more broadly to data sharing with firms who engage in this behaviour, being enabled a take 'fast-track' route to gain efficiency advantages (e.g. regarding checks). A potential framework could also be connected to broader ESG goals:

"There could be a case with digital enforcement that whitelist [sic] [companies] start appearing. As a company by digitising, and making some of your data freely available, you can be whitelisted [sic] and maybe save time on some of the procedures. It's not necessarily just the stick of regulation, but maybe trying to help with efficiency [of businesses]. Also if you're a carbon saving company maybe you get extra points in public procurement or something of that sort [due to being] ranked higher in some green company rankings" (Participant 5)

Additionally, should pilot projects in this field be expanded, it was considered vitally important that central governments, the EU, and any other project sponsors must be willing to *utilise* the experiences and findings of this activity to change regulations or other relevant fields concerning technology:

"I saw many projects where they were very successful, and they go to the government and say 'it is a good use case'. But governments say 'sorry, we didn't participate in this game. We don't use it to make an analysis on legislation [and changes] that we need to adopt as a result…We're basically saying that to be able to produce an effective use case virtually every stakeholder has to be involved in some way'..." (Participant 1).

There was broad agreement surrounding the importance of government in shaping the digital transformation of the logistics sector, with national governments viewed as 'enablers' not only in the pursuit of harmonised standards, but also as drivers of reduced bureaucracy and increased incentives. In relation to the nature of the regulatory framework, it was highlighted in Section 3.2 that the responses generated in the Madrid Focus Group indicated that the legislative arrangements needed to be agile and able to take advantage of market and technological developments. As such, frameworks need to be responsive to the needs of business given that outdated and inflexible regulations can negatively affect innovation, leading to reductions in deployment of new technologies. In this sense, regulation is crucial in shaping the future of the sector as well as facilitating data exchanges at B2B and B2G levels. Crucially, regulations must also address enduring challenges concerning interoperability, security, and cybersecurity as well as connecting digitalisation to broader EU policy goals.

Amongst the respondents involved, debates surrounding the standardisation of technologies and data exchanges within logistics were extensive. A potential solution to these issues, and one which may span both regulatory and technological realms, concerned the standardisation of data models and the creation of a European mobility 'data space'. The benefit of such a space would be to enable all the various initiatives and projects from across Europe to share a forum for collaboration, and also shift the emphasis away from 'platforms', as well as provide opportunities for SMEs to be protected as a key part of the sector:

"They [large corporates] want all data from small and medium enterprises. But the bottom line is that as a transport company in logistics you're asked to drive from A to B, you know the distance, truck cost etc. So this is your tariff….[If you don't want to do it] There is somebody else in this territory [who will] so you get margin erosion, no added value, threats to the logistics industry…Hence we are investing, not in supporting platforms, but creating data spaces where SMEs and service providers can translate their, sometimes, old fashioned data models into a model and communication that fits into a data space" (Participant 11).

Respondents agreed that governments have a crucial role in helping to establish such data spaces and encouraging greater standardisation across the logistics sphere, and that it also has a prominent role in ensuring improved digital literacy for individuals involved in the logistics chain, such as truck drivers, and educational or developmental activities for other relevant stakeholders involved in this process. This activity may relate to ensuring that training is provided, which enables individuals to engage effectively with new technologies and systems, reducing the resistance to change in this process. In Austria, it was noted that the national government already has a dedicated logistics unit within the Ministry for Transport, which aims to promote the importance of logistics as well as design education and training material to support a transition towards digitalisation. Moreover, in relation to UK-EU trade, there was a desire to simplify some of the new regulatory interventions imposed post-Brexit, principally due to concerns surrounding costs and market access particularly for SMEs. This will require input from both the UK and EU as the current framework was particularly challenging for SMEs and others without access to substantial resources.

In summary, this section has provided an analysis of the regulatory requirements to be considered by the design, deployment and operation of the KEYSTONE solution within the European transport and logistics legal frameworks. It highlights the complexity of navigating through diverse regulatory landscapes across different EU member states, emphasising the need for solutions that are flexible enough to adapt to varying legal standards and protocols while ensuring compliance with essential regulations (including cyber and

security, e.g. GDPR). The section also underscores the importance of aligning new technologies with these regulatory frameworks to facilitate smooth and lawful operations.

4.2 Technological and Data Requirements

As noted in Section 3.3.1 there are a variety of IT platforms available in the transport and logistics arena, creating interoperability challenges and complexity for businesses and operators. There was also an expectation that larger firms will come to dominate the market, with smaller clients/businesses forced to follow the lead of larger businesses and operators to secure commercial contracts. Given these circumstances some interviewees felt that the development of 'another digital tool' was not required, and the KEYSTONE project may have a more effective impact by focusing on alternative interventions around standardisation across the transport, technology and regulatory spheres, and/or incentivisation initiatives. In this sense Participant 12 suggested that a key area of focus needed to be that of data sharing, specifically in terms of sharing and access requirements when dealing with different standards, systems, models, and mapping. This was characterised as ensuring that data is shared in a 'federated way' and that connections between different stakeholders are established:

"We [need to] have a different look into how we share data with each other, in a federated way, where everybody has their own data at the source, and you give access to it, instead of sending it to a lot of different parties with different systems, standards, data models, and data mapping needed for that. So that makes It a bit complex, but it is not a greenfield anymore with lots of legacy systems already in place and that makes it also a bit more, a bit more difficult" (Participant 12).

Additionally, focussing on federated data sharing was seen as a potential mechanism to ensure that SMEs were protected and supporting during the digital transition:

"We don't want to deal with platforms, like Google and Facebook, who monetise our data. We want an environment, 'data spaces', where federated data sharing is where everybody can monetise his or her own data. So that's the whole data strategy. We're very much investing into federative data sharing. We [the wider environment] don't, in logistics terms, protect our small and medium enterprises. That's one of the core aspects [we want to address] as we see these platforms like Desktop and Project 44 etc as a threat from that perspective because basically what they do is work with big corporations like Philips [as opposed to SMEs] " (Participant 11).

Outside of the discussions surrounding data sharing, another perspective emerging from the data collection process centred on the development of a digital tool to support the usage of electronic documentation, centred on 'thematic' areas related to transport mode or a specific function of the logistics chain (e.g. those supporting road transport, inland waterways, insurance etc.). These different solutions, potentially connected to the broader eFTI system, could help to create a 'playground' which will help to encourage SMEs and other business to expand their engagement with digital documents. Whilst this increases the number of platforms available, connections to the eFTI system should enable interoperability and encourage adoption.

"Every business is an island. It's a lot of work creating those APIs, but that's currently what's done. If you have a standard platform then of course you don't need APIs, then everybody would work on that platform…I want to have this one App where all the truck drivers, all the shippers, and all the parties involved look at the same version and can follow the shipment and the entire process" (Participant 6).

Focusing on interoperability, participants suggested that the KEYSTONE solution needed to have a 'bottom-up' approach, enabling the connection of key architecture and digital islands to ensure better connectivity

and interoperability, whilst ensuring trust through data protection mechanisms. Returning to SMEs, the solution would need to be suitable for those firms who do not have access to the same level of technological and financial resources as larger operators. Thus, any technological solution must be user friendly and not involve the requirement for extensive investment in new infrastructure which might be unaffordable for smaller operators and businesses. Crucially, throughout KEYSTONE, it was seen as important that the needs, and challenges, of business are fully understood. This may relate to the impact of digitalisation on organisational routines as well as broader concerns related to costs:

"We have an enormous amount of very small companies [in the EU]. So, for them, adopting any digital solution might be expensive and they won't have the necessary resources. So for those micro companies, typically with one person or a few people owning their truck and fulfilling orders, we will really have to think how to provide them some easy access, or easy subscriptions, to tools with basic functionality so that it wouldn't be an additional burden for them. They might not need 90% of the functionality that would be very relevant to a large business…So how to digitise these small companies? How to not scare them? How to keep them in business and not create additional costs and problems? So many people are employed in this sector, so we definitely do not want to lose workplaces" (Participant 5).

For those who believed a form of mobile- or web-based application would be a useful intervention, a set of requirements were outlined. As stated in the Novara roundtable there was a belief that technological integration was critically important in shaping the advancement of logistics systems, such as encouraging the adoption of advanced tracking technologies and automated data management tools. But these technologies need to 'flexible and scalable' in order to adapt to the needs of all parts of the sector and could be a component of the solution offered in KEYSTONE. Alongside tracking and data management, capturing the following information was considered as extremely beneficial for the KEYSTONE solution:

- Qualifications of Drivers (Including the ability to verify these)
- Transport unit (e.g. vehicle type)
- Inspections (e.g. when did they take place)
- Tracking Governance (Who is responsible)
- Tracking Technologies (Real-Time)
- Route / Destination.

These data were seen as important from both a business and enforcement perspective. Critically, having a form of 'status tracking' was regarded as vitally important as this would inform businesses as to the progress of their shipment, ideally in real-time. These data could be monitored via a dashboard, which would alert businesses as to the progress of their shipment, and whether certificates or clearances have been obtained. For example, a possible intervention in the field of dangerous goods was highlighted as being extremely beneficial in terms of chasing issues around compliance:

"But for dangerous goods there has been work about having these [documents] all hosted on an external server somewhere that lots of other that countries can access from there. So various nations can see exactly, at a particular time, what's being transported, [or] if that person was to be pulled over. I don't think there's been any real thought into tracking dangerous goods movements, which would be a good thing. From our perspective, it'd also be a good to see where [there] are any hotspots, for instance, incidents involving dangerous goods, [and] where [there are] any hotspots for non-compliance" (Participant 9).

Such information could also be accessed by enforcement authorities, as well as other entities involved in ensuring the shipment reaches its intended destination and can be widened to all forms of goods. For some participants the ability to ensure real-time information was highlighted as being extremely important, as some

specific systems and databases, such as the IPAFFS system in the UK, only offer 'static' tracking and as a result do not provide a 'live' version of shipment progress. This was viewed as not only being harmful for operators, but also having implications for enforcement:

"The UK decided to develop everything on the IPAFFS system and you need to upload all the documents, but it defeats the purpose because it's quite static. The vehicle is arriving, here are the details, [but] you have no view on anything before or after this. You have no view on any breaches, temperature controls. To me health identification and customs is about compliance. If something happens, how do we contain the problem and how do we resolve it as quickly as possible?" (Participant 10).

A potential solution outlined was to establish a system similar to Amazon in that users of an IT platform will be able to access this in a very simplistic way that does not even require the downloading of an application or a subscription fee. This would allow web-based alternatives to be utilised, and for operators to avoid having to purchase nodes or servers to store data. Moreover, such a platform would involve a free-to-use 'front-end' which would simply allow an operator to scan relevant documents on their phone before they are sent to enforcement authorities or those involved in the next stage of the shipment process, following an optical character recognition process. This approach would also need to allow seamless integration of platforms and systems, enabling firms to build APIs that can capture data on invoicing, packing lists, transport plans etc. This was seen as being particularly beneficial for larger firms and highlighted how platforms can cater for different firms based upon financial capability and size:

"My analogy would be Amazon. It takes me two minutes to sign up to Amazon, I've got my name, address and my credit card in and I'm done. Then I'm buying and it comes the next day because [it's a] staggering service…You haven't had to download an app. You can do it on the web. You haven't had to pay Amazon a subscription fee for data storage, and you haven't had to create a node or buy a server. You've done nothing. So something Amazon-like, particularly for SMEs, is really fundamental. And we're playing with the idea of a very simplistic, free-to-use front end [that] would allow an SME to scan their invoice on the phone. If it's done, it's loaded, it's there, and then it can be sent to my broker, or they are allowed to see it, and the freight forwarder can see it. Simple as that, it's scanned, digitised and it's on [the system]. It's on there, they won't even know it's on there. So I think that would be phenomenal for the SMEs" (Participant 3).

"Then for the larger organisations, well they want to be able to build via APIs and [have] the ability to integrate seamlessly from their ERP systems into a platform like this. What they don't want is another system to sign onto and maintain a log-in…They [larger firms] have already predominantly digitised…What they want [is the ability] to take documents, the invoice, the packing list and commodity details and to start planning the journey and creating the paperwork and declarations. Then the digital platform just needs to be able to take that off my system, and I can build an API because I am a reasonably-sized company. I will build an API that says every time a new job is created new data will be pulled down onto the digital platform. So the invoice, packing list, transport plan etc." (Participant 3).

Outside of these data points, another suggestion relating to a potential tool or solution was having a means of translation for data. This would allow (e.g.) an App to translate data sets into the correct language and format for each Member State. Furthermore, in instances where the same data must be submitted across multiple systems and databases, it was suggested that utilising centralised databases and systems was seen as advantageous because it avoids scenarios whereby operators are asked to re-input the same data into numerous databases or IT platforms:

"But one solution could be an overarching app platform that connects everything and when you input [your data] it translates it back to the correct data set going to the relevant country. So, for example, if I raise a

document over here in Belgium, how do I get it into the UK? How can I with one blink of an eye see the status of my orders? Have I received my certificates, but they haven't been uploaded? On the other hand, has it been approved and is everything happening? Basically [there are] interfacing possibilities in there and an overview, and a dashboard, that shows clearly where we are status wise. And I presume this is what Single Trade Window in the UK [aims to achieve]. That's what they want to achieve in connecting different government [functions] to one single platform and also what Europe wants to achieve [with its version]" (Participant 10).

All stakeholders reflected the importance of cyber security and trust within the KEYSTONE solution. A key message from several participants centred on the importance of protecting sensitive data surrounding contracts and shipments, with a desire for protocols and measures to be implemented which reduced vulnerabilities and risk of data breaches. From the Novara roundtable participants agreed that 'robust' measures were required to protect sensitive data, which included the implementation of advanced security protocols and encryption methods. Likewise, the requirement for 'digital enforcement' was considered vital, in relation to the likely impact of the KEYSTONE solution being formally assessed prior to its completion and release. Specifically, this concerned the sharing of data and the impact of this data on business behaviour and positioning. Such checks were seen as being important in building business confidence and encouraging firms who may be unsure of sharing data to expand their involvement in this space:

"[It is important] to understand business needs and how they like to minimise risks in sharing data. So what happens if a lot of your data is out there? How will you [your business] be impacted by automation? How might your company look compared to others? The same data could, or could be not, harmful to business…So for your project [KEYSTONE], focusing on digital enforcement [is important]. It needs to understand what the impact of the solution you release into the world will have, for different types of companies and how they will have to adjust their behaviour" (Participant 5).

In summary, this section has discussed the technological and data requirements essential for the successful implementation and operation of the prospective KEYSTONE solution. It outlines the critical technical capabilities that must be developed, including advanced data analytics, robust cybersecurity measures, and seamless system interoperability. The section emphasised the importance of creating scalable and flexible systems that can adapt to varying technological landscapes and diverse trajectories of development across different parts of Europe, ensuring that the KEYSTONE solution aims to effectively meet the diverse needs of all stakeholders involved in the transport and logistics sectors.

5. Conclusions

This report represents the completion of Task 1.2 "Generate and prioritise KEYSTONE's requirements". Task 1.2 is an essential part of Work Package 1 (Gap Analysis and State of the Art), dedicated to identifying, mapping and analysing stakeholders' expectations, and defining the requirements for the KEYSTONE solution.

The methodology implemented in Task 1.2 involved a literature / documentation review of existing secondary data, a focus group, a round table and 13 semi-structured interviews. It covered expertise across different socio-economic environments in Europe and the UK, and engaged a wide range of stakeholders including transport operators, ports / terminals, enforcement authorities and wider regulatory bodies. The discussions within the focus group, roundtable and interviewes were structured around bespoke questionnaires and tailored stimulus material, designed to probe deeply into stakeholders' needs.

The data collected has provided invaluable insights into the current 'state of the art' in digitalised transport systems across Europe, and identified critical gaps that the KEYSTONE solution must address. The dialogues highlighted the complexity of the existing regulatory frameworks and underscored the necessity for enhanced cooperation between member states to facilitate smoother cross-border transport and logistics operations. Stakeholders pointed out the urgent need for standardisation of digital tools that could ensure compliance and facilitate seamless data exchanges across borders and stakeholders.

The results of Task 1.2 have provided a notion of existing solutions that have also informed the work of Task 1.3. An analysis of the functionalities that the KEYSTONE platform should offer has also been included in the report. This inventory serves as a foundational element for ongoing development of the KEYSTONE solution, with reference to specific functionalities that could simplify complex digital processes and enhance the provision of digital information required for effective control activities by enforcement authorities across Europe.

Furthermore, participants highlighted the importance of designing a solution that aligns with the real-world operational challenges and regulatory landscapes faced by stakeholders, not just adding to the plethora of platforms that already exist. This alignment is crucial for ensuring the adoption and effective implementation of the KEYSTONE solution. Participants emphasised the need for a solution that is not only technologically advanced but also user-friendly, catering to the needs of a diverse user base including SMEs which may not have the technical prowess of larger corporations.

In conclusion, the insights derived from the all the data collection and analysis activity under Task 1.2 aim to guide the development of the KEYSTONE solution to ensure it is robust, user-centric and capable of supporting the on-going digital transformation of the European transport and logistics sector. Task 1.2 will assist the KEYSTONE solution in its aim to establish smart, resilient enforcement systems that enhance the security, efficiency and sustainability of transport operations across Europe. The ongoing collaboration of the WP1 team with other WPs within the KEYSTONE Consortium and their continuous engagement with stakeholders are pivotal in designing, implementing and refining these solutions, ensuring they meet the evolving needs of the transport ecosystem and contribute effectively to its digitalisation.

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Annex 1 – Survey update (Task 1.1)

This annex is aimed at updating the analysis of the survey that has been designed and implemented in Task T1.1, see Deliverable 1.1[38]. After a first data collection period (from 13th of September to 14th of November 2023) the survey has been promoted and distributed until the 24th April 2024 in order to collect more answers and to broaden the geographical representativeness of the stakeholders. So, this annex provides a final analysis of the survey by highlighting any gap compared with what has been published in Deliverable 1.1.

General statistics

Overall the data collection lasted about 7 months, from 13th of September to 24th April 2024. The number of stakeholders who answered the survey is 309. Among these stakeholders, 127 of them completed the survey entirely.

In the first data collection period (13th of September to 14th of November 2023) the survey was filled out by 203 respondents. 91 of them have completed the survey. In the second data collection period (15th November 2023 to 20th April 2024) 106 new stakeholders filled out the survey and 36 of them completed it. The process of filling out the survey in the second data collection period is quite "flat". The distribution of completed answers collected per day is reported in Figure 1.

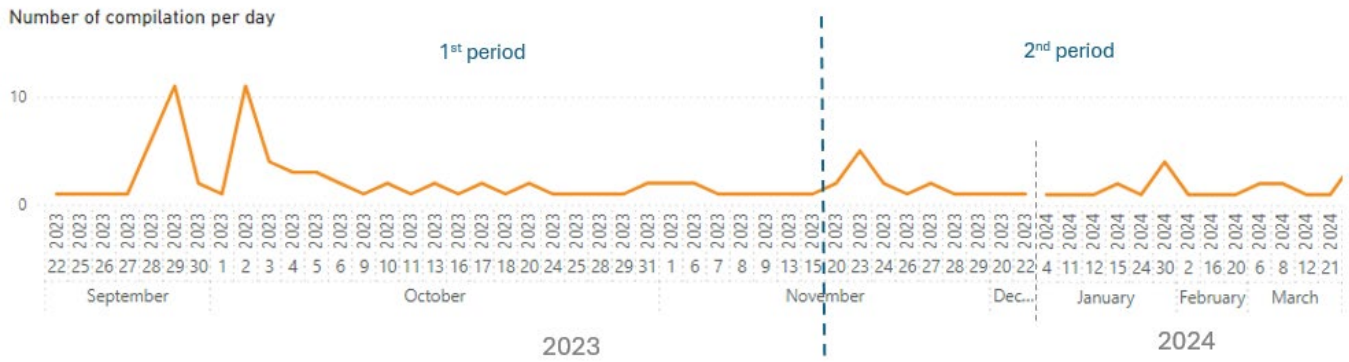

Figure 1 Number of compilations per day.

Similarly to Deliverable 1.1, to properly identify, gather and interpret the needs of stakeholders, the analysis has been focused on those participants who have completed the survey, namely 127. Anyway, the answers that have been excluded from analysis do not deviate from the final remarks.

Table 1 shows the number of completed compilations for each target groups and for each data collection period. Overall, the survey collected 81 answers from logistic operators, 10 form freight terminals and 36 from enforcement authorities.

Table 3. Number of respondents for each target group

[38] "Stakeholders' identification and needs" (https://www.keystone-project.com/deliverables)

Target group	N° of completed compilation - 1st data collection period	N° of completed compilation - 2nd data collection period	Total completed compilation
Logistic operators	58	23	**81**
Freight terminals	7	3	**10**
Enforcement authorities	26	10	**36**

In addition to increasing the number of stakeholders, the second data collection period was aimed at expanding the geographical representativeness of the answers. The purpose was to collect information from most European countries, especially from those ones that play a relevant role in the European logistic sector. Table 2 displays and reports, for each target group, those countries the answers have been collected from.

Table 4. Geographical representativeness of data

Target group	European map after 1st data collection period	European map after 2nd data collection period	EU countries reached
Logistic operators			Austria Belgium Denmark Estonia Finland France Germany Greece Italy Netherlands Portugal Romania Slovakia Spain Switzerland UK
Freight terminals			France Germany Greece Italy Spain

Enforcement authorities			Belgium Croatia Cyprus France Germany Greece Hungary Ireland Italy Lithuania Malta Netherlands Poland Portugal Romania Slovenia Spain Sweden Switzerland UK

Overall, after the 2nd data collection period, the geographical representativeness improved considerably for all the three target groups, namely freight terminals, logistic operators, and enforcement authorities. For these groups, answers were provided respectively from 5, 16 and 20 countries. For all the target groups the main Central European countries (Spain, France, Germany, Italy) have been included in the survey, thus ensuring the collection of needs and requirements from the most relevant actors in logistic sector.

Profiling analysis of the target groups

This section provides an overview of the main characteristics of the stakeholders of the three target groups.

Logistic operators
This target group includes 81 logistic operators, transport companies and users located in 16 different European Countries (Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Italy, Netherlands, Portugal, Romania, Slovakia, Spain, Switzerland, UK). 60% of them carry out international transport.

Freight terminals
This target group includes 10 freight terminals, located in 5 different European countries (France, Germany, Greece, Italy, Spain). 80% of them carry out international transport. The intermodal transport performed are road-air, road-rail, road-sea, and road-rail-sea, as detailed in Table 3.

Table 5. Freight terminals: type of multimodal transport

Multimodal transport	Number of terminals	Countries
Road + rail	3	France, Germany, Italy
Road + air	2	Italy
Road + rail + sea	2	Italy
Road + sea	1	Spain

Air	1	Italy
Road	1	Greece

Enforcement authorities

This target group collects 36 enforcement authorities, located in 20 different European countries (Belgium, Croatia, Cyprus, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, UK). In this group are included several types of enforcement authorities: ministry, public authorities (e.g. seaport authorities), road police, and customs. Other association such as the federal office responsible for drafting road traffic legislation, the authorities designated by the Italian Transport Ministry to performs checks on road and rail about all goods (including waste and dangerous goods) and user associations are also included.

Comparing with the first data collection period, an higher representativeness of road police authorities has been achieved. The number of road police interviewed increased from 2 to 8 as well as the number of countries included (new responses from Belgium, Germany, Netherlands, Poland).

Table 4 displays the number of answers grouped by authoritiy type and the corresponding countries of headquarters.

Table 6. Enforcement authorities: responses collected per authority type and corresponding countries.

Authority type	Number of answers	Countries
Ministry	12	Spain, Romania, Slovenia, United Kingdom, Netherlands, Hungary, Cyprus, Croatia
Public authority (e.g. seaport authority)	9	Sweden, Spain, Malta, Italy, Ireland, Portugal
Road police	8	Spain, Lithuania, Belgium, Germany, Netherlands, Poland
Other	4	Spain, Italy, Switzerland, Greece
Customs	3	Italy, Slovenia, France

The main rules enforced by respondents are driving/rest times, cabotage, roadworthiness, weights and dimensions, ADR, posting of workers, as shown in Figure 2.

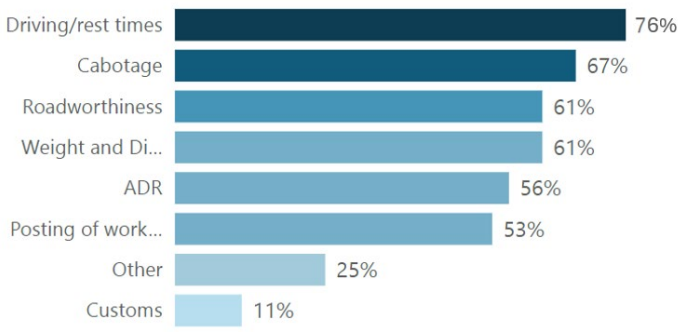

Figure 2 Enforcement authorities: rules enforced.

Analysis of data collected and main insights.

This section updates the analysis reported *in chapters 3.4.2, 3.4.3 and 3.4.4 of Deliverable 1.1* about data and technology role, data sharing between authorities and logistic actors, national and EU tools used for data exchange and data needs. By comparison with the insights provided in D1.1, a final outcome is here reported.

Logistic operators

Data and technology role
As described in *chapter 3.4.2.2 of Deliverable 1.1,* the analysis of the answers confirms the pivotal role played by technology in improving and enhancing compliance checks. 25% of respondents think that, in addition to digital transformation, other aspects should be considered. These respondents believe that it is important to improve the organization of the border infrastructure by staffing it with more customs officers. Other respondents think that saving the soil is a priority. This can be achieved by optimizing the information systems and the interconnected network to relieve road transportation of both good and passengers.
Efforts should also be made on the creation of the conditions for perfect interoperability between all modes of transport, such as documentation, safety systems, access conditions, standardized use of the same language. In addition to the aspects published in Deliverable 1.1, further barriers can be reported: the complex legislation, the cooperation between member states, the geo-political context (e.g., non-EU borders, Brexit, uncertainty of regulations, different languages), and the type of shipping (dangerous or perishable goods, project cargo).

Data sharing with authorities
The analysis confirms the insights of chapter *3.4.2.3 of Deliverable 1.1*. Most of the logistic operators interviewed (60%) shares data with at least one enforcement authority, especially with customs (72% of cases) and port authorities (44%). The analysis also confirms the reasons for not sharing data (lack of suitable digital tools, the lack of trust and legal security and no obligation to share data) as well as the main kind of data shared (cargo, vehicle, driver, and operation) and the tool used.

Data sharing with other actors
The analysis confirms the trend of data sharing with other actors described in *chapter 3.4.2.4 of Deliverable 1.1*. To recap, 50% of respondents share data with other actors and half of them exchange information automatically by digital and integrated platforms. 25% of respondents do not share data but it is interested in exploring this chance while the last 25% of respondents is not interested in sharing data, due to confidentiality, competition reasons and lack of trust. The main kind of data shared is validated (cargo, vehicle, and drivers) as well as the tools used.

Data needs
The analysis confirms that about 60% of respondents need further data for improving their productivity and efficiency, as described in *chapter 3.4.2.5 of Deliverable 1.1*.
In addition to data already listed in Deliverable 1.1, respondents would like to have further data about port waiting times, terminal congestion, loading and unloading windows at the terminal, and customs inspections and authorizations.

EU platforms
The insights described in *chapter 3.4.2.6 of Deliverable 1.1* about the usage of EU platforms are here confirmed: only 15% of respondents have exchanged information with the EU platforms at least once and the most used platforms are IMI and eFTI platforms. These EU platforms are integrated with the national platform only in half of these cases.

Freight Terminals

Data and technology role
The analysis confirms the pivotal role played by technology in improving and enhancing compliance checks (90% of respondents). Unlike the data collected in the first phase and described *in chapter 3.4.3.2 of Deliverable 1.1*, 10% of respondents claim that, in addition to technology transformation, multimodal transport must be encouraged, especially for land transport.

Data sharing with authorities
The analysis confirms the insights described in *chapter 3.4.3.3 of Deliverable 1.1*: 60% of freight terminals share data with authorities and the main barrier is the lack of suitable tools and platforms. In some cases, the sharing of data is carried out directly by the terminal's customers or shipping companies. The analysis also confirms the main kind of data shared: cargo, vehicle, and operation.

Data sharing with other actors
The analysis confirms the results of *chapter 3.4.3.4 of Deliverable 1.1* as regards data sharing with other actors: 50% of freight terminals shares data automatically by digital platforms, 20% shares data manually and 30% does not share data with other actors. The main kind of data exchanged is about cargo, transport status, vehicle, and yard situation.
As regards the digital tools, the Hupac[39] suite (WOLF, GOAL, EDIGES) is added to the list of tools already listed in Deliverables 1.1.

Data needs
The analysis confirms that 70% of freight terminals interviewed need more data to improve their productivity and efficiency. In addition to the data already listed in *chapter 3.4.3.5 of Deliverable 1.1*, terminals need data about digital documents for ADR (Accord Dangereuses Route).

EU platforms
The analysis confirms that none of the terminals interviewed has never exchanged information with the European platform designed to facilitate cross-border compliance checks (ERRU, IMI, TACHOnet, Resper and eFTI platforms), as already highlighted in *chapter 3.4.3.6 of Deliverable 1.1*.

Enforcement Authorities

Data and technology role
The analysis confirms (88% of respondents agrees on) that data and technology play a pivotal role in improving and enhancing compliance checks. The remaining respondents believe that there are other aspects to be considered, especially administrative and organizational aspects, as already reported in *chapter 3.4.4.2. of Deliverable 1.1*.
Furthermore, other respondents believe that effective enforcement is highly dependent on the practices of enforcement authorities and the means at their disposal. The increasing complexity of the legal bases for enforcement is a particular problem for the road haulage sector.

Data needs
The analysis confirms (88% of respondents agree on) that authorities would need further data, currently not shared from the stakeholders, to improve the checks.
In addition to data listed *in chapter 3.4.4.3 of Deliverable 1.1*, enforcement authorities would need data about the loading/leaving time stamped on CMR documents, data about goods imported or exported which can be used for risk based inspection thus reducing inspection time for customs, data about LSP (Logistic Service

[39] https://www.hupac.com/IT/Home-37901b00

Provider) and shippers, data about planned driver stops and the travelled distance (for carbon footprint calculation).

Current platforms

In addition to the platforms already listed *in chapter 3.4.4.4 of Deliverable 1.1*, the enforcement authorities interviewed declare to use Octet[40] and DSRC-RP[41] for analysing tachograph data during road checks.
Digital infrastructure and ecosystems of ports are also used: Portbase[42] in the Netherland and the Logistic Single Window JUL[43] in Portugal. Another platform used is TRAZA [44]application, a tool that allows you to present all the necessary documents to carry out procedures related to special traffic authorizations defined by the General Directorate of Traffic. These procedures are necessary for "exceptional transport", namely that type of road transport of goods that exceeds the limits of shape, mass or safety dictated by the highway code. Some enforcement authorities also rely on Eucaris[45] (European Car and Driving License Information System), a European platform to promote the exchange of vehicle and driving license information among its member nations to combat international vehicle crime and driving license tourism.
The analysis confirms (88% of respondents agrees on) that these platforms should be improved and enhanced, mainly by integrating new data sources. In addition to the data already listed *in chapter 3.4.4.4 of Deliverable 1.1*, enforcement authorities ask for the integration of new data sources such as data about cross-borders, tachograph card register for the field control tasks (e.g. direct access to TACHOnet), EU wide PTI (Periodic Technical Inspection) database to verify the validity of PTI during roadside checks of vehicles, geolocation of the transport vehicle during its journey from origin to destination, documentation about dangerous goods and waste networked across EU and data about the National Registry of Resident population (e.g. for Italy ANPR[46]).

EU platforms

The analysis confirms the insights described *in chapter 3.4.4.5 of Deliverable 1.1*: about the 70% of respondents declares to use one or more of the EU platforms developed for carrying out controls, about the 20% does not even know these platforms and the 10% does not use them even though they know them.
The most used EU platforms are TACHOnet, IMI and ERRU and the best way to improve these platforms is to integrate them into a unique platform and to improve the EU platforms' accessibility.

Conclusions

This annex provides an updated analysis of the survey presented in Deliverable D1.1. From 13th of September to 24th April 2024, the survey has been filled out by 309 stakeholders (127 of them have completed the survey) from 20 European countries. As relevant information has been shared and validated by several European logistic actors, the geographical representativeness of the survey is good. So, a reliable and accurate analysis of needs, requirements and expectations can be documented.
The extended data collection period has allowed us to enrich information about the existing barriers in the logistic field, the data needs and the tools and platforms currently used. According to the main topics of the survey, the analysis confirms the insights already discussed in D1.1. Almost all respondents agree that data and technology play a pivotal role in improving and enhancing compliance checks. According to the survey responses, the lack of suitable digital tools for sharing data is one of the main barriers and no unique platforms (national and/or international) exist. The EU platforms are not yet widely used and have some limitations such as poor accessibility and lack of integration. All interviewed stakeholders are aware of the importance of data and its exchange for enhancing business opportunities and compliance checks.
In conclusion, the analysis of the survey will support and guide the next activities for properly designing and implementing the innovative KEYSTONE solution.

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