FInest – **F**uture **In**ternet **e**nabled optimi**s**ation of **t**ransport and logistics networks

D2.3

DETAILED SPECIFICATION OF USE CASE SCENARIOS

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Abstract

The former deliverable, D2.2, consisted of a High Level Specification of Use Case Scenarios. In this report, we presented the three main use cases, describing the transport set-up and the main business processes, without focusing on any particular area.

In the present deliverable D2.3, we go one step further and describe more in details the areas in the use cases associated with main challenges and describing concrete scenarios explaining how operations are done. The main goal of D2.3 is to deliver scenarios for testing and demonstrating the FInest capabilities in real-life set ups, thus scenarios in which envisioned improvements are achieved. These are referred to as to-be scenarios.

The process followed in M7-12, resulting in the specification of these to-be scenarios, has been divided in a first phase focusing on current situation, then a phase looking for possible solutions to achieve the improvements needed in the future.

The work has been built up so that each of the three use cases could work in parallel, while securing a high level of interaction among them in order to align the results, as well as consolidating their results for facilitating interaction with the Technical WPs.

The first phase of the work focused on describing the current practices more in detail, describe as-is scenarios, identifying main challenges, root cause, identify needs and goals, as well as a set of ideas of possible IT-enabled solutions for the business challenges.

Thereafter, the needs and ideas for solutions identified were consolidated, highlighting a high number of commonalities across the use cases. This consolidation work resulted in a set of 21 general requirements (presented in Chapter 4).

Finally these general requirements were used as a basis for selecting the to-be scenarios. The purpose of these to-be scenarios is to illustrate how business improvements enabled by Future Internet IT capabilities, including operations and processes, are envisioned. The to-be scenarios, specific to a given use case, were selected according to the importance for the use case and use case partners, but also taking into account relevance for other use cases and actors.

The selected to-be scenarios are as follows:

To-be Scenario	Focus	Use Case lead
1	Handling of Late Booking Cancellation	UC1
2	Resource Coordination	UC1
3	Real-Time Event Handling	UC2
4	E-Planning	UC3
5	Automated Shipment Tracking	UC3

This report documents the results the work during the M7-12 period, including main challenges, root causes, as-is scenarios, needs and ideas for solutions, consolidated use case results into general requirements, and to-be use case scenarios for demonstrating business improvement enabled through FInest.

In the process of identifying challenges, needs, solutions, scenarios, the team had regular interaction with WP1 to check the relevance of these findings for the domain, but also with the technical WPs, to check the relevance for FInest.

Document History

Version	Date	Comments
V0.1	108-03-2012	First draft: detailed structure
V0.2	10-03-2012	Second draft: chap 1 (introduction, working process), 2 (introduction), 2.2 (UC1 story line), 2.4 (UC3 story line), and 3 (consolidation)
V0.4	14-03-2012	Third draft: updated chap 1, 3, 2.1, 2.2, insertion of chap 2.3 (UC2 story line), and draft chap 4
V0.4	15-03-2012	Fourth draft: Update of chap 2.2, 4.1, and draft chap 5.
V0.5	20-03-2012	Fifth draft: updated chap 1, 2, 3, 4, 5
V0.6	20-03-2012	Sixth draft: finalized chap 1, 3; updated chap 4, 5
V0.7	21-03-2012	Lay-out, conclusion, chap 5, abstract – sent to internal review
V0.8	29-03-2012	Final draft: chap2 shortened; creation of Annex 1, corrections based on suggestions from internal reviewers and use case partners.
V1.0	30-03-2012	Final version

Table of Contents

List of Tables

List of Figures

Acronyms

Acronym	Explanation
AIS	automatic identification system
D1.1	Initial report on the transport and logistics domain analysis
D1.3	Business requirements for future transport and logistics ICT solutions
D2.1	Use case specification methodology
D2.2	High level specification of use case scenarios
D3.2	Conceptual design of domain specific FI platform for transport and logistics
EDI	Electronic data interchange
ETA	Expected Time of Arrival
ETD	Expected Time of Departure
F.I.	Future Internet
IoT	Internet of Things
ISPS	International Ship and Port Facility Security
KPI	Key Performance Indicator
LSC	Logistics Service Client
LSP	Logistics Service Provider
PCS	Port Community System
RFID	Radio Frequency Identification
SME	Small- and medium-sized enterprise
SSN	Safe Sea Net
T&L	Transport and Logistics
TB-UCS	To-be use case scenarios
TEP	Transport Execution Plan
TSD	Transport Service Description
UC	Use Case
UCS	Use Case Scenario

1. Introduction

1.1. Purpose of the deliverable

The purpose of the deliverable, as explained in the project's Description of Work1 (on page 14), is to present a set of real world use case scenarios from the transport and logistics domain, which shall be used for demonstrating the FInest solution. In addition, the report present the methodology and working process that lead the team to the conclusion presented hereby. The work presented in this report is a continuation of the high level use case specification, topic of the previous deliverable D2.2 (first part of Task 2.2).

Important criteria for the identification of these scenarios:

- They must be possible to test, so real-world data and concrete business knowledge must be available.
- They must represent a challenging part of the business, so that the solution to be tested can generate some improvement that is actually relevant for the business actors. This means that the identification processes focuses on the main challenges that the use case actors are facing today.

Although the main goal is to deliver a set of scenarios presented in chapter 5, the entire process for reaching this goal has revealed a large amount of important information for subsequent work in FInest, which is also presented in the present report. The Annex1 is very rich in detailed data and explanation about current practices and business challenges, and is believed to represent an important source of information for the other WPs later in the project. Similarly, the chapter 4 presents a consolidation process which is not directly relevant for the description of the to-be scenarios, but very important for facilitating the communication and interaction with the technical WPs, as well as for assessing the relevance of the use case work for the domain (WP1).

1.2. Background

A *use case* is a description of a business activity, a set of actions to reach a goal. As explained in the Methodology (D2.1), the term "use case" in WP2 refers to the overall studied scenarios (the overall pictures). In WP2, the three main use cases are:

1. *Use Case 1: Fish Export from Norway to Brazil*
2. *Use Case 2: Import of Fashionable Goods from Asia to Europe*
3. *Use Case 3: Global Consumer Goods Production and Distribution*

Each use case comprises several *scenarios* showing how actors in the use case perform a specific set of operations in order to achieve a specific result (e.g. delivery of cargo from C to a destination D).

[1] 285598 FInest - Workplan table - 2011-04-08 20:55

To ensure that real life practices are brought in the development of the technical solution in FInest, WP2 is focused on establishing use cases, and defining use case scenarios for testing, demonstrating, and evaluating the FInest solution.

Task T2.2 consists of:

(i) *high level specification of the use cases* focusing on as-is work/business[2] processes and current challenges (described in the previous deliverable D2.2), and
(ii) *detailed specification of the use cases* scenarios *describing* both the current as-is situation and possible to-be situations (subject of the present deliverable D2.3) where it is shown how Future Internet can be used to improve the processes.

The former deliverable, D2.2, consisted of a *High Level Specification of Use Case Scenarios*. In this report, we presented the three main use cases, describing the transport set-up and the main business processes, without focusing on any particular area.

In the present deliverable D2.3, *Detailed Specification of Use Case Scenarios*, we go one step further and describe more in details the areas in the use cases associated with main challenges and describing concrete scenarios explaining how operations are done. The main goal of D2.3 is to deliver scenarios for testing and demonstrating the FInest platform, thus scenarios in which envisioned improvements are achieved. These are referred to as *to-be scenarios*. The process resulting of the specification of these to-be scenarios include the description of *as-is scenarios* (current practices), highlighting the main challenges, and enabling the identification of needs for improvement.

1.3. Introduction to the use cases

1.3.1. Uses cases and domain

In D2.2, the project team defined three main use cases of freight transport that differ in transport mode, type and volume of goods and involved parties. The purpose is to address business challenges that occur in the world-wide transport and logistics sector. The use cases should be representative of the domain.

The table below summarizes the 3 use cases, and their specificities in terms of supply chain scope, trade, cargo, load unit, transport mode and perspective (role represented) actors involved (from FInest consortium). From the summary, we can see that the use cases are quite complementary. Even though all three are focusing on unitized cargo, the use cases are representative of a large amount of freight transport, and of types of transport chains that require a high degree of collaboration among a great number of actors.

[2] In the present report, the terms *work process* and *business process* are used interchangeably, and refer to how the work is done in an organization.

Table 1: Summary of WP2's three Use Cases

	Use Case 1 – Fish Export from Norway to Brazil	Use case 2 – Import of Fashionable Goods from Asia to Europe	Use case 3 – Global Consumer Goods Production & Distribution
Supply Chain Scope	Feeder process for overseas fish export	Door-to-door shipment from a supplier to customer	Inbound and outbound logistics of a manufacturer
Trade	Norway > Europe (Feeder) > Brazil (overseas)	Asia > Europe	Far East > Turkey (import) Turkey > UK (export)
Cargo	Fish – frozen, dry	Fashionable goods	Materials (inbound) Home appliance (outbound)
Load unit	Container	Pallet Unit load device	Pallet / slip sheets Container
Transport Mode	Ship	Truck Aircraft	Truck Ship
Perspective	Transport Service Provider: - Shipping line - Port - Terminal	Transport service provider: - Freight Forwarder - Air carrier - Trucker	Transport user: Manufacturer
Actors involved (nr. employees)	North Sea container Line (8) Ålesund port (12) Tyrholm og Farstad (40)	Kuehne+Nagel (60.000) AirFrance KLM Cargo (108.000)	Arcelik (19.000)

Domain-representativeness of the use cases:

- The M6 deliverables (D1.1 and D2.2) showed that the use cases are representative of the domain. The types of cargo, load units, trades, roles involved are covering a large part of the domain.
- The challenges encountered and presented in D2.2 are typical challenges of the domain and in phase with the ones presented in D1.1.

The use case scenarios designed in WP2 cannot cover 100% of the business requirements of the T&L domain, as schematized in the figure hereby. Therefore, to ensure that contribution from WP2 will not be misleading, the identification of to-be scenarios during the period M7-12 have taken into account the possible generalization of the challenges encountered to the T& L domain. Besides, cross-check with WP1 has been necessary for ensuring that the Domain Business Requirements are covered in the use cases.

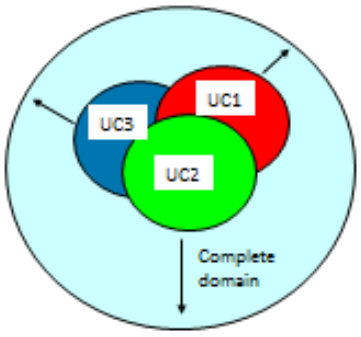


Figure 1: WP2' use cases as a part of the T&L Domain

1.3.2. Uses cases and involvement of SMEs

The use cases represent the interest of large companies, but also of small- and medium-size enterprises.

- 50% of the industry partners in WP2 are SMEs, operating on a regional market.
- For Use Case 1, the perspective is the one of SMEs. However, it is important that the scenarios related to the UC1 are not too specific. Attention has been put on ensuring relevance for other actors with similar roles in the domain.
- In Use Cases 2 and 3, led by large companies, the main challenges are representative of what is experienced in the domain (WP1), regardless the size of the company. Therefore the voice of SMEs is also represented in these use cases.
- The challenges and the solutions developed are applicable to the entire domain, including SMEs. Indeed, the areas for expected improvement from the Finest solutions are related to order management, deviation management, scheduling and coordination, monitoring and tracking, and information exchange. These areas are as important for small companies as for large ones. Effective information exploitation and business collaboration is important regardless of the size of the company.

1.4. Structure of the report

The Deliverable is structured as follows:

Chapter 1: **Introduction** to the deliverable D2.3 and the use cases.

Chapter 2: Description of the **methodology** and **working process** for the period M7-12.

Chapter 3: Summary of the **outcome of the as-is analysis**. For each use case, the main challenges identified and their root causes are presented. The detailed description of this work is documented in **Annex 1**. For each use case, a story line "from challenges to solutions" is described, including an summary of the use case, the main challenges and root causes described in details, then illustrated in as-is scenarios, and finally, needs for improvement and ideas for possible solutions are identified. The focus is on specific challenges and requirements, which constituted the baseline for the general requirements presented in Chapter 4 and the to-be scenarios presented in Chapter 5. This Annex 1 represents also important documentation for subsequent work in the project.

Chapter 4: **Consolidation** of the results from the three uses cases (challenges, needs and ideas for solutions) into general requirements.

Chapter 5: Detailed description of five **to-be use case scenarios** illustrating possible business solutions. The four FInest demonstrators (presented in the technical WPs) are related to four of these scenarios.

Chapter 6: Summary of the results focusing on **potential improvement envisioned** by the use cases, in each phase of transport operations and from the perspectives of different roles.

Chapter 7: **Conclusion** and summary of the work, lessons learned and further work (M13-18)

2. Methodology and working process

2.1.1. Overall Methodology

The figure below (introduced in D2.1 and D2.2) shows the main components in the Methodology for working with the use cases. It also shows what is included in D2.3 and interaction with other WPs. The work related to D2.3 during the period M7-12:

- consists of both as-is and to-be descriptions of scenarios, the former being the basis for understanding current practices, while the latter will be used later in the project for testing the FInest solution (green box "Experimentation Specification").
- is supported by WP1 (orange box "Domain Analysis") in order to ensure the relevance of the identified scenarios for the Transport and Logistics domain.
- is based on interactions with the technical WPs (orange box "Future Internet components and platform"). WP2 is delivering a set of requirements to the technical WPs while receiving input regarding the possibilities offered by the components.
- has enabled the start of identification of some specific measurement criteria which will give valuable input to the next phase and task T2.3 regarding the evaluation methodology (green box "Evaluation Criteria"). This is presented briefly in the conclusion chapter.

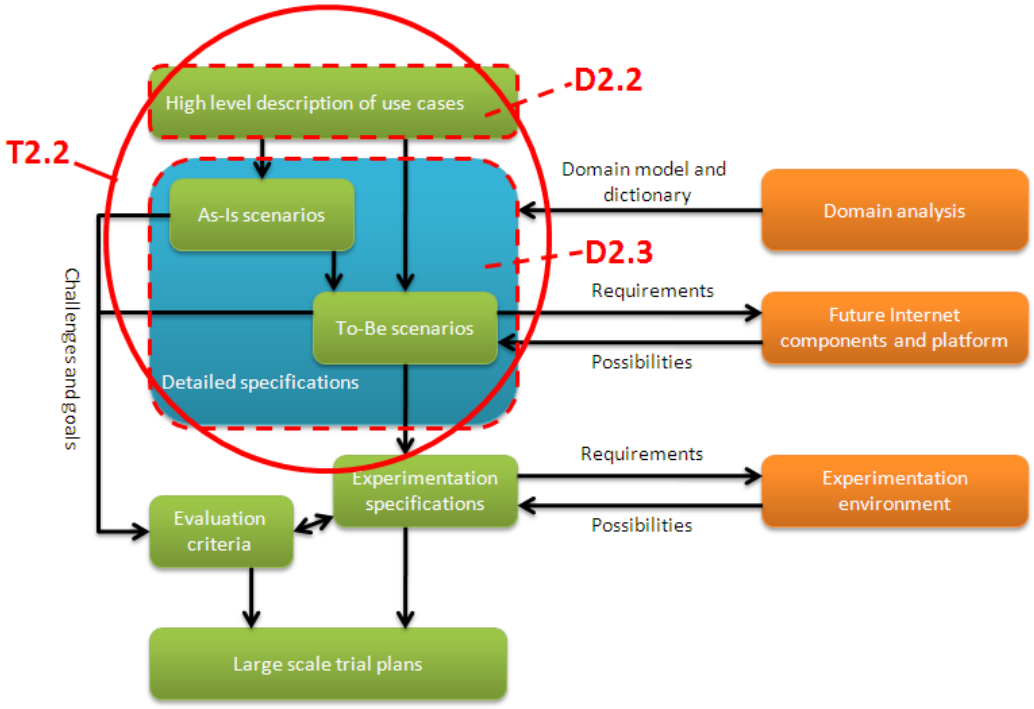


Figure 2: WP2 use case specification main components

According to the overall Methodology described in D2.1, the *detailed description of use case scenarios* (D2.3) shall consist of the followings:

- As-is detailed description
  - A detailed description of how operations are done today
  - Refinement of the high-level description (one or a few of the main steps described in the high-level description may be described as a detailed scenario).
  - Main challenges
  - More realistic and detailed view on Future Internet opportunities
- To-be detailed description
  - A view into the future showing how operations can be done with Future Internet technology
  - Based on as-is description (one or a few steps in the detailed description may be described as a scenario; the ones where we see that FI technology will bring an improvement)
  - Show how Future Internet technology will be used
  - Identify new / refined requirements to the FInest components and platform.

The use case scenario template (introduced in D2.1) is used for structuring and presenting information and results. Furthermore, the four phases of transport operations (also introduced in D2.1) are used for categorization of results and these are used in all deliverables for consistent presentations of results.

2.1.2. D2.3 Methodology and Working Process

Based on the Use Case Methodology described in D2.1, the team designed a more detailed methodology (figure below) and working process for the period M7-12 (D2.3)

The present chapter describe both a methodology for scenario identification (as-is and to-be) and description, a methodology identical for any use case, as well as a methodology for consolidating the results from several use cases.

2.1.2.1. Methodology for Scenario identification

The **core of the approach** taken is: the set of **main challenges** identified as most important by the domain partners. This means that the scenarios (as-is and to-be) are constructed around main challenges to current practices, for which needs for improvements are expressed. The core of the work conducted during the period M7-M12 has turned around analyzing and describing these challenges, their causes, their possible business solutions, and resulting necessary IT-capabilities.

This working process was followed by each use cases, with periodic meetings for ensuring common understanding and alignment among the use case-specific work, and for enabling the establishment of templates to be used for presenting the results in a harmonized way.

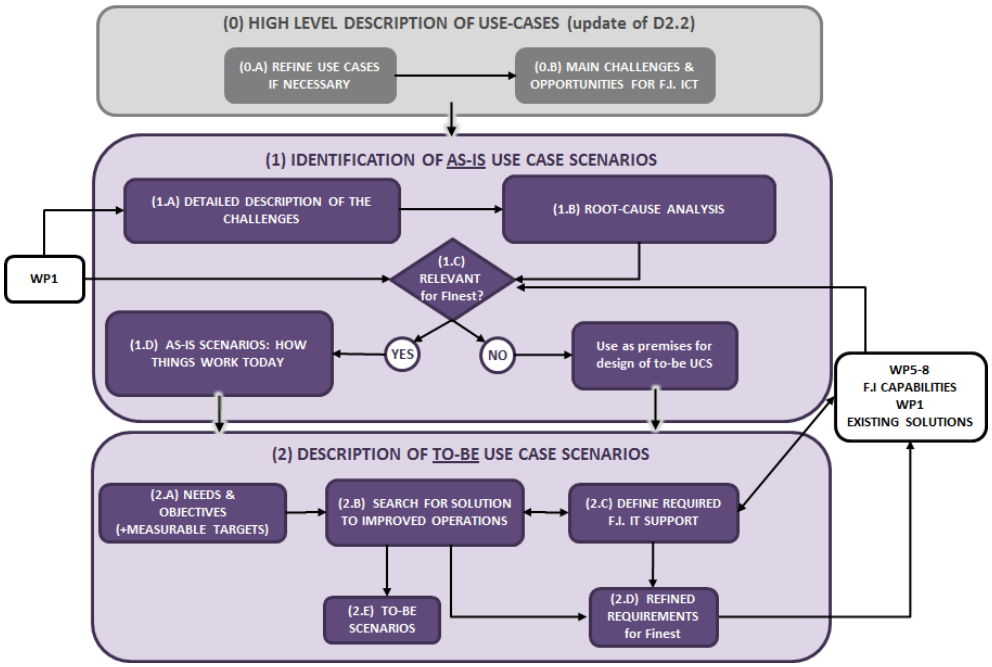


Figure 3: Methodology for identification of use case scenarios

The methodology is shown in the figure above, which is the path taken by each use-case for building up their story line.

(0) High Level Description of Use Cases

The starting point (box (0)) is the High Level Use Case Description (D2.2), from which updates were made in the description of the transport set up, and main challenges were identified.

(1) Identification of as-is use case scenarios

In **phase 1**, the focus was on the *identification of as-is scenarios*, which consisted of:

(1.A) For each of the main challenges, a **detailed description of the challenge**, its relevance for the main domain requirements (WP1), the description of the problem, the negative consequences of this problem, where / when the problem occurs, who experiences it, and some idea of how to how to overcome the challenge.

(1.B) For each challenges, the **root causes** were identified and described. This exercise was an important part of the M7-M12 process, because it highlighted the core of the problems to be solved, enabling the technical WPs to understand better how business works and why, and enabling the use case to identify the areas that necessitate improvement, and for which testing the Finest solutions would be very relevant for the use case actors.

(1.C) Before going further and describe how things work today, highlighting the problems expressed in the challenge description, it was necessary to validate the **relevance of the challenge for Finest** and for the domain. First, this was done internally, by verifying that the problems on focus are representative of the Domain (the requirements expressed in WP1). Secondly, this was done through interaction with the Technical WPs (5-8) during a workshop (Amsterdam, in January 2012. See chapter 5.1 for more information) in which the main challenges were presented and feedback was received. At that stage, none of the challenges

were excluded, because all representing potential for improvement that Future Internet Technologies could enable.

(1.D) for each Main Challenge, **as-is scenarios** were described, basically telling "how things work today".

(2) Description of to-be use case scenarios

In **phase 2**of the working process, the focus was on the search for *possible solutions on which to base the to-be scenarios.*

(2.A) Each use case started by identifying **needs/goals** related to each main challenges or specific root cause. The focus was not on specific metrics for measuring performance, but on targets that are possible to measure, so that the needed improvements expressed in the to-be scenarios can easily be measured, hereby providing a starting point for the evaluation methodology to be described during the period M13-M18 (D2.4). It is important to note also that in the detailed description of the main scenarios, some quantitative elements are also expressed (as consequences of the problem described, such as loss of income, lower asset utilization etc…).

(2.B) (2.C) In relations to these needs & goals, the next step consisted of searching for **appropriate business solutions** to the challenges expressed, as well as related **IT-based support**. This was done by the use case participants identifying a set of possible solutions that can be expected to be enable by Finest and Future Internet (without going into technical details). These were presented to the technical WPs for feedback regarding the relevance for Finest. Based on this feedback, the "ideas for solutions" were refined, and some root-causes were removed from the analysis because not seen as relevant for Finest (either easily solvable using existing solutions, or depending on other factors than improved business collaboration).

(2.D) Requirements. As a result of all the work done for identifying appropriate real-life future scenarios for demonstrating the Finest solutions, the requirements expressed at M6 (D2.2) were refined into a set of requirements for the Finest components. It is important to note that these requirements resulted from an alignment of the outcomes of the 3 use cases, as well as alignment with WP1, so that WP2 could deliver a consolidated set of general requirements relevant for all three use cases (this consolidation process is presented in the next section). Although these requirements are not the main focus of the Deliverable D2.3, it is believed that this part of the work has the most value for the technical WPs.

(2.E) The final step of the process is the description of to-be scenarios, as specific applications of the ideas of solutions. These to-be scenarios serve to illustrate "how things will work in the future", and how the envisioned solutions are implemented, **from a business perspective**, and how improvements are enabled.

In terms of **documentation of results** in the present report, phase 1 (as-is) is summarized in chapter 3, with main focus on challenges and root causes description. The same phase 1, and a part of phase 2 (2.A needs/goals and 2.B/C. business and IT-based solutions) are presented in detail in Annex 1. Phase 2.D (requirements) are presented in a consolidated form (as use case general requirements) in chapter 4. Phase 2.E (to-be scenarios) are presented in chapter 5.

2.1.2.2. Consolidation of results and selection of use case scenarios

Most of the work conducted in M7-M12 was done at the use case level, basically because the scenarios are to be real-world scenarios, reflecting on real business practices and challenges. Each use case built its own story line, following the same pattern/template.

However, for enabling the alignment between WP1, WP2, and WP3 and for being able to deliver some consolidated information (requirements) to the Technical WPs (5-8), **the outcome of the three use cases was consolidated**, highlighting the commonalities[3] among the use cases, so that general challenges and needs could be presented regardless of the use case (context), as well as general ideas of capabilities needed to overcome these challenges (the IT-enabled solutions referred to).

Once this consolidation work was done, the use case teams could go back to focusing on the each use case, assess the importance of these consolidated requirements, the envisioned benefits, and provide specific applications of the envisioned solutions/improvements in the form of to-be scenarios.

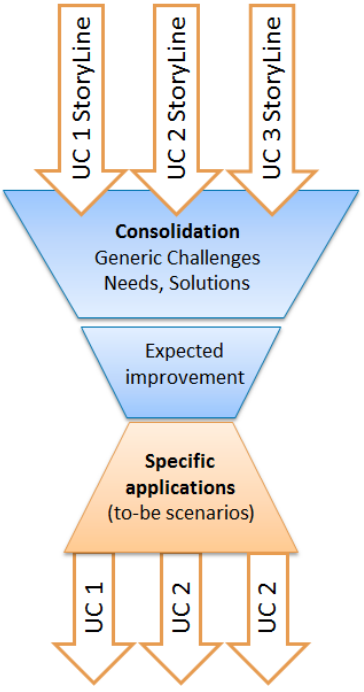


Figure 4: Structuring of the outcomes of M7-12

The figure hereby schematizes this structuring of the outcomes.

- First each use case worked in parallel on the description of specific challenges, root causes, as-is scenarios, needs and ideas for solutions (summarized in Chapter 3, detailed in Annex 1)
- Then we consolidated the findings into a set of general requirements (Chapter 4)
- Finally we proposed a set of to-be scenarios as specific applications of the ideas of solutions that are seen as most relevant for the Finest project. (Chapter 5)

[3] "Commonalities" refer to similarities in challenges, problem, root causes, but also needs and ideas for solutions across the use cases. The use cases reported a lot in common, and all the use case general requirements presented are at least representative of two of three use cases, depending on the perspective (business role) taken.

2.1.3. Timeline

The diagram below illustrates the timeline of the M7-M12 work conducted in WP2. The 5 main milestones were:

- Early December: agreement on a common way of identifying as-is scenarios: describing main challenges, root-causes, and current practices.
- Early January: all as-is scenarios identified, and current practices to be presented to the project team for knowledge transfer as well as for receiving feedback. Prototype workshop in Amsterdam.
- End of February: possible solutions identified, and presented to the Technical WPs, together with the related challenges and root causes, in order to receive feedback.
- Early mars: refined requirements for Finest (consolidated) presented to the project team, and aligned with WP1's Business requirements. In the Plenary meeting in Haifa the wp2 results (generic requirement and ideas for possible solutions) were discussed, evaluated and coordinated with the other WPs.
- Mid mars: description of to-be scenarios based on the envisioned improvements of the main challenges.

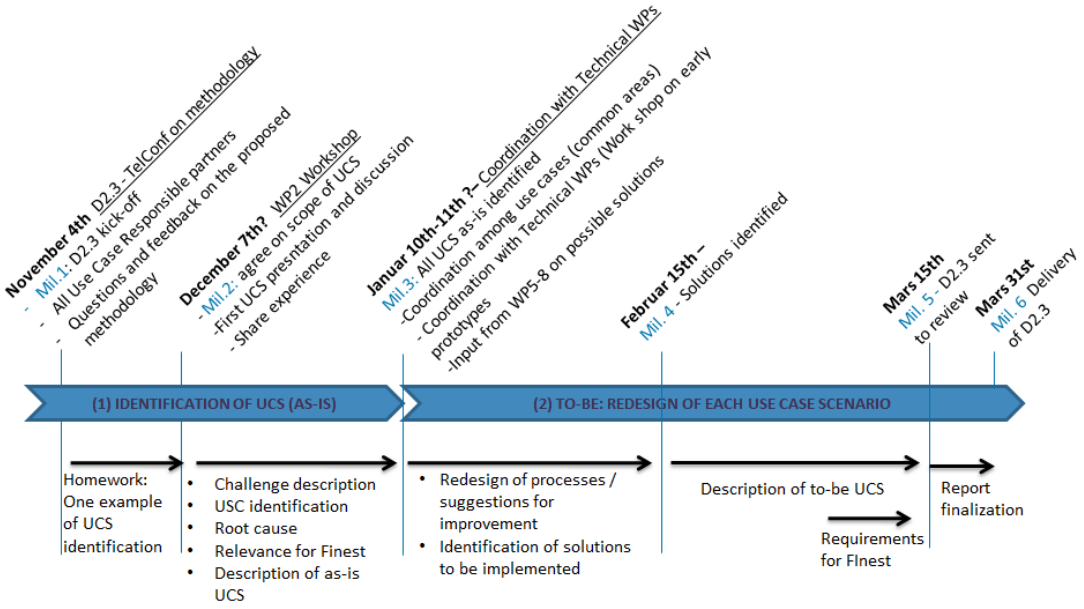


Figure 5: work plan for WP2 M7-12

3. As-is practices: understanding the main challenges

This section presents a summary of the as-is analysis that served as basis for identification of possible solutions, on which the to-be scenarios described in Chapter 5 are built.

What is covered in the present summary is, for each use case, the *main challenges identified* and their *root causes*.

The complete documentation of the as-is analysis conducted by each use case, illustrating the challenges by as-is scenarios and presenting a set of needs and ideas for solutions[4], is available in **Annex 1**.

Introduction to Annex 1: "As-is analysis and identification of possible solutions"

This Annex represents a rich source of data and information that is expected to be used as reference and input for further work in the FInest project.

It presents a **Story Line** for each use case - "from challenge to solution" -, covering the followings: (1) use case introduction, (2) Detailed description of Main Challenges, (3) Detailed Root Cause analysis for each challenge, (4) As-is scenarios illustrating each challenge, (5) Identification of needs & goals, along with ideas for possible solutions.

The results summarized in the present chapter relate to point (2) Main challenges, and (3) Root-causes.

3.1. Representativeness of the use cases' challenges for the Domain.

Before presenting each use case challenge separately, an overall view of all the main challenges is summarized in Figure 6 below.

The purpose of the diagram below is to show the variety of main challenges revealed in the use cases, both in terms of domain business requirement categories[5] (WP1: Planning, Resource management, Monitoring and visibility, Collaboration) and with regards to the four phases of transport business processes (marketing/alignment, planning, execution, completion). The goal of this grouping is also to show the similarities among the use cases, by grouping them together into challenge categories.

[4] It is important to note that the word "solution" used by the WP2 team is used from the perspective of the business. The intention has been to identify *ideas of possible IT-enabled solutions*, not to impose any technical solution.

[5] the 8 requirements presented in D1.1 were updated to 4 in D1.3

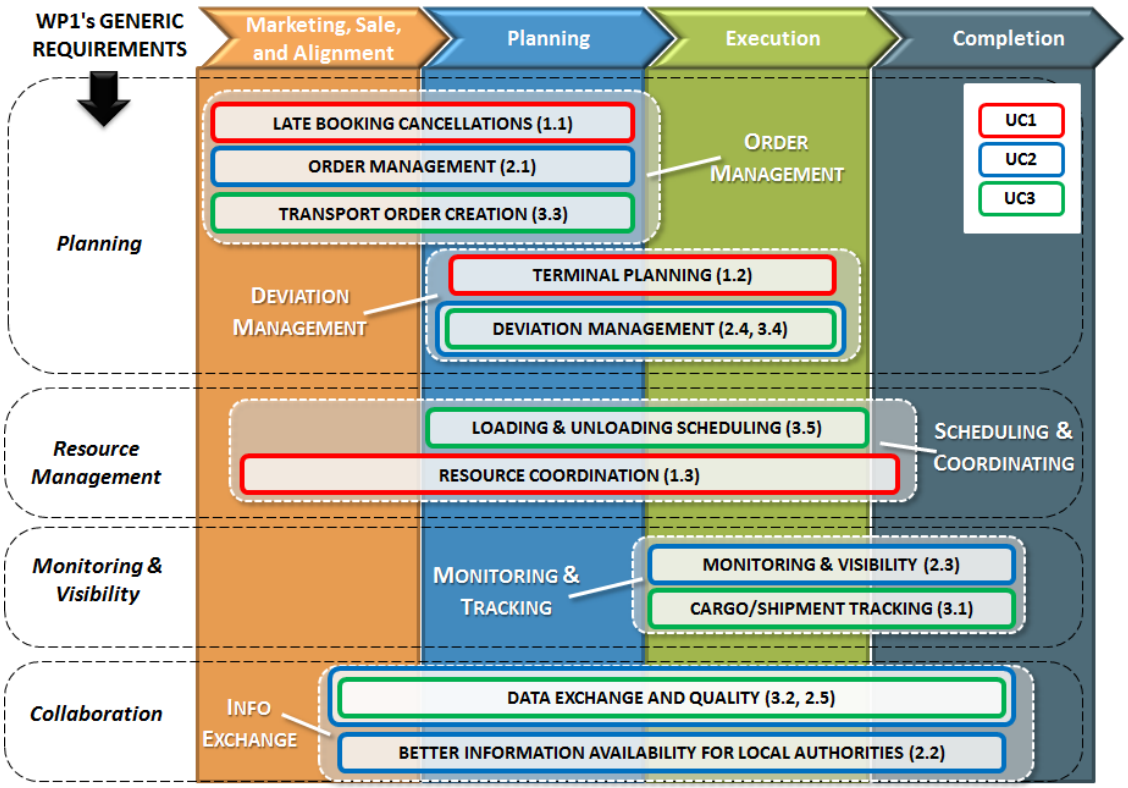


Figure 6: Mapping of Use Cases' Main Challenges to Domain Business requirements and Four phases of operations.

Each of the main challenges identified by the use cases is summarized in a white box in the center of the matrix; the number represents the use case followed by the corresponding challenge number. Three colors (red, blue, green) are used for facilitating the identification of which use case the challenge is extracted from.

It is important to note that these main challenges are in fact more varied than they appear here, and for several of them cover more than one requirement category (more detail information is presented in Annex 1). However, for facilitating the reading, they are associated to the requirement they correspond most to.

- **Planning**: the need for improvement expressed through the use cases, related to planning activities appears the *most important*, given that each use case has identified two of their main challenges as *planning-related challenges*. The three first ones (1.1, 2.1, 3.3) focus on *operational planning*, covering the operations of finding suitable *service*, *booking*, and establishing transport *execution plan* (thus covering the marketing/alignment and the planning phases). The three other main challenges (1.2, 2.4, 3.4) related to planning focus on *deviation management and replanning*, and are covering processes related to *signaling* and *handling* of deviations, *updating* of transport execution plan (thus belonging to the operational phases planning and execution).
- **Resource management**: the need for improvement related to Resource management is expressed through two main challenges (3.5, 1.3) in the use cases, both related to *synchronization of use of assets/resources* at pick-up/drop-off or transshipment point. These challenges are noticeable in *all four phases* of transport operation (which also is

reflected in D1.3): in the marketing/alignment phase when finding the appropriate service and supplier, in the planning phase when coordinating schedules and resources availabilities, in the execution phase when following up resources plan and availability, and in the completion phase when generating the right invoice that correctly reflects the actual resources used.

- **Monitoring and visibility**: the need for improvement related to Monitoring and visibility is expressed through two main challenges (2.3, 3.1) in the use cases, both related to *monitoring of shipment* through automatic tracking of *status* of cargo and real-time *information availability*. These challenges are occurring in the execution phase, but concern also in the completion phase, in which reporting and actual performance versus agreed performance is measured.
- **Collaboration**: the need for improvement related to Collaboration is expressed through two main challenges (3.2, 2.2) in the use cases, both related to *efficient information exchange* for enabling seamless activity flow. The "collaboration" aspect lies in the need for compatibility of information systems to ensure quality and punctuality of information, which is important in all four phases of transport operations.

The figure also shows the main similarities among the use case challenges by grouping them into categories (the boxes in white dots): Order Management, Deviation Management, Scheduling and Coordinating, Monitoring and Tracking, and Information Exchange. This grouping is the result of a consolidation process describe later in Chapter 4.

3.2. Use case 1 Main Challenges - Fish Export from Norway to Brazil

An introduction of Use Case 1, including updates to the transport set up and process description can be found in Annex 1.1.

Based on the results of the high level use case 1 description (Fish export, NCL, Ålesund port, Tyrholm & Farstad), and workshop between the use case partners and MARINTEK, the team identified three main challenges that are most hindering daily business (time, cost, deviations in operations). These are believed to be highly relevant for the FInest project and, and for Future Internet to play an important role in improving interaction and collaboration among parties in order to achieve higher efficiency. These main challenges were presented to and validated with the Technical WPs during the workshop in Amsterdam.

- ***Late Cancellations of Booking of Shipping Services***

Comprising the feeder operator' problem of no-shows and dummy bookings, both resulting in loss of income due to too short time to react for ensuring capacity utilization.

- ***Terminal Planning***

Constant deviations and late information leading to rush work and low efficiency for the terminal.

- ***Resource Coordination***

Inefficiency in the coordination of resource booking and planning at the port/terminal related to port call.

These three main challenges are summarized in the figure below, which on a very high level shows that all three challenges are related to planning activities and replanning during the execution phase.

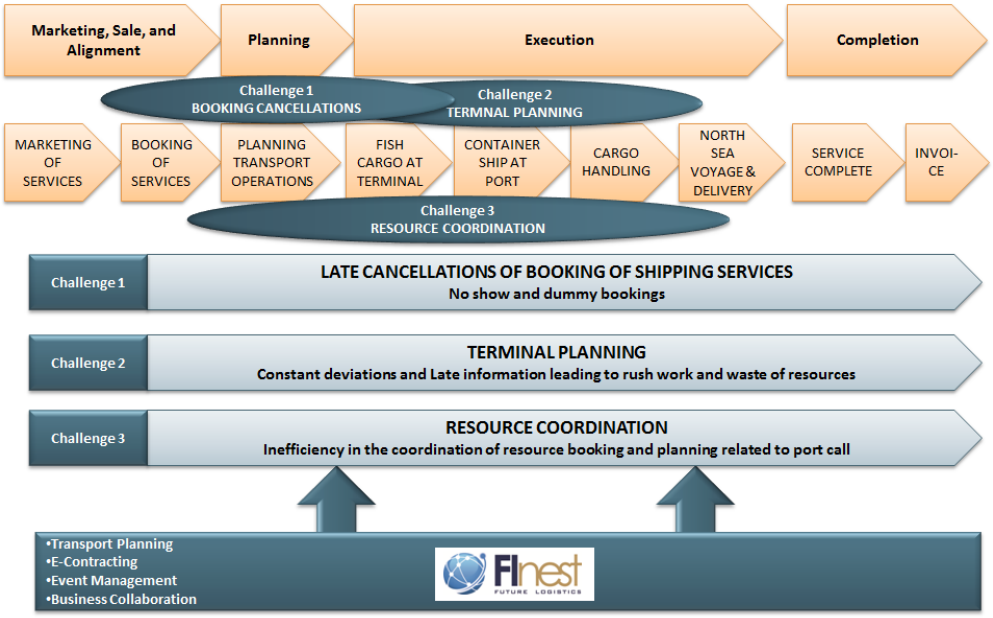


Figure 7: Main challenges encountered in Use Case 1

These challenges and their problems and root causes are summarized in the following sections, while a complete and detail analysis is given in Annex 1.1.

3.2.1. Challenge 1.1: Late booking cancellations

Challenge description

There are two main reasons related to the problems of late changes in plans and need for replanning of shipping operations: "No shows" and "Booking ". Technically, only "dummy booking" is a problem of late booking cancellation, but "no-shows", which relates to delayed booking information flow has the same consequences, namely that the ship must sail with less cargo onboard than originally planned, because the operator has no time to find replacement cargo. So both challenges described below can be related to a main challenge "late booking cancellation".

Root cause analysis

The first problem, No Shows, is mainly about delayed booking Information flow due to late information, short planning window, and more explicitly due to manual transfer of information.

The second problem, "Dummy booking" or "Booking Cancellations", is caused by short planning window too. In addition, from the part of the exporter, problems related to production, license and other clarification documents-related problems are important causes of late cancellation of booking. Finally, an important problem which could be avoid thanks to better planning upstream in the supply chain in the reservation of capacity by customer for securing place onboard a ship for the desired voyage. Regardless of how this reservation of capacity is done, whether customers book several ships for a same shipment, or whether they book without knowing really the amount of cargo that will in fact be available, the problem is still the one of bookings being unreliable and the feeder operator not being able to do anything to avoid it.

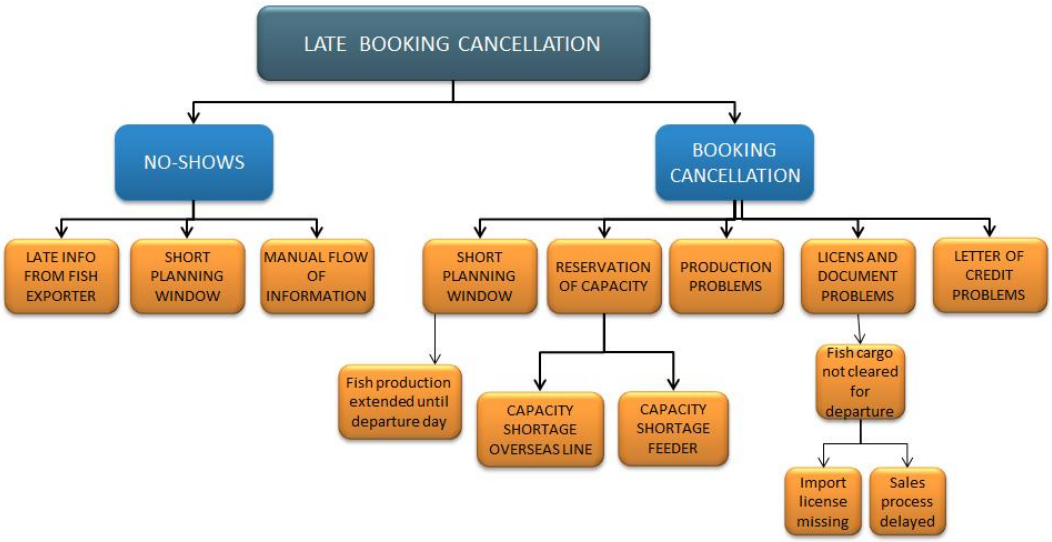


Figure 8: Root cause analysis – Challenge 1.1

The identification of the challenge's root causes highlight the need for solutions for both reducing the number of late cancellations of bookings and overcoming the consequences of these cancellations. While the former is more dependent on changes in business models regarding cancellation policy and pricing models, the latter is believed to represent an interesting opportunity for Future Internet technology. Indeed, these late cancellations can be dealt through more active search for customers in need of transport, i.e. finding cargo that can cover for these late cancellations more effectively and in a short period before vessel departure.

3.2.2. Challenge 1.2: Terminal Planning

Challenge description

The terminal faces problems of changes in bookings.

The terminal's loading activity depends on several factors: loading list ready, containers available, fish cargo available at terminal, fish cargo cleared for export, vessel at port and ready for loading, cargo handling equipment and workers available.

Late changes in booking is the biggest problem, with constant changes all the time until start of uploading, but more seriously late changes (late confirmation of discharge / loading list, in turn due to changes in booking between the shipper and carrier). These late changes in booking create a need for replanning, rush work, waste of resources and reduced time for cargo handling.

Root cause analysis

The main problems related to the Terminal Planning challenge and their root causes are summarized in the diagram below:

- *High resource use*, in terms of time, man-hours, and physical activity related to the treatment of bookings.

- *Delay in ship departure* or *incomplete loading of ship*, both due to the reduced time for loading, which can be due to delay in ship arrival, delay of cargo, or delay in loading list.

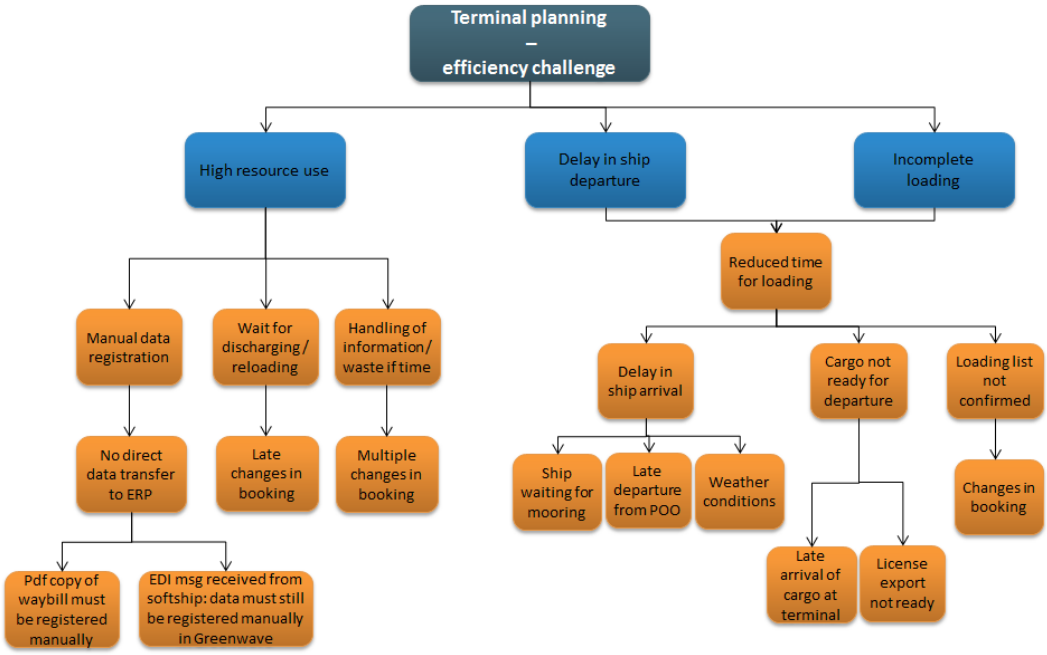


Figure 9: Root cause analysis – Challenge 1.2

The identification of the challenge's root causes highlight the need for improvement in planning upstream in the transport chain, all the way from the shipper (fish exporter), to the carrier, to the port. Indeed, the all the information necessary for correct planning of terminal activity is delivered by one of these roles, which means that the improvement of planning and efficiency of terminal activity is highly dependent on improvement in planning and information sharing on the side of the carrier and of the port.

3.2.3. Challenge 1.3: Resource Coordination

Challenge description

This challenge is about lack of visibility about service & resources available and resource need at the port/terminal (services delivered at the port & terminal for the port users: ship services, cargo handling), which results in inefficiency in the coordination related to booking of services, and (re)planning of resources. This is mainly due to lack of information availability or easy access, multiple communication channels, and lack of automatic transfer of data.

Suboptimal resource coordination is a problem for both the port & terminal's service users (ship, shipping line, ship agent) and the port & terminal service providers. On the one hand, announcing port call and booking of service require a lot of interaction and manual information transfer from the part of the carrier / ship agent / captain. On the other hand, the efficiency in planning and replanning at the port could be greatly improved with more synchronization among resources.

Root cause analysis

The main problems related to the Resource Coordination challenge and their root causes are summarized in the diagram below. The three main problems identified are:

- *Difficulty in finding information about service at, from and to the port*. This problem is a general information centralization and availability challenge, and concerns all roles in the transport and logistics domain. In the diagram, one of the root cause identified in the low awareness about sea transport (underuse of potential, thus lower port throughput). Although the port would benefit directly from improved information sharing about sea transport, this is not a root-cause directly related to the resource coordination, and therefore out of the scope of this analysis.
- *Inefficient process for booking port and terminal resources and services*. Today each port call include a higher number of interactions and messages. Besides, the ship has seldom access to real-time information when preparing a port call.
- *Resource availability conflict*. The most direct problem related to coordination of resources is that there are very often problems of resource unavailability, and coordination among the carrier (the ship) and the port and terminal services providers is inefficient.

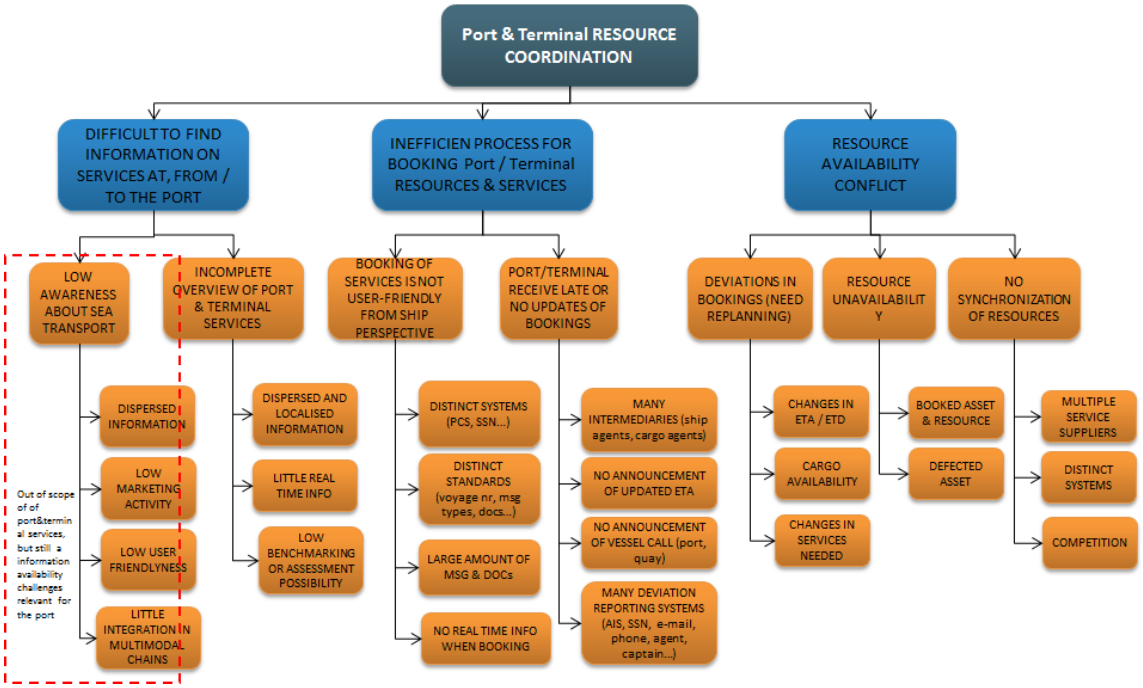


Figure 10: Root cause analysis – Challenge 1.3

The identification of the challenge's root causes highlight the need for improved information sharing, real time information, and automatized data exchange. The notification of port calls and booking of services must be made easier, more automatic and user friendly for both the vessel and the port. Furthermore, the booking of resources at the port must be based on real time information about availability, in order to avoid back and forth discussion about possibilities. Finally, the port community must have a platform enabling the synchronization of resource planning among distinct and individual services providers.

Conclusion:

The three above mentioned challenges are not totally independent from each other. Particularly, the Terminal Planning challenge is highlight similar root causes as the Late booking cancellation challenge and the Resource coordination challenge. As explained earlier, the terminal is very dependent on improvement on the side of the carrier and the port:

- Improvements envisioned for the challenge 1.1 *late booking cancellations* will be beneficial for the terminal, because information will come earlier, cancellations might be reduced, and last minutes booking of cargo available at the terminal may be enabled.
- Improvements envisioned for the challenge 1.3 *coordination of resources* at the port will be beneficial for the terminal, because information will be more automatized, and booking of services from the port and terminal will be based on real time information on available capacity, which avoid a great number of interactions in order to synchronize resources.

3.3. Use case 2 Main Challenges - Import of Fashionable Goods from Asia to Europe

An introduction of Use Case 2, including updates to the transport set up and process description can be found in Annex 1.2.

Based on the results of the high level use case description the main challenges in use case 2 (Airfreight, K+N /Air France-KLM Cargo) have been identified and analyzed. The figure below shows the main process steps with its sub steps, including the main challenges.

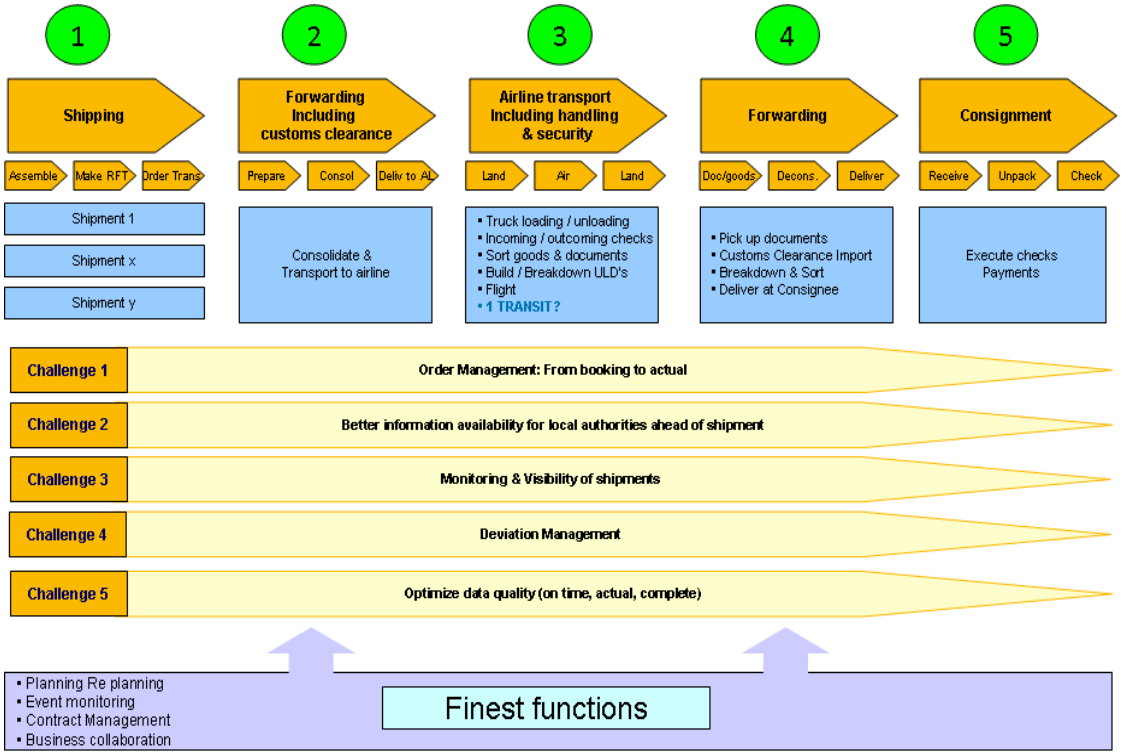


Figure 11: Main challenges encountered in Use Case 2

By investigating the whole process flow five main generic challenges have been determined. These main challenges were chosen because they are generic for forwarding and airfreight industry and have a big impact on the whole transport. These main challenges were presented to and validated with the Technical WPs during the workshop in Amsterdam.

The challenges are:

- ***Order Management: Reducing the gap from booking to actual***

  This challenge addresses the problem of high, low or no shows and late cancellations which means that in many cases the actual goods that have to be transported differ from the booking in amount / weight / size.

- ***Better information availability for local authorities ahead of shipment***

  For example: Customs needs to know exactly what is being shipped at what time. They need this information with the right quality on time to make a good risk assessment and determine if a shipment needs to be checked. Both planned and unplanned checks of customs disturb the cargo processes.

- ***Monitoring and Visibility of shipments***

  Information availability of shipments is not always available for all logistic stakeholders who need to react. There is also a timing lag in the information availability. This is causing late reaction on deviations, causing disruptions in the process.

- ***Deviation Management***

  Ad-hoc deviations occur very often, for example a late arriving truck at the carrier warehouse due to traffic jams or an offload of a shipment by the airline because there was more freight delivered by the forwarder then booked. Deviations are not standard, and therefore inefficient. It has also an effect on client satisfaction because contractual agreements might not be met. Data availability for making the right and fast decisions when deviations occur is the main challenge here. This will decrease the impact of the deviation on the transport plan.

- ***Optimize Data quality (on time, actual, complete)***

  Data quality is an underlying problem of all the above challenges. Disruptions will occur when the information flow is not synchronized with the physical flow. Therefore this challenge has not been investigated separately, but through the root cause analysis of the other four challenges.

The first four challenges and their problems and root causes are summarized in the following sections, while a complete and detail analysis is given in Annex 1.2.

3.3.1. Challenge 2.1: Order Management

Challenge description

When shipping goods, there is often a gap between the booking information and the actual shipment, because the planning is not aligned and/or available info not shared.

The gaps above cause the following:

- Delay of shipments (forwarder or carrier cannot accept the freight until the gaps are fixed)
- Shipper will not get his shipments on time in full at the consignee
- Forwarder cannot consolidate efficient
- Carrier cannot optimize their use of assets & delivers lower quality
- Invoice sent are not always conform the shipment which causes a lot of rework for many parties in the supply chain

Both forwarder and carrier need to have the same information about the dimensions and numbers of goods which have to be transported. Diverse transport problems will occur when the booking differs from the actual goods to be shipped.

Root cause analysis

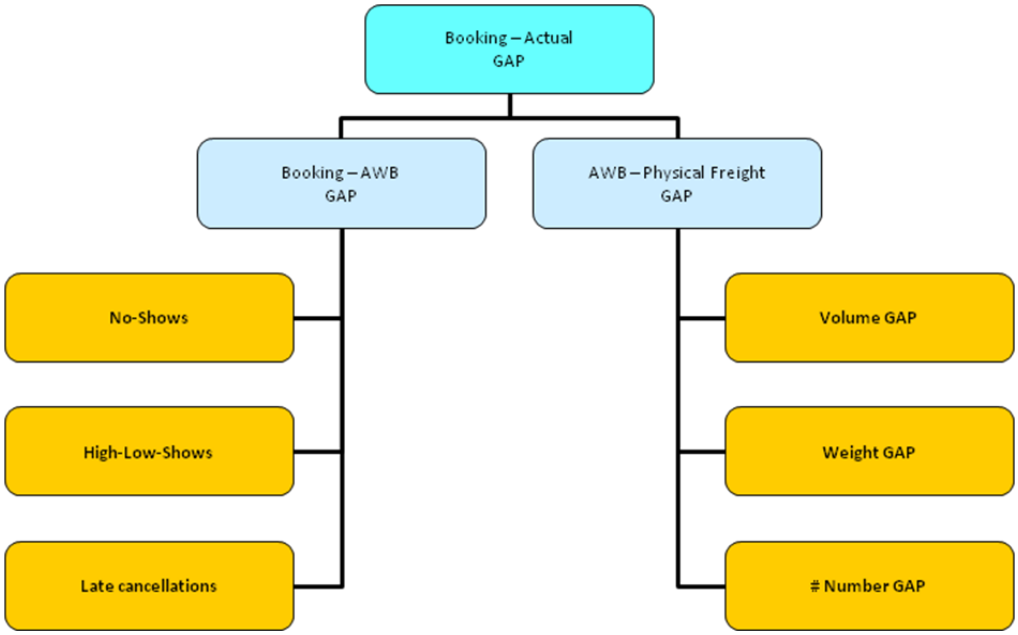


Figure 12: Root cause analysis – Challenge 2.1

As shown in the figure below the gap between booking and actual can be divided in two kinds of gaps: The gap between booking and the actual air waybill (both paper documents), cause problems like no shows or high / low shows and late cancellations, and gap between the air waybill (paper) and the physical freight. The problems related to no or high/low shows and late cancellations, analyzed in more detail in Annex 1.2, can be due to late or wrong communication, delayed trucks, quality or quantity problems, hold of shipments due to local authorities, issuing documentation or cancelled orders.

Furthermore, the problem of gaps regarding volume, weight or amount of goods can be caused by communicating wrong measurements, thievery, working with actual and operational volume (which can differ), re-packing or the loss of pieces in a warehouse where the goods have been temporarily stored.

Finally, all kinds of gaps results from misinformation wither due to human errors regarding incorrect counting or wrong data processing by the system.

The identification of the challenge's root causes highlights the need for correct booking information, and better detections and handling of inconsistencies.

3.3.2. Challenge 2.2: Better information availability for local authorities ahead of shipment

Challenge description

Local customs can stop shipments which causes a delay in the whole chain, especially when the stop of a shipment is not communicated.

The stop of a shipment is a problem when:

- It is a unplanned stop
- When the stop is not communicated to partners involved

When a stop occurs it increases workload for several parties in the supply chain, and possible delays for shipper and consignee

In the case that local authorities are not informed in time the shipment might be stopped due to custom control. By increasing the quality of communication with authorities (on time, in full, with the right quality) this problem could be reduced because possible stops can be planned. If all stakeholders know that the shipment will be stopped at a certain point of time they can change their schedule up front.

Root cause analysis

A stop of the shipment can be caused due to reasons of *data quality* which means that information is wrong or too late available, or due to the *kind of goods or the destination*. These two main problems and their causes are schematized in the figure below.

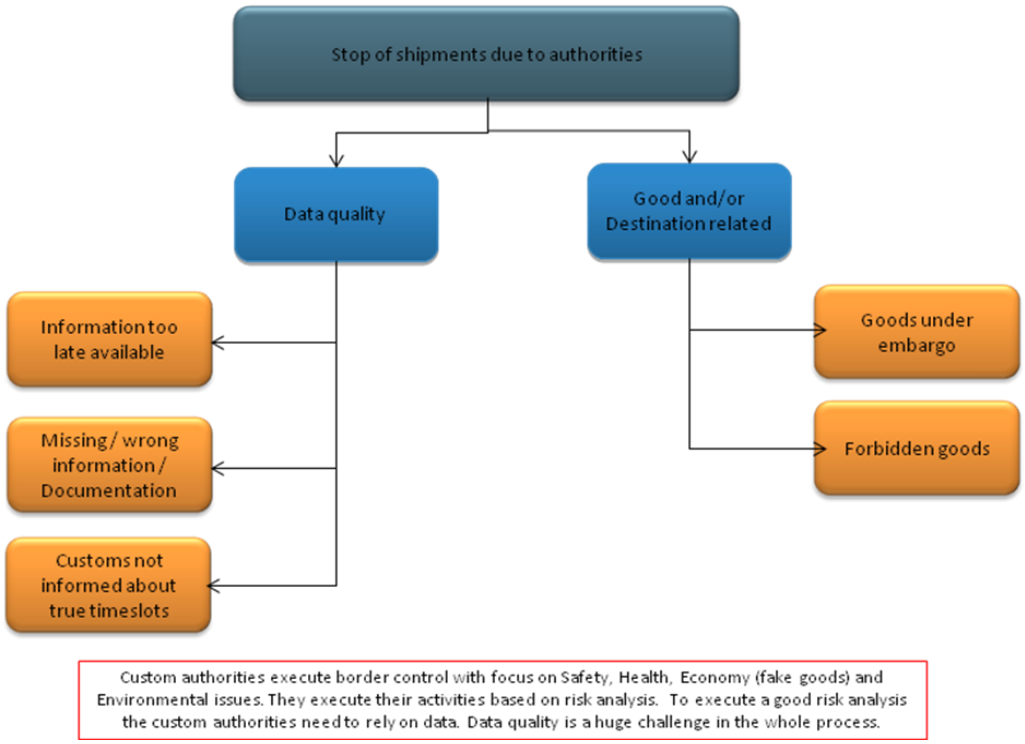


Figure 13: Root cause analysis – Challenge 2.2

The causes related to data quality are described in more detail in Annex 1.2 and reveal problems of EDI problems, late transfer of waybill, or problems of wrong registration of information.

The identification of the challenge's root causes highlight the need for data centralization, immediate availability, and securing right information.

3.3.3. Challenge 2.3: Monitoring and visibility of shipments

Challenge description

Following up and monitoring the process helps the parties to react on short notice in case of deviations and to find the improvement points in the process. It is the basis for continuous improvement. The current challenge is that information regarding shipments is not always available for all logistic stakeholders.

Root cause analysis

An insufficient monitoring and visibility system is caused by several reasons, which are schematized in the figure below. One problem is that every stakeholder has got its *own system* which cannot be used by other companies so that data is isolated, not shared automatically. Also a *poor data quality* or *not enough milestones* can be a reason for problems.

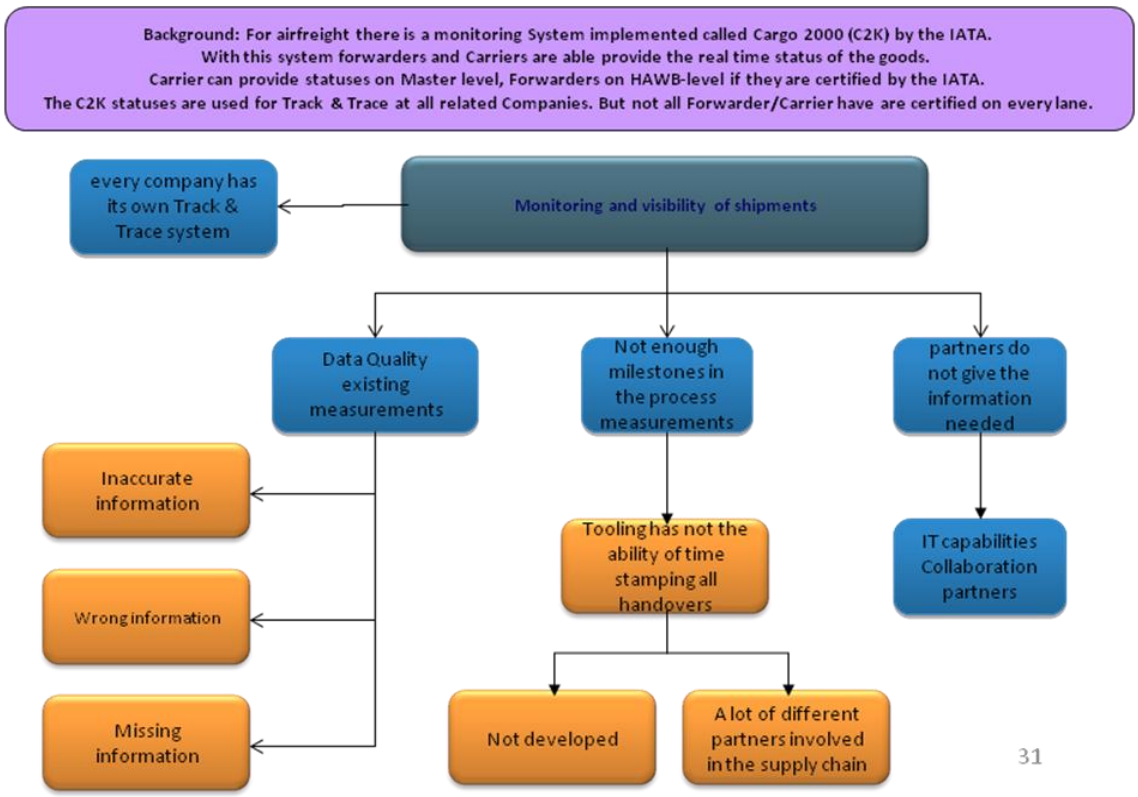


Figure 14: Root cause analysis – Challenge 2.3

The causes related to data quality - wrong or missing information - are described in more details in Annex 1.2, and reveal problems of synchronization of information flow, human errors and lack of data control systems.

The identification of the challenge's root causes highlights the need for more milestones available in a monitoring system in order to support early detection of problems. In addition, automatic synchronization of physical and information flow is necessary.

3.3.4. Challenge 2.4: Deviation Management

Challenge description

Ad-hoc deviations occur in many ways. Examples in forwarder-air cargo area are:

- Shipment is to late delivered due to a late arriving truck at the carrier warehouse
- A Shipment is off loaded by airline because there was more freight delivered by the forwarder then booked

Deviations are not standard, and therefore inefficient. It has also an effect on client satisfaction because contractual agreements might not be met

Root cause analysis

Problems in deviation management, as schematized in the figure below, are often due to no or late communication between the stakeholders or different data sources, causing different views on the actual situation and therefore hindering optimal decision making. This can be caused by the usage of different legacy systems, information fragmented available.

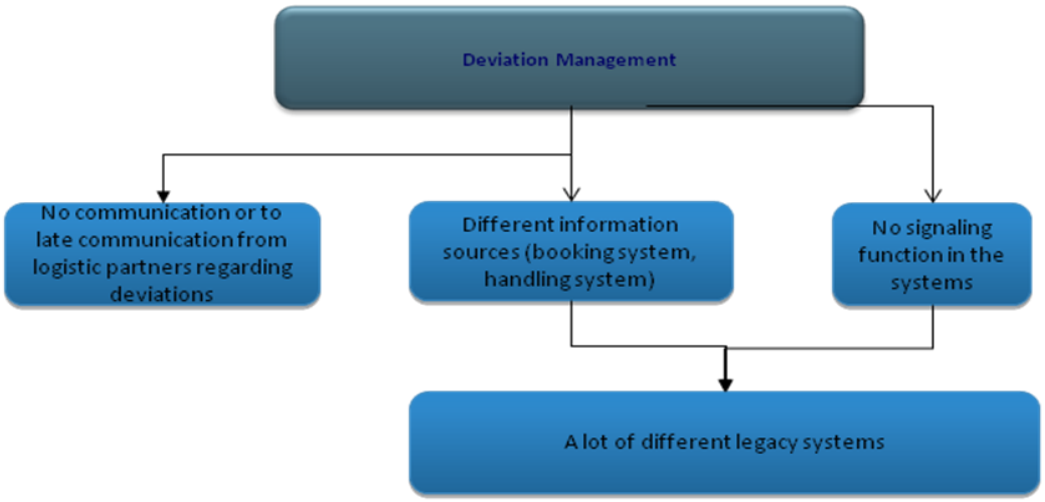


Figure 15: Root cause analysis – Challenge 2.4

Though some deviations can be decreased by problem solving techniques, there still will be events which cannot be prevented. In that case we need to reduce the impact of deviation.

Therefore a good deviation management can help every stakeholder to minimize the impact of unforeseeable events or delays, providing information as early as possible, to optimize decision making. Like the other challenges the deviation management depends from the right information at the right time available for every stakeholder.

3.4. Use case 3 Main Challenges - Global Consumer Goods Production and Distribution

An introduction of Use Case 3, including updates to the transport set up and process description can be found in Annex 1.3.

To consolidate and prioritize the challenges that were identified at the high level use case description step, an internal study was conducted in Arcelik and the critical processes that consume most of the time spent for import & export operations were determined with the intention of addressing the main problems of the companies that outsource their logistics activities. The study revealed the bottlenecks and improvement directions and as a result five different challenges are deemed to be essential for the logistics domain. These main challenges were presented to and validated with the Technical WPs during the workshop in Amsterdam. Below figure visualizes the identified challenges and the actors & activities that are affected by them.

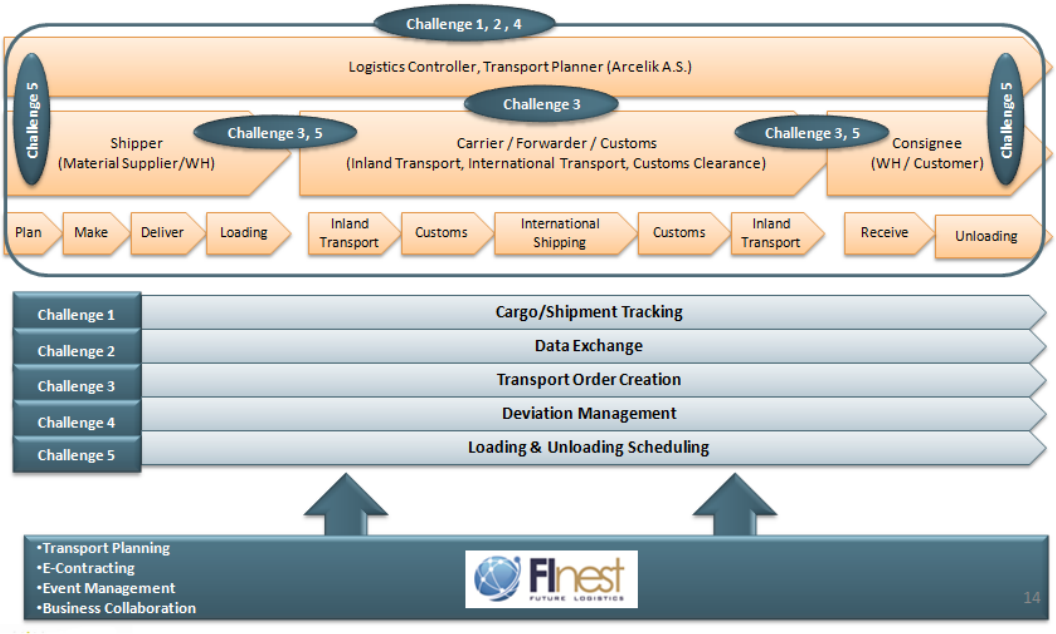


Figure 16: Main challenges encountered in Use Case 3

- ***Cargo/Shipment Tracking***

  This first challenge addresses the problems that companies might have while tracking the status of their cargo and linking status information with their operational plans.

- ***Data Exchange***

  This second challenge addresses the necessity of simplifying and optimizing the information and document exchange through automation.

- ***Transport Order Creation***

  This third challenge is mostly related with the communication problems between the transport responsible, who does the transport planning on behalf of shipper or consignee, and the logistics service providers during the order management process.

- ***Deviation Management***

  This fourth challenge refers to the problems encountered when a deviation/disruption occurs or is about to occur which in turn may lead to unfavorable consequences.

- ***Loading and Unloading Scheduling***

  This last challenge addresses the problems that might occur during pick-up and drop-off of the cargo due to planning problems stemming from the inexistence of a real-time cargo tracking mechanism.

These challenges and their problems and root causes are summarized in the following sections, while a complete and detail analysis is given in Annex 1.3.

3.4.1. Challenge 3.1: Cargo / Shipment Tracking

Challenge description

Logistics service clients, especially manufacturing firms, need to know whether the transport process of their cargo is going in line with their plans. They need to be informed immediately about possible deviations/disruptions to take action on short notice to prevent unfavorable consequences. Since there are various different dynamic parameters that have an impact on the ongoing processes, the logistics responsible, who is responsible from planning the transport of the cargo, should have a tool that monitors the cargo continuously. Many logistics service providers (also ports, airports etc.) have services available on their websites by which their clients can monitor the status of their cargo. However it is time consuming for the client company to track its shipments one by one using such services. Instead companies prefer to have or build their own tracking tools which provide visibility to all of their shipments in one platform and store the relevant data & documents. Most of such tools rely on manual input from the logistics service providers; hence it is hard to assure that status data is always up-to-date. That's why logistics responsible need to communicate with the logistics providers frequently to get real-time data or assure that the data in the tracking system is up-to-date which makes the process time consuming and sometimes complex.

Root cause analysis

As mentioned above, there are two main reasons which makes cargo/shipment tracking a challenge:

- The reliability of the data at the tracking tools is questionable because data is not always correct and up-to-date.
- Collection of real-time data is complex and time consuming.

The underlying causes of these problems are schematized in the figure below.

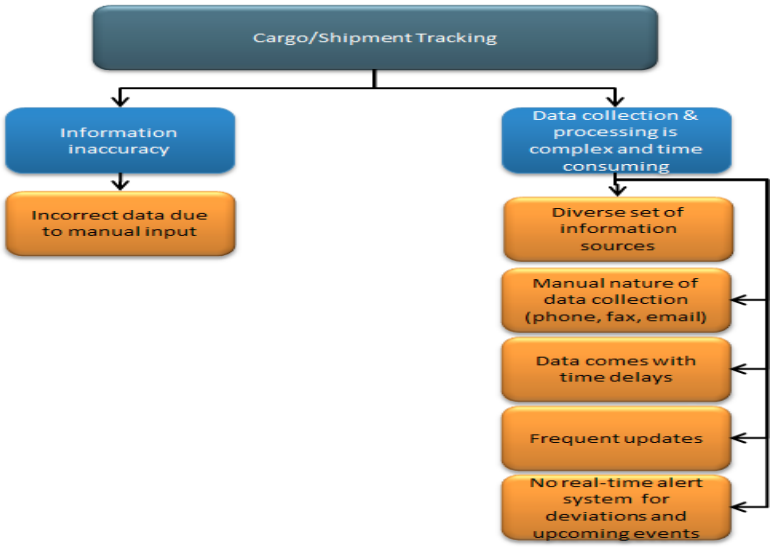


Figure 17: Root cause analysis – Challenge 3.1

- *Data reliability* problem originates from the manual data inputting to cargo tracking systems since human may make mistakes; the person conducting the data registration may misunderstand some relevant information and not update the data on time. In some cases the responsible person doesn't have incentives to do it and another possibility is that input from different sources about the same entity may be different from each other.
- The process of searching for the actual (real-time) data might be *complex and time consuming* because there can be various information sources and transport responsible needs to get in contact with those sources one by one which may in turn result in information with different content/formats. In some cases he can't reach information since it is not available on the time of his request. Additionally communication media such as phone, email are used very frequently which might also create delays in information transfer.

The identification of the challenge's root causes highlights the need for automated input through integration or electronic data extraction in order to avoid human related problems. Sharing data through one channel for all parties involved, for example through a platform where points of interest can be defined and real-time alerts for deviations that can be linked to re-planning, can bring significant benefits

3.4.2. Challenge 3.2 - Data Exchange

Challenge description

For international shipping and customs clearance, the accompanying documents should be complete and accurate. In order to avoid problems at the customs, there is a flow of data & documents or document copies in parallel with the physical movement of goods. "Data exchange" challenge addresses problems associated with data and document exchange through the chain. Most of the documents are created and/or transferred through the chain manually

which leads to extra man-hours spent for the processes and information related problems which in turn results in an increased overall throughput time for the transport process.

Root cause analysis

The problems stem from delays in document/data transfer, data reliability problems, manual nature of processing data and legal restrictions.

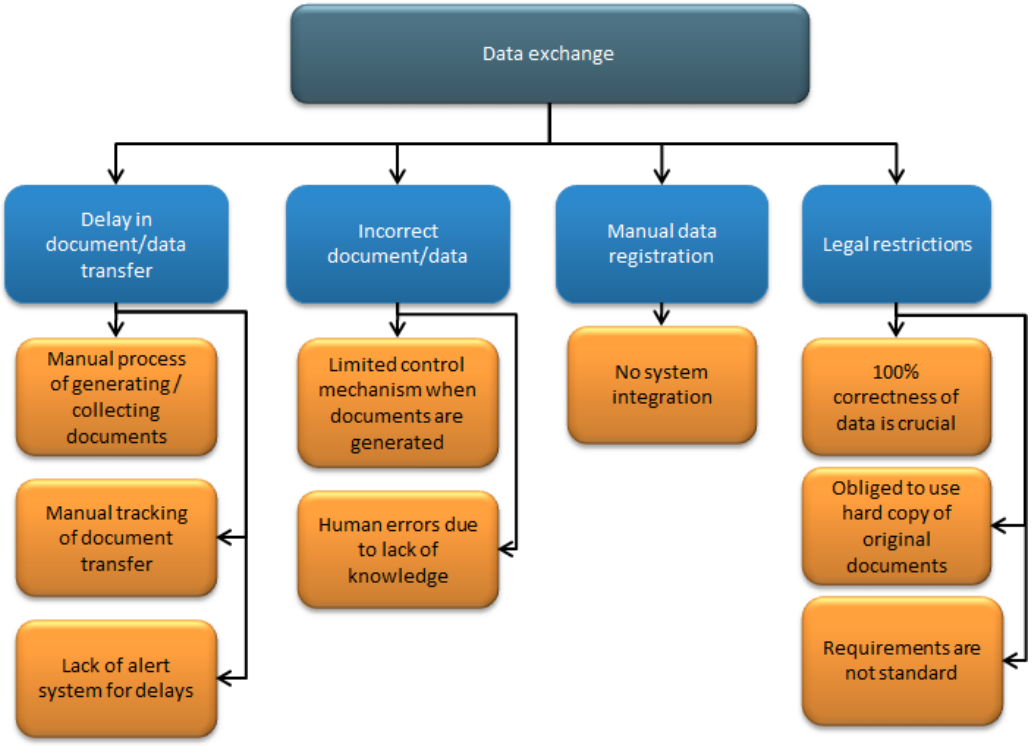


Figure 18: Root cause analysis – Challenge 3.2

As mentioned before, *delays in the information transfer* are mostly due to one-to-one communication, manual communication & data processing.

Data reliability problems as well originates from human errors and most of the time errors in data/documents are realized too late at the execution phase, due to lack of a control mechanism when they are generated before their transfer through the chain.

Another root cause of the problem is *manual registries*. Data is available in many different legacy systems which are not communicating with each other; this in turn leads to a data processing burden in order to copy the data to all relevant systems. The main root cause for this problem is the lack of integration among different legacy systems. It is not really manageable to have integrated systems with all partners for a company like Arcelik since there are numerous service suppliers involved.

Legal restrictions also creates problems in the process because 100 % correctness of data is crucial without any flexibility. Therefore data/documentation should be checked cautiously. Also customs may propose rules such as having original printed documents, signatures on documents etc. which may prevent the electronic transfer of the documents. Additionally the rules of the customs can change from country to country; therefore it is hard to standardize the process for tracking and controlling purposes.

The identification of the challenge's root causes highlights the need for improvement data exchange, better visibility and alert definition features.

3.4.3. Challenge 3.3 - Transport Order Creation

Challenge description

Third challenge "Transport order creation" addresses the problems confronted on pre-booking and cost estimation processes to support transport planning and it also includes booking and booking confirmation.

Before creating a transport order, the person in charge should have an overview of the available alternatives, which is a time consuming process, notably because of manual processing of information and multiple data sources.

Since no system is available that can automatically collect and merge data from the different data sources, transport mode selection decision is dependent on data collection speed, data quality, evaluation skills of the logistics responsible, and available time frame

Root cause analysis

Transport Order Creation is a challenge mainly because of the three main reasons that are depicted below:

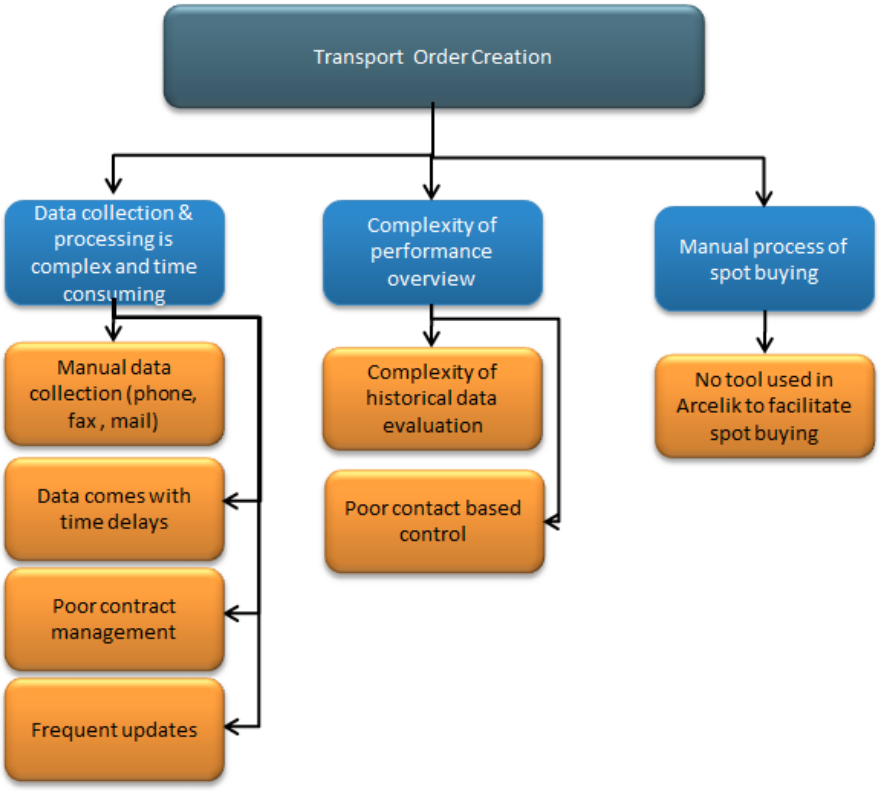


Figure 19: Root cause analysis – Challenge 3.3

- *Data collection* regarding transport services is most of the time is done manually; therefore the problems due to human errors are again existent. The root causes which make transport order creation process complex and time consuming are similar with the ones explained previously for the cargo/shipment tracking challenge. One additional root cause is poor contract based control due to hard copy contracts and not having all the relevant information in the electronic format.
- *Performance of the logistics service* providers are of importance since service quality is one of the main criteria considered while purchasing of the transport service. However measuring quality of the services may require extensive data handling and KPI management.
- *Spot buying process* is not always simple, given that logistics responsible has to collect data from sources on short notice since spot buying is generally an emergency choice for firms and the prices are not standard most of the time.

The identification of the challenge's root causes highlights the need for an online "booking portal" through which communication and collaboration between actors is facilitated.

3.4.4. Challenge 3.4 - Deviation Management

Challenge description

Deviation management as mentioned before stands for deviation handling, on-time and easy information sharing when deviations / disruptions occur or about to occur to avoid unfavorable consequences. Uncertainties are hard to predict and information sharing about disruptions are generally late communicated. Disruptions have a direct impact on shelf availability, on-time delivery performance, customer satisfaction level and loss of sales, company prestige and reliability and may result greater financial losses if companies does not respond on time.

Root cause analysis

The main root cause that makes deviation management a challenge are delays after the event occur (delay in information flow and replanning) and limited early warning possibility. These are schematized in the figure below.

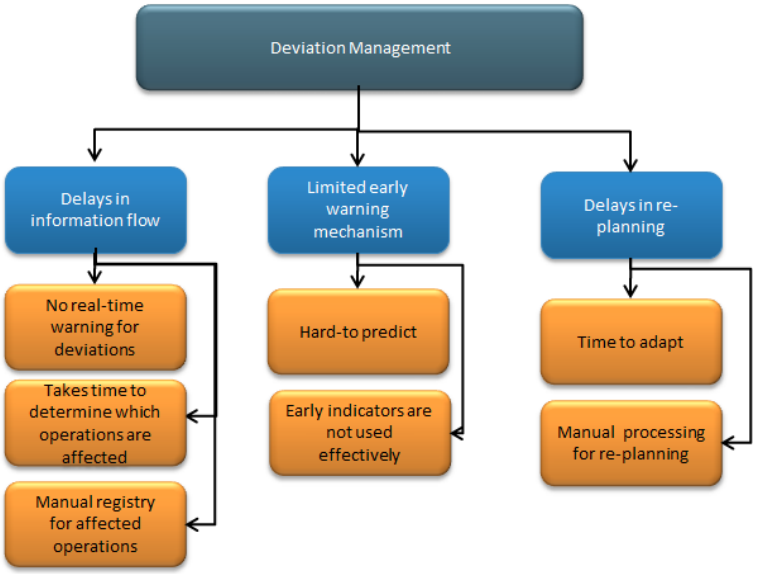


Figure 20: Root cause analysis – Challenge 3.4

- Main reasons for the *delays in information* when a disruption occurs are: one-to-one communication, lack of detail in information transferred.
- There are two main reasons which make hard to establish a *proper early warning* mechanism to foresee possible deviations beforehand: instantaneous nature of disruptions and complexity of identifying right early indicators.
- Finally *immediate re-planning* is not always possible since it may require time for individuals to adapt to the new environment and also manual processes involved in the re-planning phase.

The identification of the challenge's root causes highlights the need for sharing disruption information through one platform with all relevant parties which will ease the communication process and prevent time delays for the communication of the data.

3.4.5. Challenge 3.5: Loading and Unloading Scheduling

Challenge description

The final challenge is *loading and unloading scheduling*, which is related with synchronizing the usage of resources/assets through (real-time) appointments that are made between shipper/consignee and logistics service provider for the pick-up and drop-off time of the cargo.

Loading & Unloading time is always planned, but actual timing may vary depending on several reasons. Lack of real-time visibility of processes makes it difficult to schedule and update appointments in real-time, and update workload plans in order to optimize operations and asset utilization

Root cause analysis

The problems are observed due to lack of a fast and convenient resource/asset planning system which can respond to real-time changes and update plans using the real time status of the cargo.

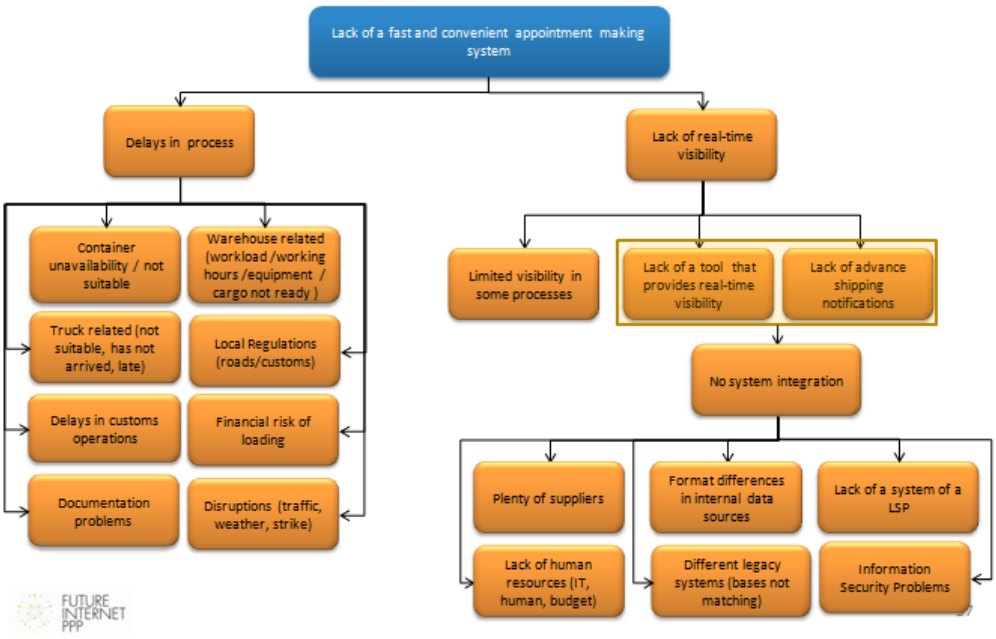


Figure 21: Root cause analysis – Challenge 3.5

Delays are inevitable if planning is not accurate / or flexible enough to cope with changes. Apart from planning, delays in loading & unloading operations can happen because of various reasons depicted in the figure above. Additionally real time information is not utilized in resource management software in Arcelik due to lack of real time visibility and lack of system integration with partners. As mentioned before having one-to-one integration with numerous partners in the chain is not manageable for companies like Arcelik, therefore a cloud based solution where information sharing is done via cloud technology is something Arcelik expects a lot to benefits from.

4. Consolidation of Outcomes: use cases' General Requirements

The description of challenges in the previous chapter and the detailed as-is analysis documented in Annex 1 cover a large amount of information related to challenges, root causes, needs, ideas for solutions. In order to provide some input to the technical WPs that is *general for the three use cases*, and in order to better show how the findings of the use cases is representative of the transport and logistics domain as a whole, a consolidation of all findings of the use cases has been made.

The purpose of this chapter is to highlight the similarities among the use cases: similar challenges, similar needs, similar envisioned solutions, i.e., technical capabilities needed. This does not mean that specificities were left aside. In fact, most of the challenges, root causes, needs or ideas for solutions identified in one use case were relevant in a way or another for another use case, but often with a different perspective (role) or wording.

The consolidation of outcomes is helpful on several levels:

- Provide a consolidated set of requirements to Finest (presented in chapter 4.2)
- Show the representativeness of the use cases with regards the domain as a whole (presented in 4.3)
- Highlight the expected improvements and benefits from the perspective of WP2 and the domain roles represented, and not specifically from perspective of single use case or actor (covered in chapter 6)
- Help building to-be scenarios that illustrates improvements that are relevant for the entire domain, and not only for the use case actors (presented in chapter 5).

4.1. Consolidation process

This consolidation of the results of the use case work was made as follows:

I. <u>Alignment of Challenges with WP1 Main Business Requirements</u>

Remaining at main challenge level, these were grouped according to main similarities,

- First, grouped into main challenge categories: Order Management, Deviation Management, Scheduling and Coordinating, Monitoring and Tracking, and Information Exchange.
- Then mapped towards WP1's four main Business Requirements[6] presented in D1.3: Planning, Monitoring & Visibility, Resource Management, and Collaboration.

The mapping cannot show the details of the main challenges, nor the root causes or the detail of the Domain's business requirements, but this first alignment work was meant to facilitate the further consolidation of all needs and ideas for solutions identified.

The result of this mapping is shown in Figure 6 in Chapter 3.

[6] the 8 requirements presented in D1.1 were updated to 4 in D1.3

II. Consolidation of Needs and ideas for possible solutions

Through the as-is analysis (documented in Annex 1), each use cases produced a set of needs for tackling the challenges and root causes identified, as well as ideas for possible solutions. Many of these needs were relatively similar, but from distinct perspective (role) and with distinct wording.

For consolidating these needs, we further translated and grouped them into **business functions**. This enabled to link all needs to some specific business functionalities required to achieve them, and in turn facilitated the translation of needs into ideas for possible solutions, or more **precisely IT capabilities**[7] required to achieve the need.

These business functions are presented in the matrix below. These are grouped according to the Domain Business Requirements identified by WP1 (D1.3), and briefly described

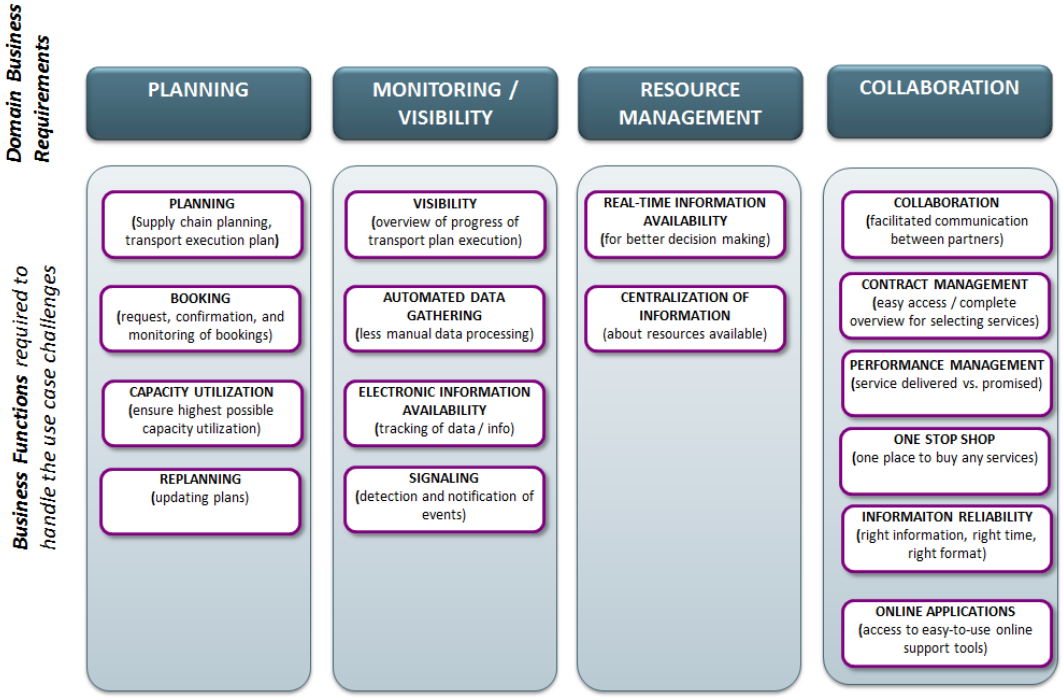


Figure 22: Business functions

This grouping was done for all the needs identified by the use cases, and the result is a list of 21 general requirements common to the use cases and representative for the domain as a whole. This list was presented to the rest of the Finest team for feedback and alignment across the WPs.

This list is presented in the next chapter.

[7] From the point of view of WP2 and the Domain partners, the focus has been on business solutions which can be enabled by Future Internet. From the point of view of the Technical WPs, these correspond to IT capabilities required from FInest and its components.

4.2. 21 Use Case General Requirements

The

Table 4 on the next two pages presents the result of the consolidation of all needs and ideas for IT-enabled solutions identified by the use cases, which can be summarized as 21 *use case general requirements*.

The table contains the following information:

- The first column in the numbering of the use case general requirements
- The "needs" column provide the main "needs" that were expressed by the use cases, and translated into more general forms (less use case specific).
- The column "Business Functions" indicates the main business functions (introduced above) to which the needs correspond.
- The column "IT Capabilities required" present the ideas for possible IT-enabled solutions that the use cases have identified
- The column "short name" provides a summary name of the whole row, thus the requirement described

Table 2: 21 General Requirements identified in the use cases.

	NEEDS	BUSINESS FUNCTIONS	IT CAPABILITIES REQUIRED	SHORT NAME
1	Overview of contracts and contract management	CONTRACT MANAGEMENT	a **booking portal** that creates overview of alternatives transport services matching transport demand (transport plan), using contracts (e-contracting) and criteria defined (best price, best lead time etc.). Provides cost estimation to transport planner and enable benchmarking. Send booking request and confirmation.	*BOOKING PORTAL[8]FORCONTRACT-BASED SERVICE SELECTION*
2	Improve planning upstream and reduce cancellations by implementing alternative cancellation windows & price models	PLANNING	**Booking Manager for spot buying** enabling more binding booking, support variable pricing and hindering the double registration of bookings	*CANCELLATION AND PRICE MODELS IMPROVING PLANNING UPSTREM*
3	Transport plans overview	PLANNING	System for **monitoring transport plans** and status of booking	*MONITORING PLANS & BOOKINGS*
4	Booking based on real-time information on resource availability, Synchronizing of resources and automatic resource planning	PLANNING	A "**Resource planning**" system enabling Intelligent drafting of resource plan and showing real time status of resource booking.	*BOOKING BASED ON REAL TIME SYNCHRIONIZING OF REOSURCES*
5	Booking with ease, Less manual communication	BOOKING	A "**booking" portal**: linked to market place, enable quotations / benchmarking, reservation of capacity, sending booking requests to service providers, sending booking confirmation to customer, and monitoring of booking status.	*AUTOMATIC HANDLING OF BOOKING*
6	Visibility of the status of the shipment (ref points of interest)	VISIBILITY	A "**monitoring**" [9] portal with (semi) automated input from the tracking systems, showing status of the shipment/cargo (or event)	VISIBILITY OF SHIPMENT STATUS
7	Contract based performance control with ease	PERFORMANCE MANAGEMENT	A system for **automated contact-based control**: calculate KPIs for comparing agreed performance (criteria from contracts) with actual performance for the transport plan), and historic data recording.	CONTRACT-BASED PERFORMANCE MEASUREMENT
8	Low threshold tooling available for supply chain partners, via internet. Assumption: all partners have access to internet	ONLINE APPLICATIONS	A **Collaboration Platform**, accessible via the internet where tooling can be downloaded and used.	LOW THRESHOLD TOOLING AVAILABLE FOR SUPPLY CHAIN PARTNERS
9	Handle late cancellations (rebook and find replacement)	CAPACITY UTILIZATION	**Match maker**: capacity<->need, enabling last minute booking, by identifying best match between available capacity and pending transport needs	*MATCH MAKER FOR HANDLING LATE CANCELATIONS*
10	One place featuring all services and	REAL-TIME	A "**resource coordination**" portal for **transshipment** points, providing up-to-date	*REAL-TIME RESOURCE*

[8] It is important to note that the reference to "portal" in the table is not a specific reference to the technical design of FInest (cloud-based), but just a way of explaining a type of IT support needed, from the point of view of business representatives.

[9] It is important to note that Monitoring is more active that Visibility. The idea behind the so called monitoring portal is to establish visibility but also to use the data gathered for triggering actions if needed.

	resource available in real-time accessible by all service suppliers from a single destination	INFORMATION AVAILABILITY	information to suppliers about arrival/departure and all resources requested / booked.	*COORDINATION FOR TRANSHIPMENT POINTS*
11	Immediate and fast communication between supply chain partners when deviations occur	COLLABORATION	Collaboration platform for **fast communication** regarding planning and re-planning and new input for the event manager	*FAST COMMUNICATION FOR (RE)PLANNING*
12	Single platform for port call & service booking at any destination	ONE STOP SHOPPING	A **single platform for booking** of services for carriers at **transshipment points** (airport, port, terminals)	*ONE-STOP-SHOPPING AT TRANSHIPMENT POINTS*
13	Easy-to-find real-time information on available services for enabling voyage planning, and overview of transport demand	CENTRALIZATION OF INFORMATION	**Online Market place** (TEP/TSD) Collect and display transport needs and transport services offer * Electronic (integration with ERP systems) or manual uploading (with standard templates) of demand data * Electronic retrieval of service information from logistics services providers (schedule, voyage details etc.)	*EASY ACCESS TO ANY TEP AND TSD INFORMATION,E- MARKET PLACE*
14	Single information source for all parties, less one-to-one communication	CENTRALIZATION OF INFORMATION	A "**information center**" for the entire transport community combining all information and up-to-date / real-time data , with integration with back-end systems and automatic data collection (IoT)	*SINGLE INFO SOURCE*
15	The right information and documentation on time with Alerts for delays in document / data flow	INFORMAITON REALIABILITY	A **push system for ensuring data quality and punctuality** from transport service client. Monitors the status of document transfer, gives triggers on time when information needs to be sent, and alerts in case of deviation (with identification of responsible). Next “step” can only be initiated if all necessary input is filled in.	*PUSH-SYSTEM FOR DATA QUALITY AND PUNCTUALITY*
16	Correct booking information	INFORMATION RELIABILITY	A **booking intelligence** application that combines booking information from different supply chain partners and gives a trigger when inconsistencies occur.	*CORRECT BOOKING INFORMATION, WITH ALERTS FOR INCONSISTENCIES*
17	Less manual processing of data, minimum human interface	AUTOMATED DATA GATHERING	A portal that facilitates **data/document exchange**, through automated creation and electronic transfer of information, and standard documents through system (eForms). Creating folders/pointers to document copies should also be enabled.	*EDI INTEGRATION, AUTOMATIC GATHERING OF DATA*
18	Time stamping done without human interface	AUTOMATED DATA GATHERING	A collaboration platform that **collects data from shipment units via tags** / RFID chips (leveraging on Internet of Things)	TIME STAMPING DONE WITHOUT HUMAN INTERFACE
19	Links between documents / messages	ELECTRONIC INFORMATION AVAILABILITY	A portal that automatically **links the data/documents/message** to relevant information element (order, offer, plan, invoice, etc)	*LINKS BETWEEN DOCUMENTS AND INFORMATION ELEMENTS*
20	Detection and immediate notification of deviations. Real-time information	SIGNALING	“**deviation management**” system for **detecting early signals**, automatic recording of changes, generating real-time alerts according to predefined points of interests, early indicators / alert rules and expected performance criteria	*ONTIME/EARLYDETECTION AND SIGNALING OF DEVIATION*
21	Trigger re-planning with ease	REPLANNING	A "**deviation management**" system for **automatic updates in plan** based on reception of deviation signals configured as triggers for re-planning (event-triggered re-planning)	*EVENT-TRIGGERED REPLANNING*

4.3. Alignment with WP1's Domain Business Requirements:

The following diagram shows how the 21 general requirements identified by the use cases are covering WP1's Business Requirements (D1.3), and which of the four phases of transport operations they belong to.

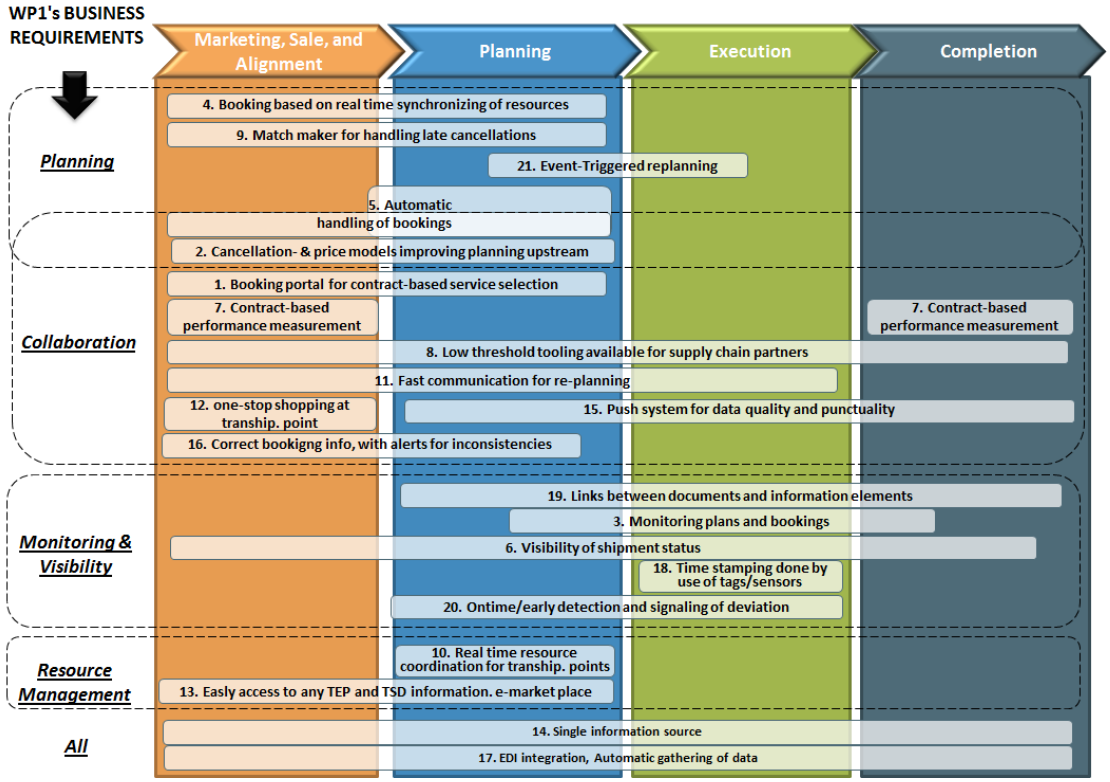


Figure 23: Mapping of Use Cases General Requirements to Domain Business requirements and Four phases of operations.

The diagram above resembles the Figure 6: Mapping *of Use Cases' Main Challenges to Domain Business requirements and Four phases of operations.* While Figure 6 showed the mapping of the use cases' **main challenges** with the domain business requirements and the four phases of transport operations, the Figure 23 above shows the mapping of the **21 use case general requirements** with domain requirements and four phases.

Description of Figure 23:

The white boxes represent the 21 main requirements presented in the previous chapter. The title written the *short name* used in Table 2.

The allocation of a use case general requirement to one of the domain business requirement category (on the left) is done according to the *need* expressed in the requirement, while the allocation of these 21 requirements across the four phases is based on the *IT capability expressed*, and the expected improvement behind the requirement.

For example, requirement #16. "Correct Booking information, with alerts for inconsistencies" is a requirement reflecting the domain business requirement "Collaboration", because it deals with ensuring all parties have the correct information for coordinating their operations. When it comes to the four phases, this requirement #16 is expecting improvement in the booking process (sales/alignment phase) and resulting planning activities (planning phase), but does not focus on accuracy of booking information during the execution phase, nor on the correctness of information on the invoice during the completion phase (these points are covered in the requirement #15. "Push system for data quality and punctuality).

This mapping is a complex exercise and contains some debatable parts, because many of the 21 requirements have underlying assumptions that make the boundaries between them relatively small. Several requirements relates to a similar challenge, thus covering various needs, or to several domain business requirements (e.g. # 2), or to distinct operational phases in different ways (e.g. # 5), which makes it difficult to summarize all in one figure.

However, the intention is to show that the use cases have identified general requirements that represent well the domain business requirements, but also highlight expected improvements in all of the four operational phases.

This analysis is presented in Chapter 6, describing on a high level the use cases' perspective on expected improvements possible through FInest, for each operational phase, and each role in the transport and logistics domain.

4.4. Alignment with Technical WPs

The Domain Business Requirements, and more precisely the 21 use case general requirements were used as a starting point for analyzing the potential support by the FInest Platform and especially the Core Modules designed in WP5 – WP8.

The investigation of how each of the requirements shall be satisfied by the FInest Platform was done in a joint workshop gathering all project partners in Haifa.
The result of this alignment between the four Domain Business Requirements, the 21 use case General Requirements, and the planned capabilities of FInest Core Modules and other platform elements is presented in Deliverable D3.2 (WP3).

5. To-be scenarios

5.1. Selection of to-be scenarios and links to general requirements

The present chapter describes the suggested to-be scenarios as relevant scenarios for demonstrating the specific application of the required IT capabilities identified by the use cases.

The consolidation work showed that several of the use case requirements are common for all three use cases. In addition, as mentioned already, the main challenges presented clear similarities. Because of these similarities, the to-be scenarios selected are not covering each of the 12 main challenges individually, but several of them. In addition, they cover most of the general requirements (to various degrees) and are significant not only for the use case used as context for the scenario, but also for the other use cases.

It is important to note that four of these scenarios are already explored in the four **demonstrators** built in cooperation between the Technical WPs and the domain partners from WP2. These demonstrators were identified in the workshop in Amsterdam.

Both the workshop in Amsterdam and the consolidation work have been important in the process identifying and refining to-be scenarios.

In Amsterdam, the process of selecting "most promising ideas/solutions" to develop demonstrators was based on two main criteria:

- Benefits for business end-users (degree of innovation)
- Viability (= impact towards future business models, barriers for adoption)

These *ideas* discussed in Amsterdam between domain partners (WP1-2) and IT experts from the Technical WPs (3-8), and the resulting demonstrators, were based on the main challenges identified in the use cases prior to the workshop, thus have the same roots as the to-be scenarios described here.

Five to-be scenarios illustrating distinct challenges in distinct contexts (use cases) were described in the following chapter, four closely linked to the demonstrator, and an additional one.

In the process of identifying ideas for solutions, the use case partners identified several to-be scenarios than these five. However, given the relevance of the certain scenarios across the use cases, and also keeping in mind that the experimentation phase later on, only the to-be scenarios presented here were retained.

The table bellows summarizes the list of five to-be scenarios, the corresponding demonstrator, the use case used for specification of the scenario, as well as the main challenges covered (illustrated with *as-is scenarios* in Annex 1).

Table 3: to-be use case scenarios

	To-be Scenario	Demonstrator & technical WP lead	Use Case lead	Main Challenges[10] covered (corresponding as-is scenarios)
1	**HANDLING OF LATE BOOKING CANCELLATION**	Demo 1 (WP8)	UC1	1.1 Late booking cancellation
2	**RESOURCE COORDINATION**	Demo 2 (WP5)	UC1	1.3 Resource coordination at port 1.2 Terminal Planning
3	**REAL-TIME EVENT HANDLING**	Demo 3 (WP6)	UC2	2.1 Order Management (2.3 Monitoring & Visibility of Shipments) (3.4,2.4 Deviation Management)
4	**E-PLANNING**	Demo 4 (WP7)	UC3	3.3 "transport order creation"
5	**AUTOMATED SHIPMENT TRACKING**	-	UC3	3.1 "cargo/shipment tracking" (2.3 Monitoring & Visibility of Shipments)

These to-be scenarios are covering most of the identified general requirements. This is summarized in the next table, the first columns referring to the number of the use case general requirement (presented in section 4.2 above), followed by the corresponding *needs* and *short name*, and the number of the scenario(s) illustrating the envisioned improvement (last column).

[10] In this column, the main challenges tackled in the scenario are listed. Given that the purpose in WP2 is to provide illustrations, and not necessarily cover the entire set of challenges, only the challenges that are central in the to-be scenarios are listed. Parentheses are used for challenges that are tackled, but indirectly. Descriptions of as-is scenarios (current practices) corresponding to these challenges can be found in Annex 1.

Table 4: use case General Requirements covered in the to-be use case scenarios

#	NEEDS	SHORT NAME	Scenarios[11]
1	Overview of contracts	*BOOKING PORTAL FOR CONTRACT-BASED SERVICE SELECTION*	4
2	Improve planning upstream and reduce cancellations by implementing alternative cancellation windows & price models	*CANCELLATION AND PRICE MODELS IMPROVING PLANNING UPSTREM*	1
3	Monitoring plans and bookings	*MONITORING PLANS & BOOKINGS*	4
4	Booking based on real-time information on resource availability, Synchronizing of resources and automatic resource planning	*BOOKING BASED ON REAL TIME SYNCHRIONIZING OF REOSURCES*	2
5	Booking with ease, Less manual communication	*AUTOMATIC HANDLING OF BOOKING*	4,(1)
6	Visibility of the status of the shipment (ref points of interest)	*VISIBILITY OF SHIPMENT STATUS*	5
7	Contract based control with ease	*CONTRACT-BASED PERFORMANCE MEASUREMENT*	None[12].
8	Low threshold tooling available for supply chain partners, via internet. Assumption: all partners have access to internet	*LOW THRESHOLD TOOLING AVAILABLE FOR SUPPLY CHAIN PARTNERS*	All[13]
9	Handle late cancellations (rebook and find replacement)	*MATCH MAKER FOR HANDLING LATE CANCELATIONS*	1
10	One place featuring all services and resource available in real-time accessible by all service suppliers from a single destination	*REAL-TIME RESOURCE COORDINATION FOR TRANSHIPMENT POINTS*	2
11	Immediate and fast communication between supply chain partners when deviations occur	*FAST COMMUNICATION FOR (RE)PLANNING*	3, (1)
12	Single platform for port call & service booking at any destination	*ONE-STOP-SHOPPING AT TRANSHIPMENT POINTS*	2
13	Easy-to-find real-time information on available services for enabling voyage planning, and overview of transport demand	*EASY ACCESS TO ANY TEP AND TSD INFORMATION,E- MARKET PLACE*	4
14	Single information source for all parties, less one-to-one communication	*SINGLE INFO SOURCE*	All[13]
15	The right information and documentation on time with Alerts for delays in document / data flow	*PUSH-SYSTEM FOR DATA QUALITY AND PUNCTUALITY*	5, (3)
16	Correct booking information	*CORRECT BOOKING INFORMATION, WITH ALERTS FOR INCONSISTENCIES*	3
17	Less manual processing of data, minimum human interface	*EDI INTEGRATION, AUTOMATIC GATHERING OF DATA*	1, 2, 4, (3), 5
18	Time stamping done without human interface	*TIME STAMPING DONE WITHOUT HUMAN INTERFACE*	5
19	Links between documents / messages	*LINKS BETWEEN DOCUMENTS AND INFORMATION ELEMENTS*	All[13]
20	Detection and immediate notification of deviations. Real-time information	*ONTIME/EARLYDETECTION AND SIGNALING OF DEVIATION*	3
21	Trigger re-planning with ease	*EVENT-TRIGGERED REPLANNING*	(2)

[11] The parenthese means that the scenario only cover the requirement partially.
[12] KPI are part of the reporting/monitoring based on contracting, planning and event management. However, KPI caculation itself has to be defined individually at the front end.
[13] Basic feature of FInest.

5.2. Five to-be scenarios for testing of FInest.

This chapter presents the five to-be scenarios, showing expected supply chain improvements to be developed by FInest.

Each to-be scenario is presented using the use case scenario template (the blue table[14]) delivered in D2.1, presenting how business operations and interactions are envisioned through the use of Future Internet and the FInest platform.

In addition, a summary and schema of the expected improvements are presented, comparing operations and interactions before and after implementing the envisioned solution.

5.2.1. To-be scenario 1: Handling of Late Booking Cancellation

This to-be scenario corresponds to what is illustrated in the Demonstrator 1, designed in collaboration with WP8. In addition, the present scenario covers some further capabilities that are not highlighted explicitly in Demonstrator 1.

This scenario, featuring a feeder shipping operator, is a typical example of the problem of decision-making and planning in short time window as a consequence of late changes in demand.

Five main enablers are identified in order to reach the carrier's main strategic goals.

Table 5: To-be use case scenario 1: Handling of Late Booking Cancellation

UCS elements	Description
UCS name	Handling of Late Booking Cancellation
ID	TB-UCS1
Goal	Handling of late cancellation of bookings of feeder shipping services.
Summary	The scenario illustrates how the carrier is able to handle late cancellations of bookings and search for candidates for replacing the cancelled cargo, thus ensuring higher load factor. The system establishes overview of available capacity in the short period before departure, and identifies matching shipment needs from an online market place. The carrier is then able to send an offer directly to the shipper whose transport needs matches best the capacity available.
Category	Planning, Replanning, Booking
Actors	Sea Carriers (Feeder operator, oversea operator); Agents (overseas line and feeder); Forwarder; Shipper (fish exporter)
Primary actor	Carrier: Feeder operator, bearing direct consequences of no-show.
Stakeholder	Overseas line: also handicapped by cancellations Terminal: handicapped by multiple and late changes in bookings Forwarders and agents: much information handling for nothing
Preconditions	A fish exporter needs to export fish in containers
Triggers	The fish exporter contacts the forwarder for arranging transport.

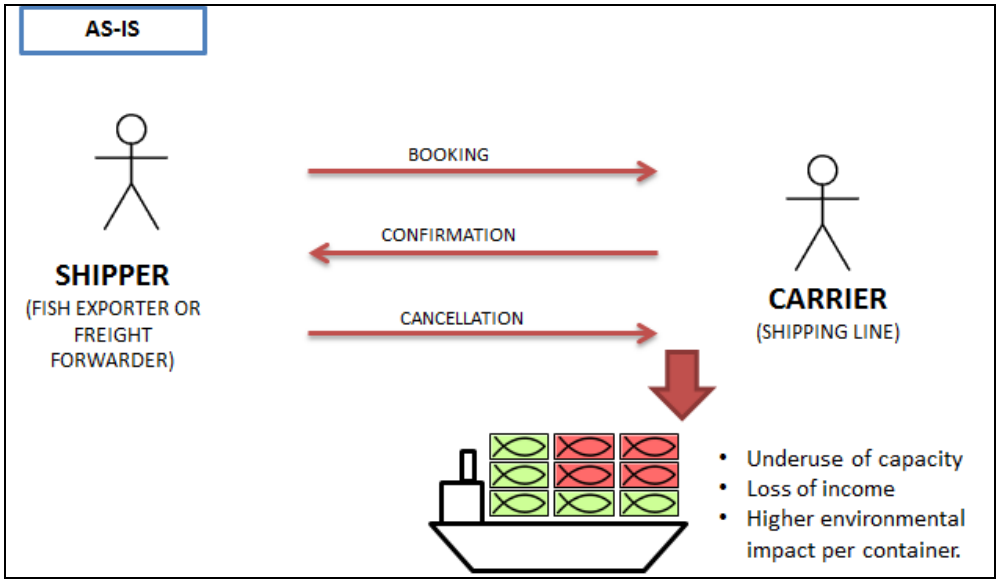
[14] Please note that several of the fields of this template were optional, which means that not all five to-be scenarios descriptions are covering the exact same set of fields.

Scenario	Reservation of capacity (up to 2 days before departure) 1. Shippers can register in a common platform needs for transport, as well as reserve capacity from a specific carrier with no commitment 2. Based on historic of cancellations of the given shipper, the system calculates probability of cancellations, which helps the carrier to forecast bookings and plan more accurately 3. Handling of booking cancellations (up to 4 hours before departure): 4. The feeder operator has built an operational plan based on all booking requests received during the past 5 days. 5. 12 hours before departure, a cancellation of booking is communicated to the feeder operator by a shipper A. 6. According to the contract terms, penalty is given to the shipper (e.g. non-refund) or not 7. This cancellation is registered in an online system that informs automatically all parties depending on that information (including the terminal operator). 8. The carrier checks available capacity at later departures and send a proposal for new booking to the shipper A. 9. Further, the system, that has an overview of the carrier's operational plan(s), highlights the capacity available resulting from the cancellation (and other similar cancellations). 10. The systems, which is linked to online market places where needs for transport are registered, identifies appropriate candidates for filling up the available capacity. This is done by finding the best match possible given a set of criteria (the time remaining before departure, the current localization of the cargo, the number of containers to be shipped, etc.). 11. The carrier selects one relevant candidate (shipment needed) for filling up as much available capacity as possible, and sends an offer to the shipper B. 12. Shipper B accepts the offer and books this shipment as a last minute booking. 13. The carrier updates the operational plan, stowage plan, and discharge/ loading list 14. The discharge / loading list is communicated to the terminal
Decision point	Similar to as-is UCS1-1 (Late Booking Cancellation) described in Annex 1.1
Information processing	The online system is connected to: - the carrier's back end system - online market place with information on transport services and transport needs
Post conditions	The vessel effectuates its voyage
Challenges	Remaining challenges (same as for the as-is scenario UCS1-1): • Late cancellations remain a problem, although financial consequences may be overcome through distinct pricing model. New challenges: • 100% match is difficult due to the number of point of loading. Not only the quantity and type of cargo must match, but also the point of loading and discharge. • Last minute booking is still constrained by time needed for physical cargo handling.
Future Internet opportunities	The following general requirements identified in WP2 are covered in this scenario: 2.Cancellations and price models for improving planning upstream 5. Booking with ease, less manual communication 8. Low threshold tooling available for supply chain partners 9. Match Maker for handling late cancellations 14. Single information source 17. EDI integration, automatic gathering of data

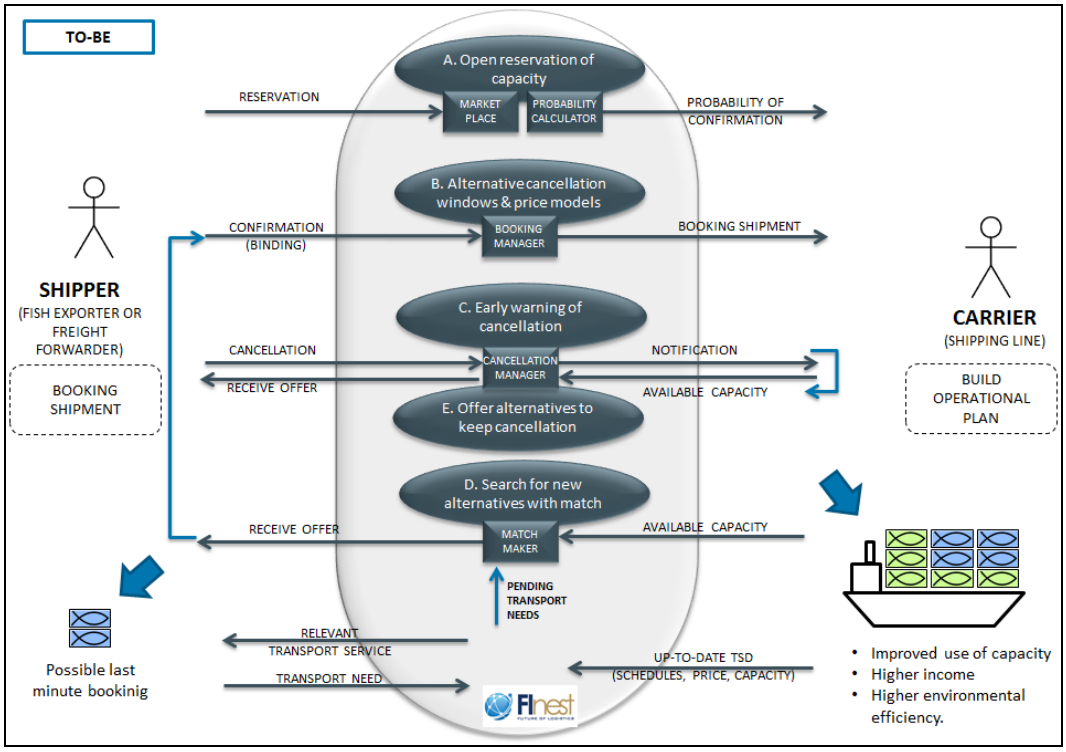
Foreseen changes and improvements in the scenario:

The two pictures below illustrate the as-is (presented in Annex 1.1) and to-be situations related to *late handling of cancellations*, followed by a table summarizing the changes and improvements expecting in the scenario 1.

Before



After



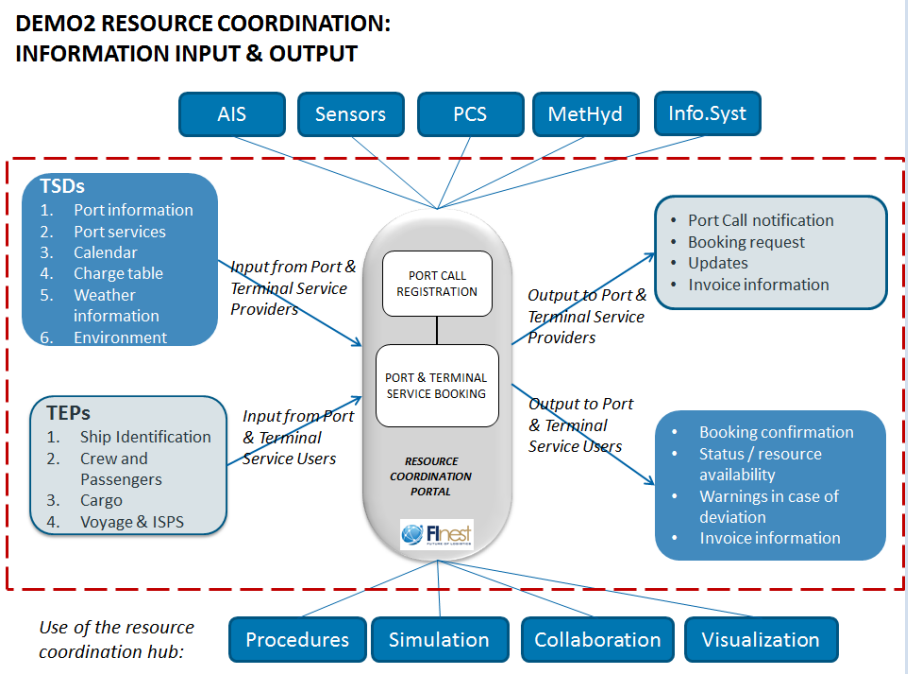
Business Role	Before	After
Shipper	• Flexibility in booking	• More commitment to booking • Incentive for more accurate planning • Possible last minute booking
Carrier	• Cancellations • Low visibility of demand • Late cancellations • Late information • Low environmental efficiency	• Active search of customer (last minute) • Improve use of capacity • Higher income • Higher environmental efficiency
Terminal	• Frequent changes in discharge/loading list	• Less changes, less booking cancellations. • Possibilities to book replacement cargo

5.2.2. To-be scenario 2: Resource Coordination at Port & Terminal

Table 6: To-be use case scenario 2: Resource Coordination at Port & Terminal

UCS **elements**	Description
UCS name	RESOURCE COORDINATION AT PORT & TERMINAL
ID	TB-UCS2
Goal	Seamless handling of ship arrival: Reducing redundancy, errors in information transfer and increase preparedness
Summary	Handling of ship arrival corresponds to the operational phase from planning of port call (when a ship announces it to the port) until the port call is completed (the ship has arrived and left).
Actors involved	**Actors**: Port, Vessel, Ship agent , Shipping Line, Terminal **Systems**: Port Community System (inPort), SafeSeaNet (SSN), AIS
Primary actor	Port (port control): responsible for handling port call; main decision maker.
Stakeholder	• **Terminal** (receive info about ship arrival and need for cargo handling services) • **Ship services suppliers** (receiver of information related to booking of ship services) • **Local authorities** (receiver of ISPS information and info about arrival of cargo) • **Local community** (receiver of information related to local maritime traffic)
Preconditions	Ship needs to call at port for loading and discharging of cargo
Triggers	Port call announcement
Main success scenario	0. A container operator communicates an operational plan to a ship and ship agent. The voyage includes a call at Ålesund port. 1. The captain/ship agent logins into an online platform (the resource coordination hub, described in Demonstrator 2) for register the planned port call and booking related services at the port of Ålesund 2. The platform integrates information from the SSN system and the Port Community System. 3. The captain select the actual ship from a database, then select the actual port of call 4. In the port call window, all information already communicated to SSN appears[15]. The captain validates, or updates the ETA, then select the quay and confirm the port call. 5. If the quay is not available, a warning appears displaying quay availability at the approximate time of port call, and the captain must either chose another quay or update the ETA/ETD. 6. The captain / ship agent continues to booking of port & terminal services, by selecting them from a list and providing some specifications 7. The platform combines this information with information from port/terminal for establishing a suggested resource plan 8. When booking is sent, a booking status window appears, displaying all resources booked, the time window, and the status of the booking (booked, waiting for confirmation, under progress, completed, etc.) 9. All bookings are sent to the service suppliers, who confirm or propose another time. The system updates the resource plan progressively as service suppliers confirm the booking. 10. On the other side, the port and terminal service suppliers can log on into the

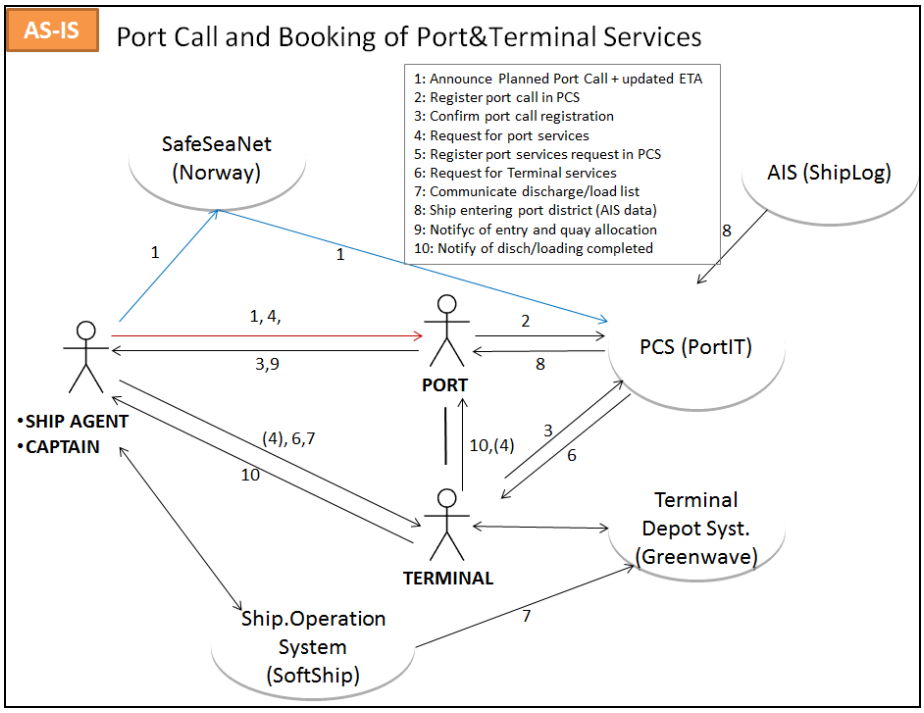
[15] Ideally the registration of information in SafeSeaNet system will be done also through the same platform.

	platform and obtain real time information about all planned port call, services booked, status of bookings etc. 11. The ship arrives at the port: AIS data about ship entering port district is sent to PCS. The ship receives an automatic confirmation of quay availability. 12. Ship services are accomplished (port) 13. Discharge / loading are done by the cargo workers (Terminal); confirmation is sent to ship agent. 14. The ship leaves the port
Decision point	Similar to as-is UCS1-3 (Resource Coordination) and as-is UCS 1-2 (Terminal planning) described in Annex 1.1
Information processing	The information input and output to and from the Resource coordination platform is illustrated below: 
Extensions	All deviations (earlier or delayed arrival, change in ETA, ETD, services needed) are handled automatically, the system giving automatic warning to port and terminal, and the process starts from step 1 again.
Alternative paths	The information on port call can be accessed directly on the PCS by the stakeholders (ship service suppliers, terminal operator)
Post conditions	The port call is completed; the ship has departed.
Challenges	Remaining challenges (same as in the as-is UCS1-3): • much information/ communication to be monitor by Port Control • capacity allocation problem New challenges: • Wrong information registered • No information registered • Limited human contact • No immediate confirmation of reception of request
Future Internet opportunities	The following general requirements identified in WP2 are covered in this scenario: 4. Resource Planning System (with on real time status of resource booking) 10. Real-Time Resource Coordination for Transshipment Points 12. One-Stop-Shopping Service at Transshipment Points

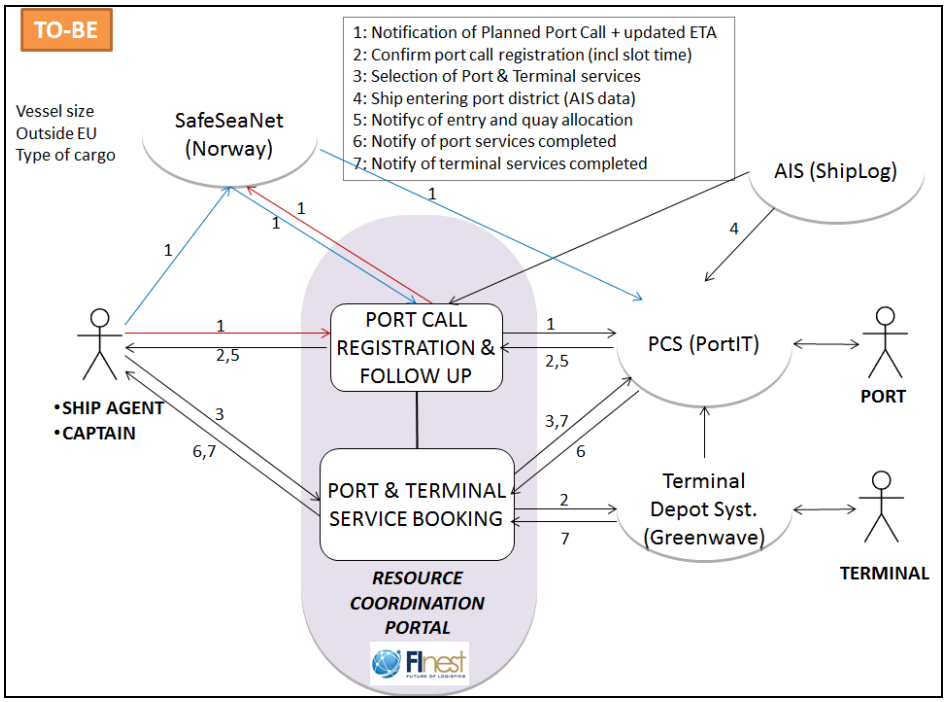
Foreseen changes and improvements in the scenario:

The two pictures below illustrate the as-is (presented in Annex 1.1) and to-be situations related to *resource coordination at port and terminal*, followed by a table summarizing the changes and improvements expecting in the scenario 2.

Before



After



Business Role	Before	After
Port	• Service info presented on website • Ship arrival & departure notified by AIS system • Port call registered by port in PCS (manually or electronically in portIT)	• Services also accessible through a common portal for ports, with calculation tools for preparing voyage. • AIS information directly retrieved by the portal for updating port call planning • Port call registered automatically in back-end system (portIT)
Captain / Ship agent	• Port call registered in SSN, then announced by email/phone/fax/radio • Booking of services by email/phone/fax/radio • No overview of capacity available at terminal for customers	• Port call registered in one place only, sharing information with ports and SSN • All booking online, with access to real time information about resource availability (quay) • Monitoring of booking based on real time info
Terminal	• Some integration between terminal and port community system. • No overview of inventory available for carrier	• Completed integration and information sharing about resource planning • Improved information sharing about updates in load/discharge and cargo available for departure.
General	• Multiple information sources, and duplication of information • Many one-to-one communication	• Centralized information source • EDI integration and automatic information sharing

5.2.3. To-be scenario 3: Real-time event handling ("one truth")

Table 7: To-be use case scenario 3: Real-time event handling

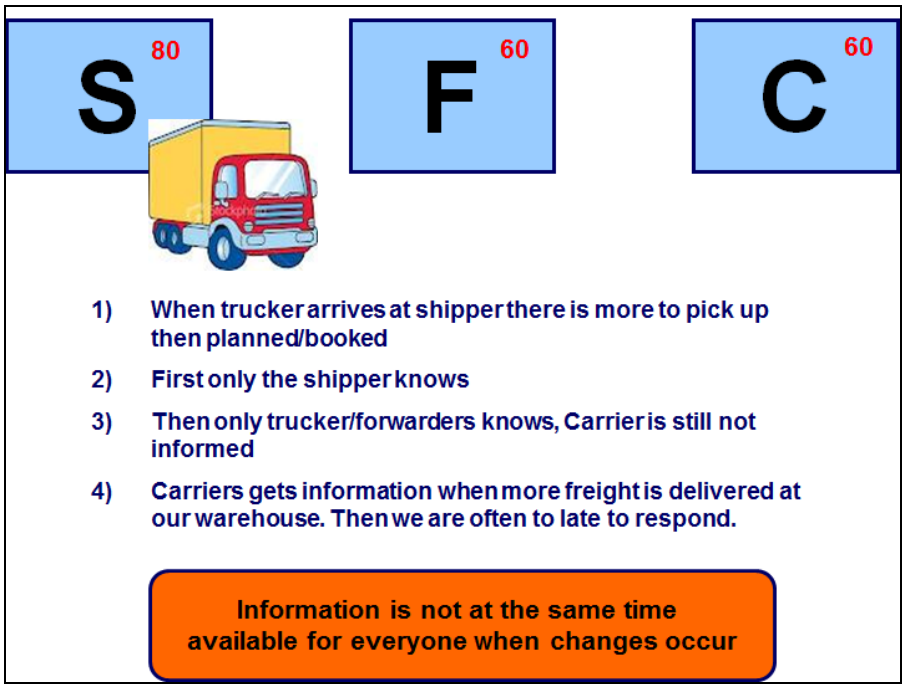
UCS elements	Description
UCS name	Air shipment – Import of shipments into EU (AMS) ex PRC. >
ID	TB-UCS3
Goal	In many shipments there is a gap between the booking information and the actual shipment, because planning is not aligned or information is not available. We have gaps between: The booking and the AWB, The AWB and the physical freight and the booking and the physical freight. This use case aims to reduce these gaps and make the process more efficient.
Summary	Several shipments of fashionable goods are being trucked from different locations in China to Xiamen. All shipments are fashionable goods (e.g. shoes, clothes, sunglasses). The forwarder consolidates the different shipments in Xiamen and transports it to the warehouse of the carrier. Air transport, including handling by carrier. The forwarder picks up the goods at the airline in AMS and arranges the customs declarations. The forwarder executes the deconsolidation and forwards it to the Consignee.
Actors involved	• **Shipper:** does the transport request • **Forwarder** (KN): KN AMS / KN SHA used ITC system CIEL FA for order processing and KN Login for visibility, C2K for data exchange with airlines and terminals • **Carrier:** Customer support officer who facilitates the booking in the booking system. Operational employees in the warehouse who physically check the freight dimensions. Employees from the documentation department who check all documents. The carrier is using many different systems for booking and operational planning and execution. • **Authorities:** Customs officer who checks cargo (both information and physical check)
Primary actor	The consignee, shippers starts in this use case with the replenishment/transport request. KN SHA is collecting the shipment from the origin. AFKL supports the freight air transport.
Stakeholder	Shipper, Forwarder, Airline, Customs, Airport Terminal Operator, Customs, Consignee
Preconditions	A shipper needs to send cargo ordered by a consignee
Triggers	Triggers can be very diverse. Some examples: Replenishment of consignee, transport request of shipper, Pick up of the shipment at the origin, transport request from forwarder
Main success scenario	1. A Consignee has made a demand forecast and orders new fashionable goods at the manufacturer/shipper. 2. The shipper is producing the fashionable goods and places at the same time an order for transport at the forwarder (4 containers). 3. The forwarder organized the whole transport and arranges trucking at origin, air transport and trucking at the destination. 4. The trucking company arranges truck capacity 5. The forwarder is counting on 4 containers for an optimal usage of their allocation at the airline and the air carrier has reserved the capacity of 4 containers. 6. The consignee experiences a higher demand and decides to order more at the

	shipper. The manufacturer produces the extra needed goods and directly gives a signal to the Finest Platform. The Finest platform distributes this information towards the forwarder and the carrier immediate. 7. The carrier and forwarder can determine together how they can serve the changed need of the shipper, other consolidation, other loading of the aircraft, change timing of delivery and determines the new prices. The final offer is send back to the shipper. 8. The shipper agrees or not agrees. When there are agreement all parties have capacity reserved for the new capacity need, 4 containers. 9. All information exchange, making this change possible, is communicated via the Finest platform, causing less data error and the logistic service providers to adapt.
Decision point	Shipper: does the shipper need transport, when, how much, which modality? Does (s)he need more, less transport? Forwarder: Latest acceptance time of the delivery at the forwarders warehouse. Needs to determine if he can support the needs of the shipper, for example: can we take more freight than originally planned? Carrier: Latest acceptance time of the delivery at the air carrier warehouse. Needs to determine if he can support the needs of the shipper, for example: can we take more freight than originally planned? Does it fit in the aircraft? More weight? What is the impact on cost and therefore pricing?
Information processing	Consignee – Shipper: Purchase order. Shipper – Forwarder: Kind of freight -> transport request. Forwarder – Carrier: Kind of freight, dimensions, handling request e.g. Medicine, Flowers, via phone, fax, booking portal Carrier – Forwarder: Confirmation to forwarder Forwarder – Customs: Customs declaration. Carrier – Customs: Export and entry messages to customs, EDI Carrier – Forwarder: Notified delivery, via EDI
Extensions	Examples of extensions which can take place are mentioned in the root causes
Alternative path	If the actual freight differs from the booking information their might be a delay. Or the forwarder or the carrier might re plan the freight on another day/transport.
Post conditions	Shipment is customs cleared and can be delivered to the consignee; Shipment is compliant to all legal rules from safety perspective, customs perspective, etc. Products to be shipped are not under embargo.
Challenges	Challenge 1 Order Management lead to several issues or failures (see attachment). The challenge is to decrease the existing gaps.
Future Internet opportunities	Business Collaboration functions that share information on time between supply chain partners to deal with those changes in demand.

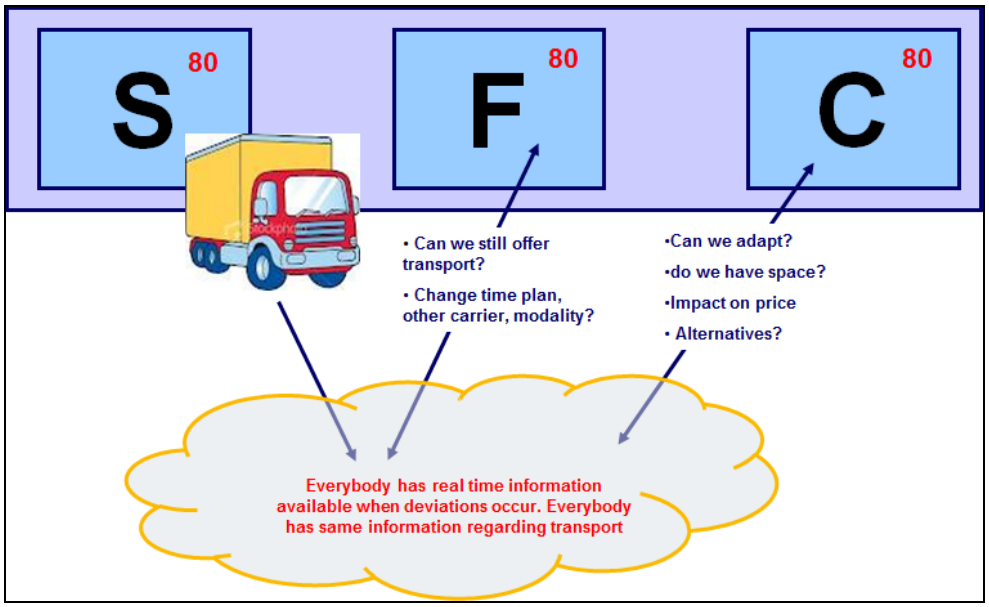
Foreseen changes and improvements in the scenario:

The two pictures below illustrate the as-is (presented in Annex 1.2) and to-be situations related to *real-time event handling*, followed by a table summarizing the changes and improvements expecting in the scenario 3.

Before



After



Shipment execution	Before	After
Trucking to Xiamen.	• Fashion market has a volatile demand • The booking, being made changes a lot • Forwarder and Carrier are not always aware of these changes causing a lot of hick ups	• Fashion market has a volatile demand • The booking, being made changes a lot • Forwarder and Carrier are immediately aware of these changes and can determine how to deal with these changes because the shippers give a change request that is immediately available via the Finest platform for forwarder and carrier • Carriers checks if it is possible and communicates deltas to the forwarder. Forwarder communicates and finalizes the deal with Shipper
Consolidating of shipments in to the carrier's warehouse	• The forwarder receives different actual freight then original booked. This is causing problems for efficient consolidation. Also difficult for the forwarder to align the consolidation with the reserved freight capacity at the carrier	• The forwarder receives different actual freight then original booked. • The forwarder was able to adapt the freight capacity because he knew the change in advance.
Air transport, including handling by carrier	• Surprises occurs when the shipments Is delivered to the airline (more freight then planned)	• No more/less surprises occur because both forwarder and airline are informed about the changes. Shipper, Forwarder and Carrier already agreed about the freight, no hick ups in the process
Pick up, custom declaration, deconsolidation	• The forwarder at the airport of destinations reserved 4 trucks for transporting the goods to their final destination. At the end 3 trucks were necessary and the Forwarder needs to pay for 4 trucks.	• The forwarder was aware of the changes and adapted his number of pick-up trucks from 4 to 3.
Forwarding to the consignee	• The consignee doesn't get his freight on time in full because the freight capacity was not available	• The consignee has freight on time in full, because there was early communication in the tree partite, Shipper, Forwarder and Carrier

5.2.4. To-be scenario 4: ePlanning (Transport Order Management)

Table 8: To-be use case scenario 4: ePlanning

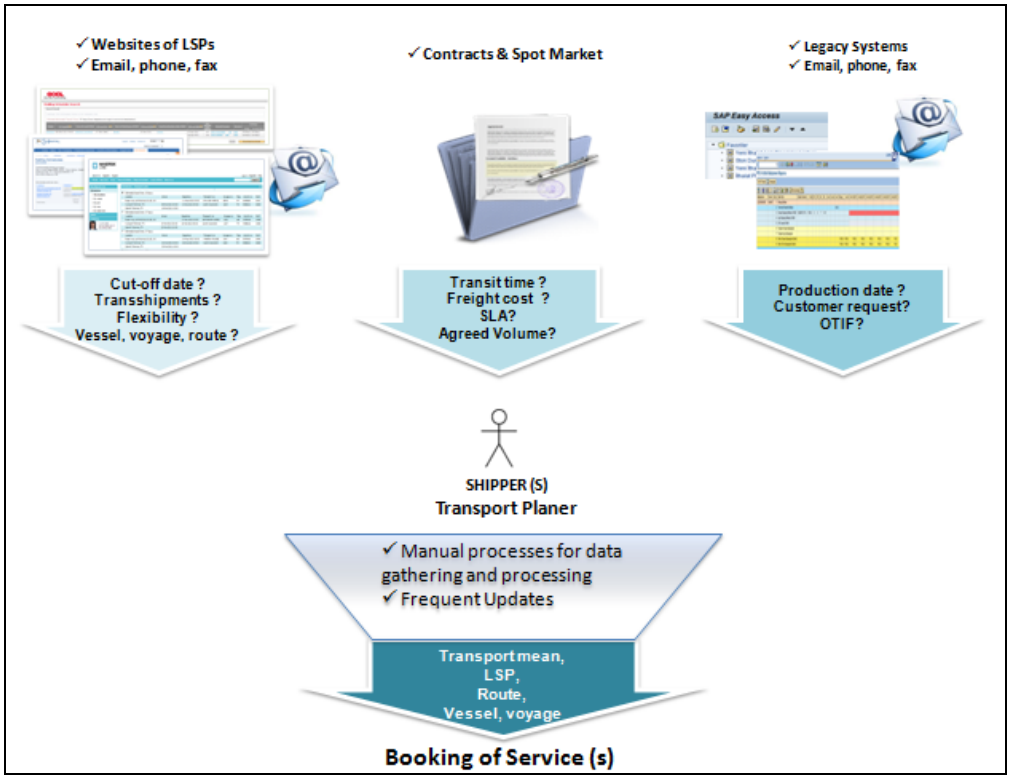
UCS elements	Description
UCS name	E-PLANNING
ID	TB-UCS4
Goal	Creating an overview of the alternative transport means, ensure cost efficiency, effective contract management, on-time delivery in full
Summary	**Import:** Purchased items (raw materials) from a material supplier in Korea are loaded on containers/trucks and transported to the port of loading (Busan). Containers are customs-cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. Finally they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance. **Export:** Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.
Actors involved	**Actors:** Shipper (Material Supplier of Arcelik or Arcelik itself (Logistics Responsible)), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself) **Systems:** Logistics Portal of Arcelik, Websites of LSPs
Primary actor	**Logistic Responsible (transport planner):** responsible for transport order creation, main decision maker.
Stakeholder	Customs Broker/Authorities
Preconditions	Confirmed purchase order between Shipper and Consignee: shipper needs transport.
Triggers	Definition of transport demand (e.g. Shipping Order Form or Pre-Order Record)
Main success scenario	1. Shipper defines transport demand (in a format similar to packing list) and inputs transport demand to FInest platform. 2. Transport Planer is notified when the transport demand is created in the FInest platform and he can make corrections/updates on the demand description. 3. Transport planner selects the transport demands to start transport planning. 4. The system automatically matches services (of long-term contracted parties) with transport demand and presents a set of feasible transport plan alternatives to the transport planner. 5. Transport Planer selects the best option available from the presented list and the system tries to book services in the plan. 6. Transport planner can view its existing transport plans and monitor/check the status of his booking (confirmed/not confirmed).
Decision point	Same as as-is scenario of "Transport Order Creation" (UCS3-3), described in Annex 1.3
Information processing	• Online market place collecting / displaying transport needs and transport offers • The system matches the demand with service using contract information • Backend systems for booking
Post conditions	Booking of Transport Service(s)

Challenges	Contract based performance management and displaying related KPIs during transport order creation
Future Internet opportunities	The following general requirements identified in WP2 are covered in this scenario: 1- Overview of contracts 5- Booking with ease, Less manual communication 13- Easy-to-find real-time information on available services for enabling voyage planning, and overview of transport demand 17- Less manual processing of data, minimum human interface

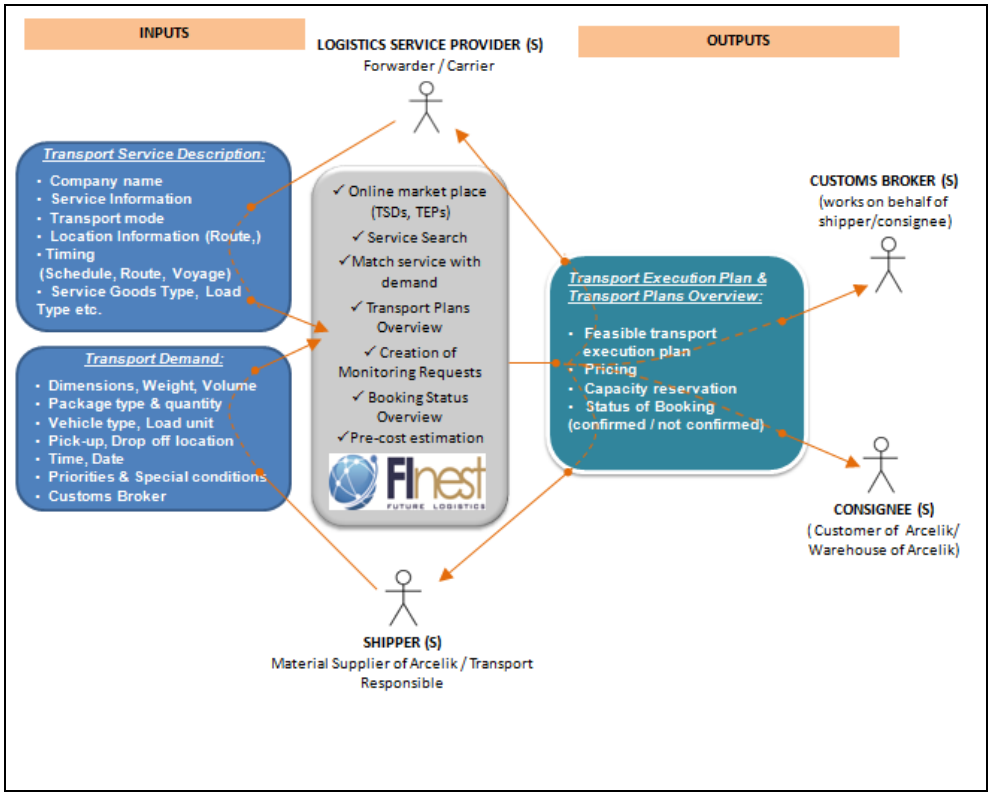
Foreseen changes and improvements in the scenario:

The two pictures below illustrate the as-is (presented in Annex 1.3) and to-be situations related to *ePlanning*, followed by a table summarizing the expected changes and improvements.

Before



After



Business Role	Before	After
Shipper	• Manual process of data collection • Data is collected from many different sources which have different formats • Time delays in information input • Hard to track updates • Manual data processing for forming a cost overview	• Online service description connected to booking application • Automated data gathering • Automatic pre-cost estimation • Visibility of historical usage on the time of purchasing • Effective contract management • Visibility on environmental impact • Collaboration among partners who work on the same transport chain plan

5.2.5. To-be scenario 5: Automated Shipment Tracking

Table 9: To-be use case scenario 5: Automated Shipment Tracking

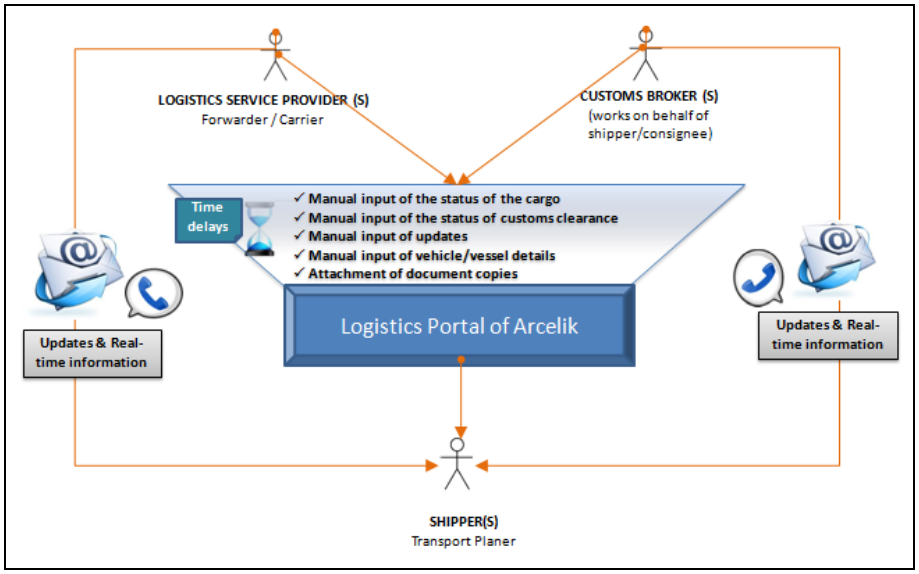
UCS **elements**	Description
UCS name	AUTOMATED SHIPMENT TRACKING
ID	TB-UCS5
Goal	Ensure on-time delivery in full, receive information about deviations, ensure security of the cargo along the supply chain, foresee bottlenecks and problems to take precautions on-time, ensure high customer satisfaction
Summary	**Import:** Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance. **Export:** Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.
Actors involved	**Actors:** Shipper (Material Supplier of Arcelik or Arcelik itself (Logistics Responsible)), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself) , Customs Broker **Systems:** FInest platform, internal tracking systems or websites of logistics service providers
Primary actor	**Logistics Responsible:** Responsible for Logistics planning , transport monitoring and handling the deviations during execution to achieve high delivery performance
Stakeholder	Customs Authorities, Port Authorities
Preconditions	Confirmed purchase order between Shipper and Consignee and the products are/will be ready for shipment
Triggers	Logistics service provider (carrier) arranges pick-up
Main success scenario	1. LSP has real-time tracking systems available and accepts to share it with the FInest platform. 2. Real-time data on shipment status (event) is extracted from information sources electronically. 3. Actors can define their points of interests and performance criteria (e.g. agreed duration) for their monitoring requests (alert rules) and can subscribe to the events that they are interested. 4. After the execution phase of the shipment is started, according to the monitoring requests they defined, actors receive notifications/alerts. Cargo deviations and time deviations are informed to the parties when they happen (within a very short notice). 5. The shipment status is visible to the all parties involved (who have authorization to see it) from one source. 6. By using sorting/reporting features, users can form lists/reports including information about the shipments that they would like to monitor if they

	have authorization; hence can manage their workload effectively by planning current & proceeding operations based on more reliable data.
Decision point	Same as as-is scenario "Cargo/Shipment Tracking" (UCS3-1)
Information processing	• Real-time data creation by external sources (Tracking systems etc.) • Event Monitoring • Status updates on Shipments
Alternative paths (optional)	Real-time event data can be collected via RFID tags or other similar technologies and shared with FInest platform directly (without any interaction with an intermediate tracking system).
Post conditions	Alert/Notification creation and planning/re-planning if necessary.
Challenges	• Creation of real-time data • Limited visibility in customs processes
Future Internet opportunities	The following general requirements identified in WP2 are covered in this scenario: 6- Visibility of the status of the shipment (ref points of interest) 15- The right information and documentation on time with Alerts for delays in document / data flow 17- Less manual processing of data, minimum human interface

Foreseen changes and improvements in the scenario:

The two pictures below illustrate the as-is (presented in Annex 1.3) and to-be situations related to *Automated Shipment Tracking*, followed by a table summarizing the changes and improvements expecting in the scenario 5.

Before



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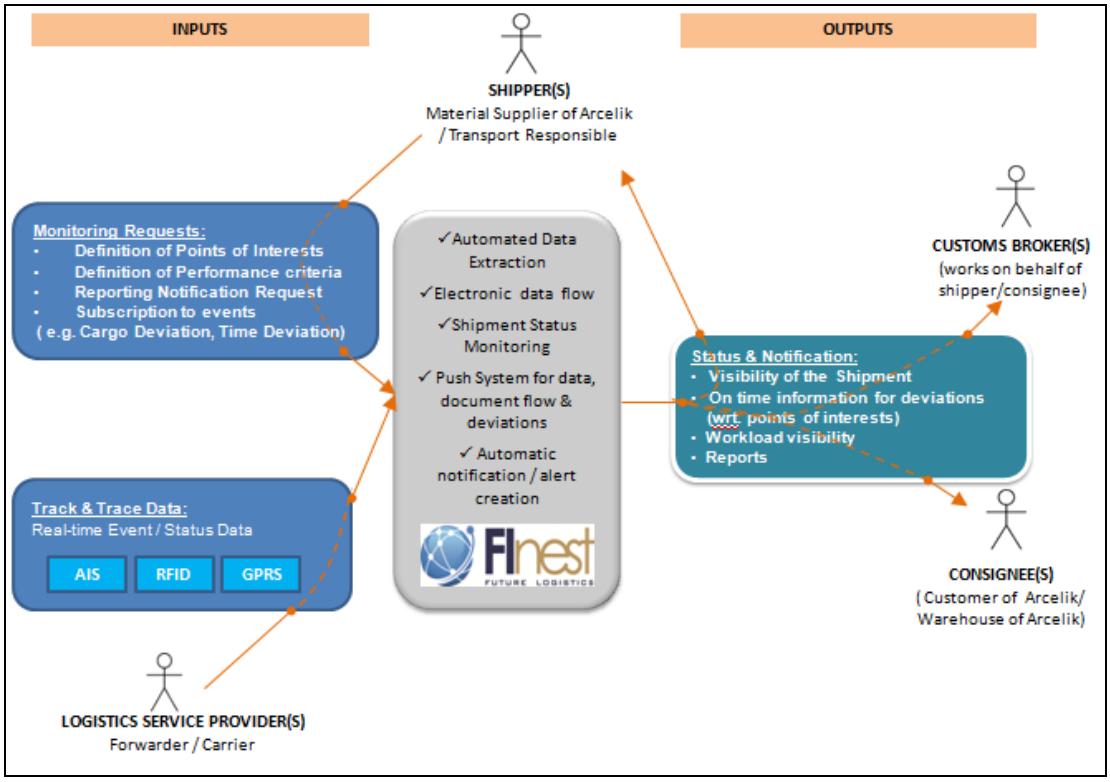


Business Role	Before	After
Shipper	• Manual input from LSPs about the status of the cargo • Time delays in information input • Lack of automated alert system for deviations	• Automated input from tracking systems • Information is visible to the parties that have authorization at the same time • Timely notification of deviations

6. Expected Impact of FInest

Many research projects currently running intends to improve the T&L domain. Besides, a huge amount of IT-systems that can be used for solving the problems expressed by the use cases (very common problems that are representative of the domain) are currently commercially available, or already implemented by actors in the domain.

However, the purpose of the project is not to solve the totality of the challenges experienced by transport and logistics actors or to identify brand-new operating solutions. The project aims at improving collaboration, and *enabling the domain to switch from close-shops to open-systems*, through the design of a platform available to any T&L actor that facilitate coordination among all parties (building on existing systems in use and facilitating data exchange), together with a set of applications accessible online by any actor for reducing dependency on back-end systems.

The team underlined that expected benefits of the FInest platform will vary from role to role in the transport domain, as well as from actor to actor, according to the size of the company, the market covered etc. (e.g. specific applications might be more relevant for SMES).

Therefore, the present chapter is aimed at presenting, on a high level, the expected impact of the FInest solution.

This chapter presents results focusing on roles and phases in the transport chain. The objective is to clarify requirements, possible new solutions/services and benefits related to roles and the four defined phases in the transport chain. In addition some possible constrains are focused on, addressing important issues to be aware of when it comes to realizing and implementing FInest solutions. The results are also related to the detailed domain business requirements identified in WP1.

6.1. Roles and actors in the supply chain represented in FInest.

Figure 24 shows the roles that the actors represented in the Use Cases have in FInest, and maps these roles to the generic role groups of logistics service client and providers, transport regulators and infrastructure managers.

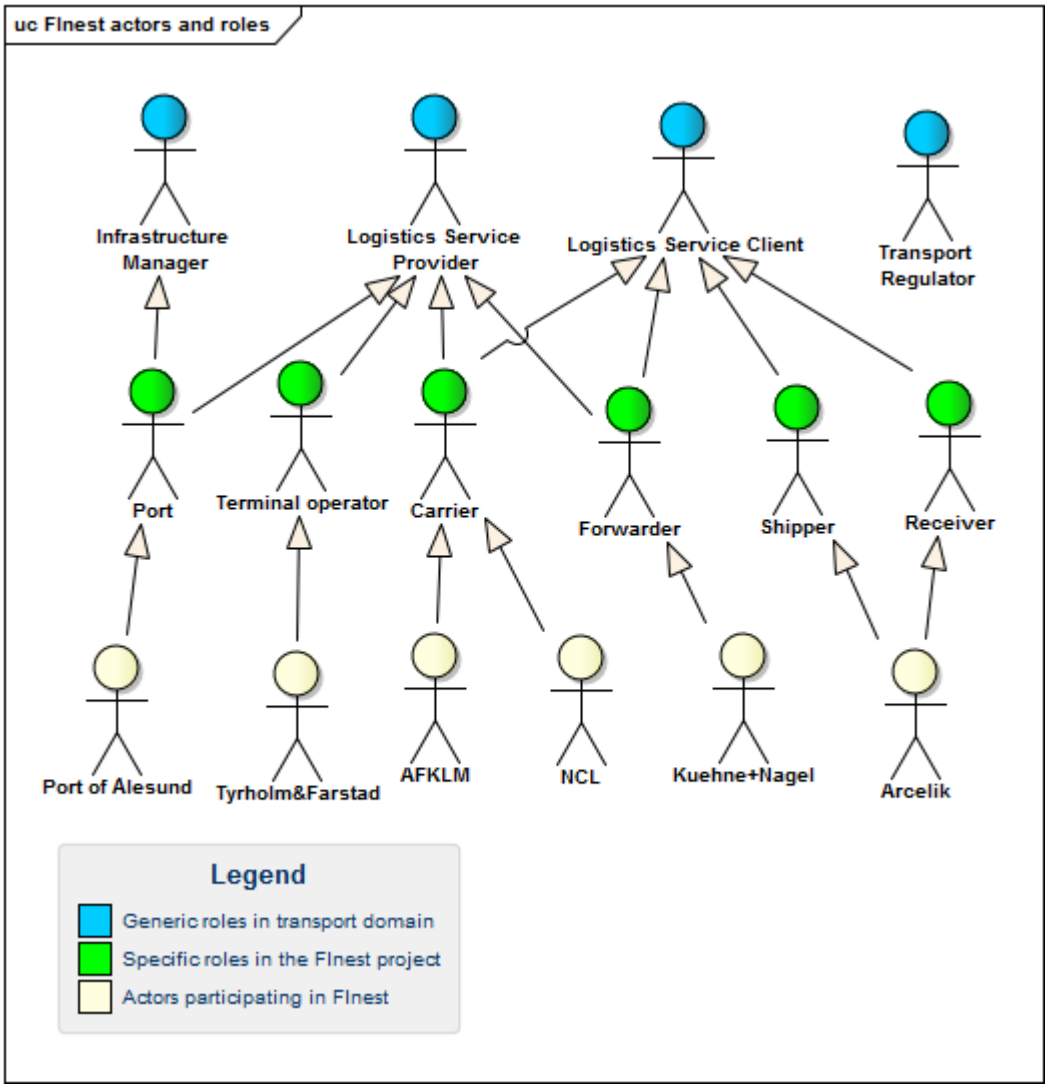


Figure 24 - Roles and actors in the FInest project

The three use cases include three of the four generic role groups, but are dominated by Logistics Service Clients and Logistics Service Providers. The study shows that most of the requirements (General requirements) are applicable for both these role groups which can be seen in relation to the focus on interaction and collaboration between the roles represented. However some of the requirements and possible IT capabilities are more relevant for some roles and seem to contribute to significant improvements of business processes and value added. These

requirements and capabilities are briefly summarized below for the role groups represented in the use cases.

Logistics service client (LSC)

This role group consists of the users of the transport and logistics services. In the use cases, Arcelik fulfills this role both as a **sender** and a **receiver** of cargo. The **forwarder** role, represented by Kuehne+Nagel, is both a logistics service provider and a client.

In addition, **carriers** can also bear the role of Logistics Service Client, both regarding cargo services at transshipment point (offered by terminal), services offered by infrastructure managers (ports, airports), but also transport services offered to carriers like shipping lines or airlines for consolidation to or deconsolidation from a transshipment point.

Logistics service provider (LSP)

This role group consists of the providers of transport and logistics services. NCL and AFKLM both have the role of **carriers**, but in different modes (short-sea container freight and air freight). Tyrholm&Farstad has the role of **terminal operator**, and the Port of Ålesund has the role of **port service provider**. The **forwarder** role is also in this group too.

Infrastructure management

This group consists of the owners, maintainers and managers of transport infrastructure, like roads and railroads, fairways, beacons and signaling systems. **Ports**, in the project represented by the Port of Ålesund, are part of this group.

Transport regulator

These are the regulators of transport, including clearance of cargo and vessels, immigration, traffic regulation etc. There are no transport regulators among the use case partners (not directly represented), but the use cases all address challenges related to the clearance of goods, thus possible future solutions on the transport regulator side may be mentioned, but not directly addressed in the project

6.2. Expected benefits in each phase of transport operation

Although the 21 general requirements identified are relevant for the three use cases, the expectations in terms of impact on current business models and benefits vary from role to role.

The following sections present a short analysis of the expected impact of FInest for the Transport and Logistics Domain, in each phase of transport and from the perspective of two main roles: the Logistics Service Client (LSC) and Logistics Service Provider (LSP).

The basis for the analysis is the next figure (already introduced in chapter 4.3), showing the 21 general requirements related to WP1's Business Requirements and to the four phases of transport operations.

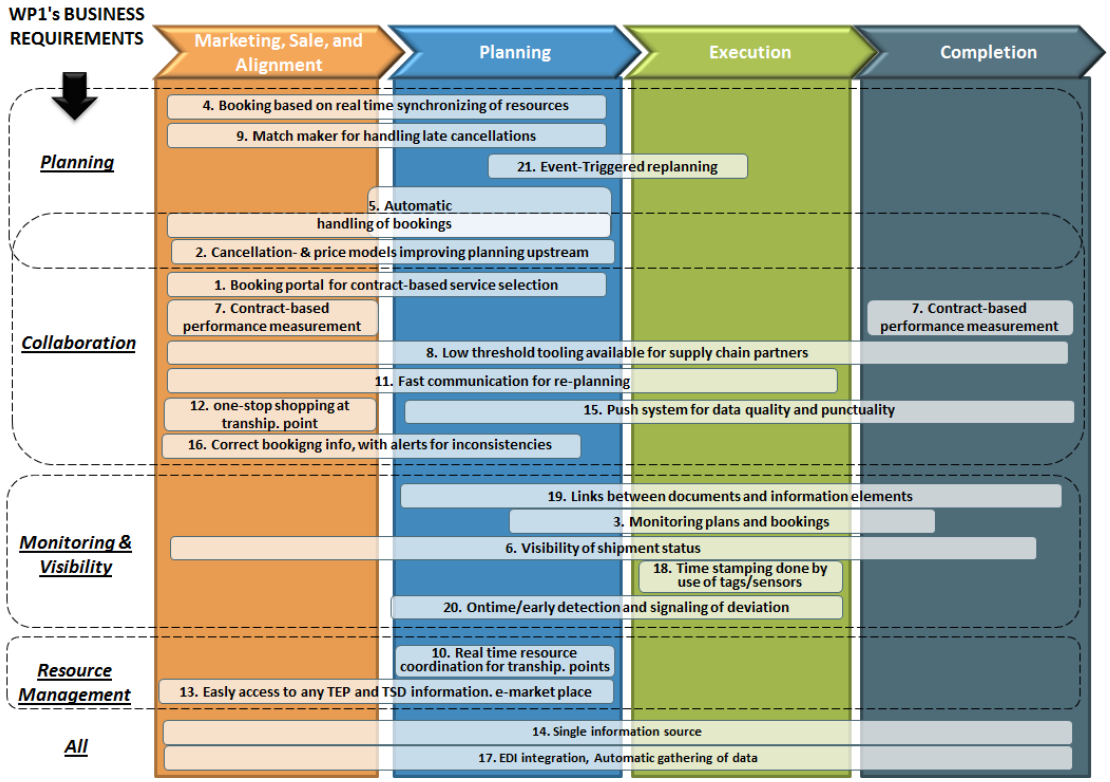


Figure 25: Mapping of Use Cases General Requirements to Domain Business requirements and Four phases of operations

The figure shows that most requirements cover several operational phases. However, the analysis below highlights the central requirements with regards to each phase, and signification for the various roles and focuses further on expected improvements through FInest. For each of the operational transport phases, the analysis is structured based on WP1's main groups of business requirements in the following order*: Collaboration, Planning, Monitoring & Visibility and Resource Management.*

6.2.1. Marketing, sale and alignment

Seven of the 12 main challenges identified in the use cases are related to this phase pointing at: data exchange, information availability, late booking cancellation, order management, transport order creation, loading and unloading scheduling and resource coordination. In addition 14 of the 21 general requirements are relevant. The most important are highlighted below related to WP1s business requirements groups.

- **Collaboration**: The diagram shows that collaboration represents the predominant group of the business requirements for this phase, when it comes to number of general requirements identified through the use case scenarios (eight of 14 general requirements which are relevant for the phase). Requirements related to improvement of the booking process are highlighted where the proposed IT- capabilities are covering significant business functions supporting information exchange and collaboration between LSC and LSP. This is based on broad access to real-time updated data at an e-market place which includes booking portal for overview and combination of alternative transport services, e-contracting, spot buying,

booking of services at transshipment points (one stop shopping), booking intelligence application for correct information (information reliability), and supplier selection based on historical performance. These capabilities are significant for both LSC and LSP and constitute radical new opportunities for efficient matching of demand and services. For the LSC the added value is related to benchmarking and selecting alternative transport services. For the LSPs the value added is related to improved marketing, predictability of market demand, resource and capacity utilization. Some of the capabilities here are illustrated in the to-be use case scenarios 1 and 4 (respectively related to demonstrator 1 and 4).

- **Planning**: the group of planning-related business requirements in this *marketing and alignment* phase is closely linked to the requirements described above related to booking, but is more directly focusing on the resource planning part of the booking process. Capacity utilization and handling of late cancelations are significant needs which may be supported by IT-capabilities like: resource planning systems enabling drafting of resource plan based on real time booking status, a "match maker" enabling last minute booking and a booking manager for spot buying. These capabilities are also relevant for the planning phase, but in this phase, the emphasis is on planning that is directly to the booking process. The benefits of these capabilities seem to be especially significant for the LSP as the possibilities for obtaining more efficient utilization of resources seem to be huge. For the LSC the value lies in the improvement of the booking process: more automatized, more informed, and with improved handling of changes in booking from the part of the service provider. The capabilities emphasized here are illustrated in the to-be use case scenarios 1 and 2 (respectively related to demonstrator 1 and 2).

- **Monitoring and visibility:** This category features several relevant business requirements in the *marketing and alignment* phase, but this is especially related to monitoring of status of shipment/cargo. Capability to monitor shipment status serve as important input for planning/replanning and booking of other transport services/legs, especially when events occur and replanning is required. This capability will contribute to possibilities for immediate re-planning and increase the agility in the transport chain. This is of great value for both LSC and LSP where the benefits are improved utilization of resources and decreased possibilities for additional delays due to the deviation. This capability is illustrated in use case scenario 3 (related to demonstrator 3).
- **Resource management**: The requirements related to *resource management*, in the *planning* phase, relate to easy-to-find and real-time information about availability of resources and services. This is closely linked to booking, where the IT-capabilities requested constitute electronic uploading of demand data (with standard templates) from LSCs and electronic retrieval of service information from LSPs. Standardization of data across LSPs are key contributors for the capabilities. The benefits of these capabilities have to be seen in connection with the other capabilities requested above, as a significant prerequisite for these.

6.2.2. Planning

Nine of the 12 main challenges identified in the use cases are related to the planning phase where seven of these are common with the Marketing, Sale and Alignment phase. In addition to the seven challenges (data exchange, information availability, late booking cancellation, order

management, transport order creation, loading and unloading scheduling and resource coordination), terminal planning and deviation management are highlighted as important challenges. Six of the challenges are also common with the Execution phase, which shows that the phases need to be seen in close connection to each other. Almost all (18 out of 21) of the general requirements are relevant for this phase. Some are highlighted below, with corresponding IT-capabilities required and the potential for improvement (though Finest).

- **Collaboration**: The diagram shows that *collaboration* represents a significant business requirements group for this phase. Seven out of the 18 requirements related to this phase are included in this group of requirements. It is interesting to register that six of these are common with the *marketing, sale and alignment* phase which can be explained due to the fact that planning is based on much of the same needs for information as for booking processes. IT- capabilities related to collaboration in this phase are supporting information exchange and collaboration primarily between LSCs and LSPs (keeping in mind that one actor can serve the role as both LSC and LSP). This is based on broad access to real-time updated data and can be related directly to the six common requirements and IT-capabilities described in the marketing, sale and alignment phase. In addition to these capabilities, the planning phase highlights the capability described as a push- system for data quality and punctuality, ensuring information reliability and the right information and documentation on time from LSC. The capabilities required are significant for both LSC and LSP. For the LSC the added value is related to real time and correct information and efficient information exchange as a way to improve planning of transport execution in a most efficient possible way. For the LSP the value added is similar, and related to best possible data and interaction with business partner for most correct and efficient operational planning. The capabilities here are illustrated in the to-be use case scenario 3, 4 (related to demonstrator 3 and 4) and 5.

- **Planning**: *Planning*-related requirements in the *planning* phase are directly focusing on improvements of transport service planning and resource utilization in operational planning. Requested capabilities which are common with the marketing, sale and alignment phase are: resource planning system, match maker ,automatic reservation of capacity which are based on real time synchronization of data including demands/bookings and available resources at the LSPs. Extended possibilities to combining and integrating information faster in scheduling work make it easier to develop alternative transport plans and services, giving the LSPs extended opportunities to conduct simulations and optimization of transport service plans. This is beneficial for the LSCs in the process of selecting transport services/ plans which fit their demands. It also enables LSPs to improve their resource utilization. Ensuring that available service capacity are easily accessible and real time updated are also beneficial for the LSPs regarding resource utilization, but make also the logistic transport system agile and flexible for the LSC. For example, a deviation management system for (1) automatic updates in plans based on new input data related to modified services and (2) signals for configuring triggers for re-planning, is expected to facilitate and optimize greatly the planning activities. These requested capabilities are beneficial when events and deviations occur in the execution phase (next phase), promoting re-planning and avoiding spoiled resource utilization and further delays. This requires that the original plan is established in a way that enables and facilitate replanning later on. These capabilities are illustrated in use case scenario 1, 2 and 4 (related to demonstrators 1, 2 and 4). Furthermore, possibility to collect, store and analyzing historical data on transport operations and performed services will contribute to improved decision support in strategic planning, which is relevant for both LSCs and LSPs. Strategic planning is not emphasized

in the use cases, but this is mentioned here just to show that IT-capabilities related to increased collaboration and information exchange in the transport operations can contribute to add value also in the strategic planning phase.

- **Monitoring & visibility**: In the *planning* phase, monitoring & visibility requirements are related to monitoring of transport plans and bookings in the execution phase. Capabilities for monitoring are of value for opportunities for early re-planning in case of deviations and is also valuable as an information service to the LSC e.g. when shipment are delayed. Another required capability is a portal that automatically links data, documents and messages to relevant information elements (order, offer, plan, and invoice) which reduce the needs for input/reporting the same data several times.

- **Resource Management** in the planning phase is related to real time resource coordination and required capabilities for providing up-to date information to suppliers about arrival/departure and all resources requested/booked, as well as up-to date information to customers about available services. The main benefit of such coordination of resources for LSP is efficiency in planning. For LSC, it represents a gain in time and effort for finding and scheduling a service. LSC here include both shippers (clients of carriers and forwarders), and carriers (clients of terminals, port/airport). For shippers, this type of coordination work is already well covered by freight forwarders, but for carriers, coordination of resources at transshipment point, although covered by ship agent, would benefit greatly from access to real time information and through a single platform. This capability is illustrated in use case scenario 2 (related to demonstrator 2).
  In addition access to standardized information about transport plans and services are significant means for establishing an online market place for transport services providing alternative transport plans. For both LSC and LSP, this can facilitate interaction and automatic of search for suppliers or customers, but also expand the pool of alternatives (expand the market) and make these more easily accessible.

6.2.3. Execution

Eight of the 12 identified challenges are related to the execution phase and 11 of the 21 general requirements, but most of the requirements (8 of 11) are within the requirement groups Collaboration and Monitoring &Visibility. Some of the requirements and capabilities related to these two groups are pointed at below:

- **Collaboration** in the execution phase is primarily related to requirements focusing on information exchange needed for re-planning/ planning in this phase, especially related to event handling and deviations. Requested capability is a collaboration platform for fast communication. Benefits are the same as for *fast replanning* in the planning phase.

  In addition a push system (which also is requested in the planning phase) represents significant capabilities when it comes to improved information reliability and facilitation of data handling procedures, making these kind of routines more efficient than today, where the same information are registered several times. The benefits of these capabilities are more efficient information handling routines for both LSC and LSP. These capabilities are illustrated in the use case scenario 5.

- **Monitoring and visibility** is related to the same requirements and capabilities as for the planning phase primarily focusing on monitoring of actual status compared with the plan and triggers for re-planning. In addition time stamping done without human interface is a need in this phase which can be supported of a capability for tag based data gathering made possible of a collaboration platform that collects data from shipment units via tags/ RFID chips. The benefits of higher visibility are greatest from the point of view of the LSC, especially when the very high number of shipments to follow up makes monitoring very hard. For LSP, the benefit lies in earlier information about deviations upstream or downstream, which is crucial for being able to adapt and replan own operations depending on deviations in other parts of the transport chain. These capabilities are mainly illustrated in use case scenario 5.

6.2.4. Completion

Four of the 12 main challenges are related to the completion phase and eight of the general requirements are relevant for this phase. The matrix reflects the fact that this phase is the less emphasized phase in the use case description and in the selected use case scenarios. However the most important requirements and capabilities are described below:

- **Collaboration:** is related to requirements focusing on needs for data confirming status related to execution of the services and service performance. A contract based performance measurement system for automated contract control is a requested capability making it possible to calculate KPIs for comparing agreed performance (criteria/indicators from contracts) with the actual plan and historic data recording. This enable LSC to benchmark LSP and select LSP based on documented historical performance. This point is also reflected in the marketing, sale and alignment phase. The push system for data quality is a required capability in this phase for ensuring that all relevant data is registered in an efficient way constituting reliable data for e.g. invoicing and claims.
- **Monitoring and Visibility**: is related to requirements which are common with the planning and execution phases, and relates primarily to monitoring and visibility. In the completion phase, correct information and easier data tracking represents benefits for both LSC and LSP when verifying the service delivery, creating invoice, handling claims etc.

Finally, there are two general requirements expressed by the use cases which relate to all the Domain Business Requirements and relevant in any phase of transport operations: Single information source, and EDI integration. Regardless of the challenges expressed, all use cases revealed a clear need for better information sharing, starting with better access to data and less manual handling of data. These are in fact seen as some of the basic features of FInest.

Conclusion

The general requirements expressed by the use cases are representative of the Domain business requirements. The use cases are facing challenges that are common to the domain, and have described needs that are characteristic of the domain. The 21 general requirements include expectations with regards to IT support. In the above sections, we have tried to summarize the expected improvements enabled by Future Internet for each of the main phases of transport operations. Many of these expected improvements are quite similar from phase to phase, but their benefits vary from the perspective of the Logistics Service Clients and Logistics Service Providers.

6.3. Possible constraints

Identification of constrains for implementation of the to-be scenarios and the identified IT-capabilities has not been an included part of the use case studies. However this is an important issue which is focused in this chapter based on research literature addressing implementation of IT-systems and change processes in the transport and logistics domain.

Collaboration and transparency

The design of a Collaboration Platform is the key contribution of the FInest project. The envisioned platform is seen as a means for collaboration/interaction between a broad set of players within the Transport and Logistics sector, including both public and private actors.

The objective pursued in FInest is to improve operations and processes thanks to increased opportunities for collaborating, sharing and integrating information across organizational and geographical boundaries. That being said, earlier research (Gustaffson, 2007[16]) related to implementation of new IT systems within the transport and logistics domain reveal that the benefits identified as well as the success of the envisioned improvements rely on one big issue in particular: transparency. This seems to be relevant also related to FInest and the ideas of solutions described in the present report.

Transparency is an important issue related to improved interaction/collaboration. It includes *having access and the willingness to share the right information at the right time* as well as *to understand the consequences of actions or of lack of actions.* The notion is based on the understanding of the importance of information and the complexity related to sharing it. It is a question of knowledge, of the players having access to the information they need as it is a competitive advantage enabling both better customer service and improved performance. At the same time transparency can bring an end to business areas and highlight bad performance due to the value of information as a business idea.

Common challenges or obstacles on the way to more transparency identified in earlier research (ibid) are identified as:

- Trust between the partners in the transport system
- Recognition of mutual benefits
- Data or information has a high commercial value for players in a transport chain, as long as it might be used conform antitrust legislation.
- Transport service providers do not easily see the benefit of sharing information or cooperating with others to improve the quality of information.
- To some players the lack of information is even the business idea and the very basis of their existence

[16] Gustafsson, Inger. 2008. *Interaction Infrastructure : a Holistic Approach to Support Co-Modality for Freight*, Blekinge Institute of Technology Doctoral Dissertation Series, ISBN 978-91-7295-127-3

Case studies (ibid) show that establishing interaction based on transparency is challenging, both in intra-organizational interfaces as well as inter-organizational interfaces. To develop interaction and cooperation in the transport sector, the following aspects need to be focused on:

- **stronger policy involvement**: improved interactions have to be driven by overall policies/strategies, e.g. strategies to establish closer interactions with the customers
- **formalization**: interaction between the transport modes needs to be facilitated, i.e. formalized and structured
- **change of mind-set** towards viewing information as something that is not primarily exclusive for one's own purpose but can be made available and benefit a wider group of players
- **recognition and mutual respect** have to build upon a clear intention from the different domains to establish a closer interaction based on **mutual respect,** and with the objectives to understand, respect and take into account the needs and starting points to all players
- **culture-matching and personal relationships** are essential to maintaining successful business partnership.
- **ideas, principles and agreements** on how to cooperate are important for establishing cooperation
- **common understanding**: of the way that the business is done and defining the information which is exchanged. This provides interfaces for building standardized, interoperable applications and providing transparency, easier access to information and better opportunities for networking with other companies.

Regarding the argument about *benefit of sharing information or cooperation*, we would like to highlight that the WP2 work and discussions between use case partners has in fact revealed that industrial actors do acknowledge that information sharing and closer cooperation is necessary to achieve higher supply chain performance.

Other constraints

In addition to the above mentioned issues we also point to some other possible constraints including both human- organizational and technological aspects. These are:

- Skills and attitudes related to using new solutions/web-based services (both among LSCs and LSP)
- Attitude and cultural aspects related to introduction of new business processes and changes
- Privacy and security regarding information exchange
- Antitrust legislation and juridical/legal aspects related to responsibilities
- Necessary access to web (LSC & LSP)

It is important to note that the above mentioned issues have not been focused in the WP2 work so far, but represent interesting aspects related to FInest to be focused in further research, possibly in later phases of FInest or in other research projects.

6.4. Summing up

The table below shows an overview of how the required IT-capabilities can contribute to improve business processes and services building on radical new ways of sharing/exchange data and real time updated data/status related to transport services.

Table 10: Possible contributions of IT-capabilities required

Capabilities – contributing to improved processes and collaboration		
Process	**Improved processes**	**Improved interaction/collaboration**
Marketing, sale and alignment	• Web-based marketing and presentation of services • Automatic matching of demands an services • Automatic benchmarking of alternative services • On-line booking and spot buying • On-line e-contracting	• Easy access to reliable and updated information about services. • Faster response about available services/capacity • Easier to identify and collaborate with new business partners and combination of transport services • Simplified procedures for booking, independent of time/working hours
Planning	• Automatic reservation of resources across organizational boundaries • Extended possibilities to combine and integrate information in scheduling work & simulation/ optimization • Early replanning based on monitoring of " real time status" • Standardized reporting routines	• Easy access to reliable and updated information across organizational boundaries • Access to real-time information. • Faster response about available services/capacity • Easier to identify and collaborate with new business partners and combination of transport • Sharing/ exchange of status data based on monitoring, tracing and tracking • Sharing of information and reporting of the same information just once
Execution	• Improved reporting routines • Monitoring, tracking and tracing • Improved resource allocation in case of replanning	• Reporting of information just once • Increased visibility of status and opportunities to follow up shipments • Stamping without human interfaces • Early information about deviations
Completion	• Easy verification of service delivery. • Automated contract control • Collecting of historical data available for benchmarking purpose	• Extended possibilities to get reliable data • Reporting of status just once

7. Conclusion

7.1. Findings

The period M7-12 for the Work Package 2 has been focusing on identifying and describing use case scenarios for enabling the demonstrating of Finest capabilities in real-life set ups.

The work has been built up so that each of the three use cases could work in parallel, while securing a high level of interaction among them in order to align the results, as well as consolidating their results for facilitating interaction with the Technical WPs.

The first phase of the work focused on describing the current practices more in detail, identifying main challenges, root cause, describe as-is scenarios, identify needs and goals, as well as a set of ideas of possible IT-enabled solutions for the business challenges.

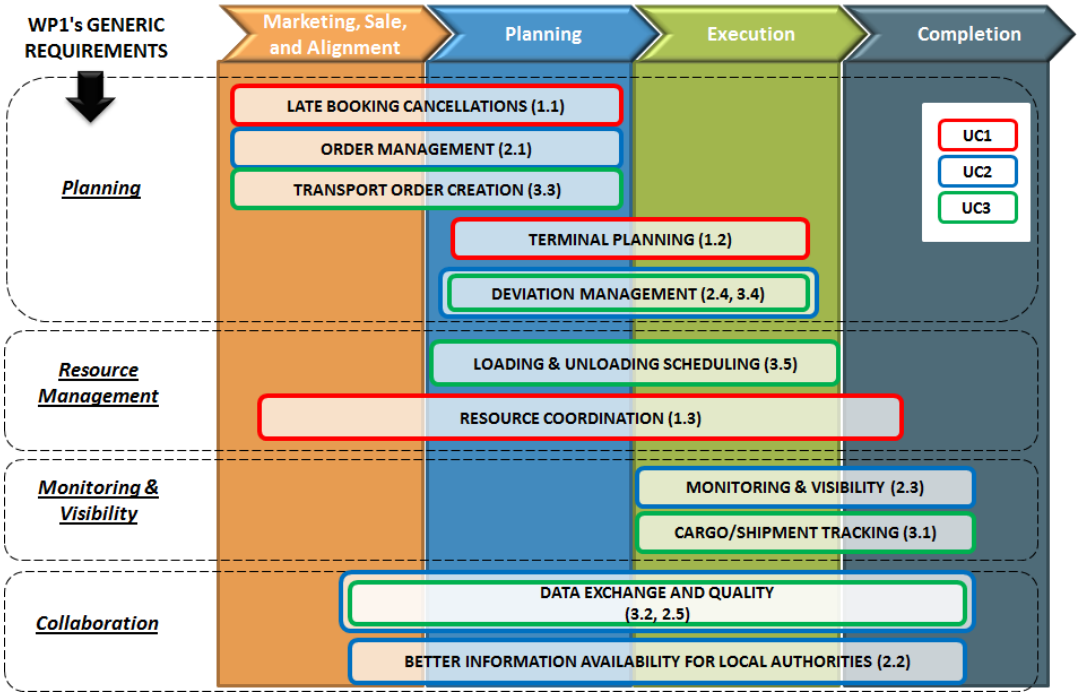
Thereafter, the needs and ideas for solutions identified were consolidated, highlighting a high number of commonalities across the use cases. This consolidation work resulted in a set of 21 general requirements.

Finally these general requirements were used as a basis for selecting the to-be scenarios. The purpose of these to-be scenarios is to illustrate how business improvements enabled by Future Internet IT capabilities, including operations and processes, are envisioned. The to-be scenarios, specific to a given use case, were selected according to the importance for the use case and use case partners, but also avoiding similar scenarios in various use cases.

The report document the results of all steps in the process, including main challenges, root causes, as-is scenarios, needs and ideas for solutions, consolidated use case results into general requirements, and to-be use case scenarios for demonstrating business improvement enabled through FInest.

7.1.1. Summary main challenges

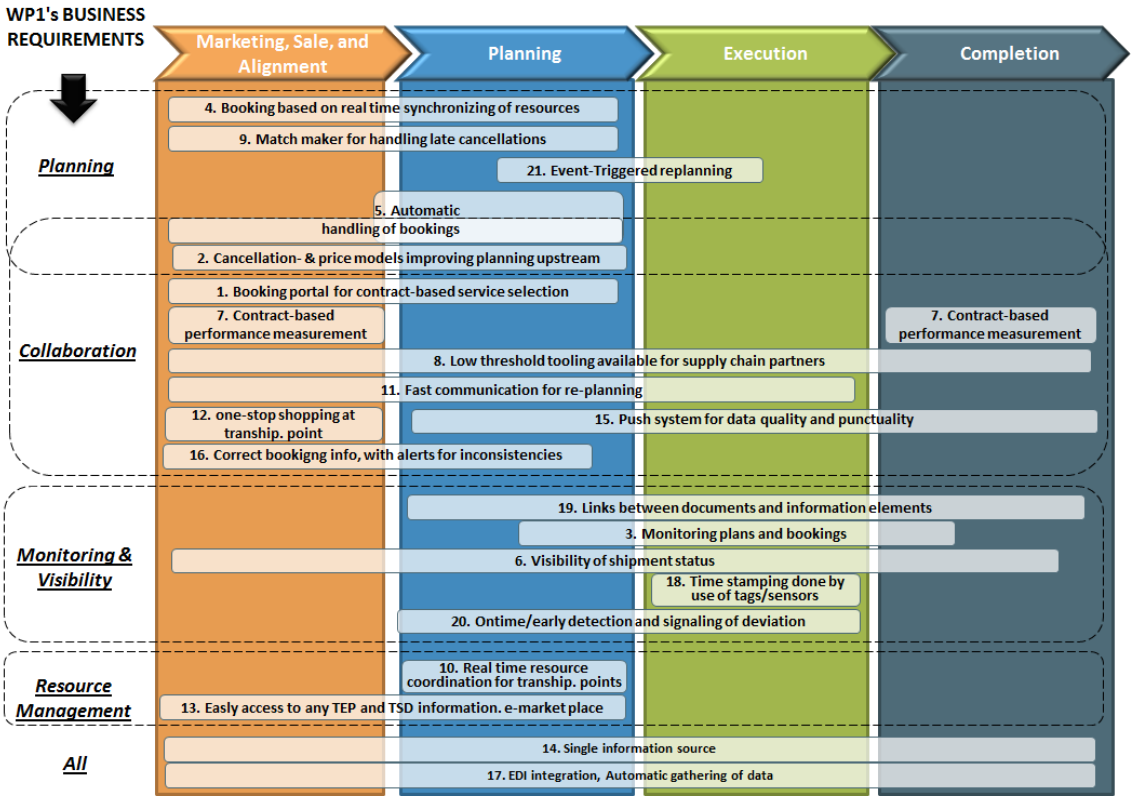
In the analysis of current practices and processes, the use cases have identified the following 12 main challenges as representing the largest potential for IT-enable improvement.



This diagram is described in detail in Chapter 3.1.

7.1.2. Summary use case general requirements

Based on a consolidation of the outcomes from each use cases, 21 general requirements have been described in Table 2 on page 48. These are summarized in the diagram below, where link to the domain business requirements as well as to the four phases of transport operations are indicated.



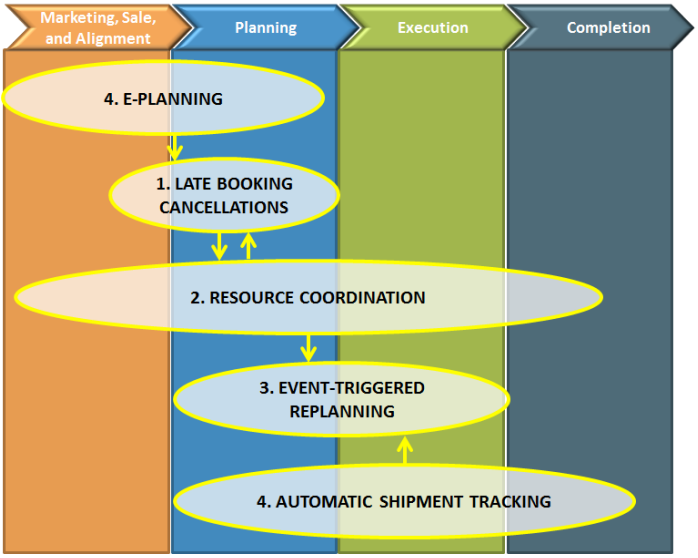
This diagram in introduced in chapter 4.3, and further analyzed in chapter 6.1.

7.1.3. To-be scenarios

The 5 use case scenarios suggested by WP2 for testing Finest capabilities in real world settings are the followings:

To-be Scenario		Generic Requirements covered in the scenario	Demonstrator & technical WP lead	Use Case
1	Handling of Late Booking Cancellation	2, 5, 8, 9, 11, 14, 17, 19	Demo 1 (WP8)	UC1
2	Resource Coordination	4, 8, 10, 12, 14, 17, 19, 21	Demo 2 (WP5)	UC1
3	Real-Time Event Handling	8,11, 14, 16, 17, 19, 20	Demo 3 (WP6)	UC2
4	E-Planning	1, 3, 5, 8, 13, 14, 15, 16, 17, 19, 20	Demo 4 (WP7)	UC3
5	Automated Shipment Tracking	6, 8, 14, 15, 17, 18, 19	-	UC3

The diagram below illustrate on a very high level how the scenarios cover the various phases of transport, and showing how complementary they are to each other.



The scenario 4 *e-planning* is mostly focusing on the alignment and planning phases, and directly related to scenario 1 *Handling of late booking cancellations*, both building on the need for matching transport demand and services. The scenario 2 *Resource coordination* is very central, because, depending on the role perspective taken, it covers all phases of transport, and serves as baseline for efficient planning and replanning operations focused on in scenario 1, but also 3 *Event-triggered replanning*. Finally the scenario 4 *Automatic shipment tracking*, focusing on higher visibility, is directly connected to scenario 3 as a prerequisite to event-triggered replanning.

The next table summarizes briefly the main improvements expected in each scenario, for the different roles in the supply chain. The purpose is to show that the to-be scenarios described are not only relevant to the use case leading the scenario and its actors, but also for the others. The highest relevance is indicated in color, while the white boxes indicate a more indirect impact/benefit.

To-be Scenario \ Roles	CARRIER	PORT/AIRPORT	TERMINAL	FORWARDER	SHIPPER
1. Handling of Late Booking Cancellation	Higher capacity utilization Less cancellations	Less deviations in traffic schedule	Improved planning upstream	Higher flexibility	Better possibilities of late booking
2. Resource Coordination	Single window shopping, improved information reliability	More efficient handling of port calls, improved information reliability	More efficient planning	Improved information reliability for operational plans	Improved information reliability for operational plans
3. Real-Time Event Handling	Real time / early information enabling efficient replanning	Less deviations in traffic schedule	Real time / early information enabling efficient replanning	Real time / early information enabling efficient replanning	Real time / early information and improved delivery performance
4. E-Planning	More automatic handling of information	Less deviations in traffic schedule	Improved planning upstream	More efficient planning, and effective contract management	More efficient planning, and effective contract management
5. Automated Shipment Tracking	More efficient communication with customer	More reliability of information	More reliability of information	Real time, early information, better visibility efficient shipment tracking.	Real time, early information, better visibility efficient shipment tracking.

7.2. Lessons learnt and needed improvements

7.2.1. Working process

The period M7-12 was characterized with intense communication and weekly (almost) daily interactions among the use case partners (WP2). Priority was given to alignment among the three use case teams, to ensure comparable work, but also to learn from each other and respect the milestones established early in the process.

Interaction with other WPs was time consuming, but very valuable for the all project.

On the improvement side, the working methodology must be described even more clearly early in the process so that neither use case partners, nor other WPs have any doubts later on.

In addition, the team experienced that several times the level of ambition was set a little too high and had to adapt the work according to the time and resources available.

7.2.2. Benefits of M6-12 work for domain partners.

The work done in WP2 has been valuable for the business partners, enabling them to clearly document their current challenges and practices and exchange this information with others.

The high degree of interactions enabled partners to learn from each other, both regarding current practices and challenges, but also in terms of ideas for solutions.

Finally, the discussion regarding the expected improvements was a learning process and enabled to focus attentions on own performance with relation to supply chain performance.

On the improvement side, the business partners would have like more focus on business and strategic goals, and to compensate for the high focus on solving operational- or information exchange- related problems.

7.3. Next steps

In the next phase of the FInest project, WP2 will work on two tasks (T2.3 and T2.4), and results will be documented in one deliverable (D2.4). This work will be a direct continuation of the work accomplished in M12 and documented in the present report.

- **Task 2.3: Experimentation Specification of Use Case Scenarios**

In this task, the scenario setting for each of the 5 to-be use case scenarios will be refined, including a description of how the technical solutions in FInest (components) are planned to be used, identification of real-world test data necessary for realizing the scenario in real scale, and specification of requirements for the experimentation environment designed in WP4.

- **Task 2.4 Evaluation Methodology for Selected Use Case Scenarios**

This task will consist of designing a methodology for assessing the enhancements and business-relevant improvements for optimizing the integration and collaboration in transport and logistics business networks that can be achieved by Future Internet Technologies and FInest. This methodology will be applied to the use case scenarios.

The WP2 team has already started the discussion regarding the evaluation methodology, and the followings points have been raised:

- The evaluation methodology/framework should disconnect from specific operational challenges and link the requirements to more strategic goals, both at the industry / supply chain level and at the role level (shipper, forwarder, carrier, terminal operator, port/airport, etc.).
- Metrics must be identified, together with a hierarchy, for enabling the measurement of performance and assessment of impact of a specific change / improvement.
- Comparable evaluation criteria should be used for measuring the performance (current and targeted) in each scenario, and enabling the evaluation of the FInest contribution.

A framework for impact assessment of the envisioned solutions has also been discussed by the partners. One possibility could be to base the performance measurement of the SCOR model and focusing on three levels of performance measurement.

- Level 1: metrics (and targets) linking operational value drivers to main industry performance areas.
- Level 2: metrics related to business performance, in a form a set of KPIs per role.
- Level 3: metrics related to a more technical description of envisioned solutions, enabling to link the capabilities offered by FI to the business performance.

Example of possible metrics, as background data for Task 2.4

Based on the heavily documented work done by the use case partners in describing the main challenges, a list of first ideas of possible performance measurement criteria to be explored further in Task 2.4 is presented in the table below. This list is based on the tables entitle "Challenge Description", and particularly the field "Why / Consequence of the problem", where many concrete criteria have been reported for indicating the negative consequences of each challenge described. The list is in alphabetic order, with indication of relevance for either Logistics Service Provider (LSP) or Logistics Service Client (LSC).

Consolidated performance criteria	LSP	LSC
Accuracy of invoice	x	x
Available time frame	x	x
Capacity (asset) utilization	x	
Contract fulfillment	x	x
Cost of data exchange (time)	x	x
Cost of handling deviations (man-hours + info exchange)	x	x
CO2 unit per voyage or shipment	x	x
Cost per unit per voyage or shipment	x	x
Customer response	x	
Customer satisfaction	x	
Data collection speed	x	x
Data quality / accuracy (number of errors)	x	x
Efficiency of working processes	x	x
Flexibility	x	x
Loss of sales	x	x
Number of changes in bookings	x	x
On-time delivery performance in full (OTIF)	x	x
Payment date	x	x
Planning costs	x	x
Punctuality (departure/arrival)	x	x
Reaction time in case of deviation	x	x
Resource efficiency	x	x
Resource used for (re)planning	x	x
Resource used for finding service		x
Resources used to handle booking (man hours, messages)	x	x
Revenue / sales / volume	x	x
Shelf availability,		x
Stock rotation	x	x
Throughput time	x	x
Total value chain cost	x	x
Predictability / visibility	x	x

Annex 1. As-is analysis and identification of possible solutions

This Annex provides the detailed documentation of what is summarized in Chapter 3.

It presents in details the work conducted by each use case for describing use case specific challenges and root-causes, illustrate them through an as-is scenario, then identifying specific needs and ideas for possible solutions around for improving current situations. This work is presented by each use case as a Story Line and represents the baseline for identifying and describing to-be scenarios (presented in Chapter 5).

It is important to note that the word "solution" used by the WP2 team is used from the perspective of the business. The intention has been to identify *ideas of possible IT-enabled solutions*, not to impose any technical solution. Furthermore, the focus has not been on identifying all and every possible solutions, but *some ideas of solutions for challenges that are believed to be relevant for FInest*, and based on which relevant to-be scenarios could be built.

Introduction to the story lines (from challenge to solution) presented by each case

In this as-is description phase, each use case has followed the same story line (reflecting the methodology described in Chapter 2). They are presented in the next three sections, covering the following elements:

1. ***Use Case Introduction:***

   Overall presentation and update of the use case presented in D2.2 (M6).

2. ***Main challenges:***

   Description and localization of main challenges hindering daily operations. Similar tables are used for each challenge, including related Domain challenges (from D1.1), related use case challenges (from D2.2), description of the problem, consequences of the problem, when/where it occurs, who is concerned, how it may be overcome.

3. ***Root-Causes***

   For each challenge, main problem and root causes are identified. Similar hierarchy diagrams are used for each challenge.

4. ***As-is scenarios***

   For each challenge, a description of "how things work today / how operations are conducted" is given in a form of a use case scenario. A similar template is used for structuring the as-is scenario illustrating the challenge.

5. ***Search for solutions:***

   In order to develop to-be use case scenarios (envisioned, desired way of conducting operations in the future), a set of ideas of possible solutions was identified by each use case, the focus being exclusively on improvements which FInest is believed to contribute to (i.e. focusing on information exchange and collaboration). These "ideas for solutions" were identified in to steps:

   - ***Needs & goals***: Description of what is needed to overcome these challenges and root causes
   - ***Ideas for solutions***: Identify Future Internet IT enabled solutions, form the perspective of the domain actors. This was done answering the following question: "If the challenge / root cause can be eliminated, what solutions / IT capabilities are needed?

   Both needs & goals and ideas for solutions are presented in one table. Similar tables are used for each use case.

The figure below illustrates the overall approach (from challenge to solution) through one example (use case 2).

First we determined the business processes (the upper line with yellow boxes) and the main challenges (grey bobbles, located in the process line for showing were the challenges occur).

For each challenge (the grey bobble "challenge 1" in the center of the figure), we mentioned the problems behind these challenges (the green circles "Px"), then investigated the underlying root causes per problem (grey circles "RCx").

Finally, we determined if the FInest platform could help in eliminating this root causes.

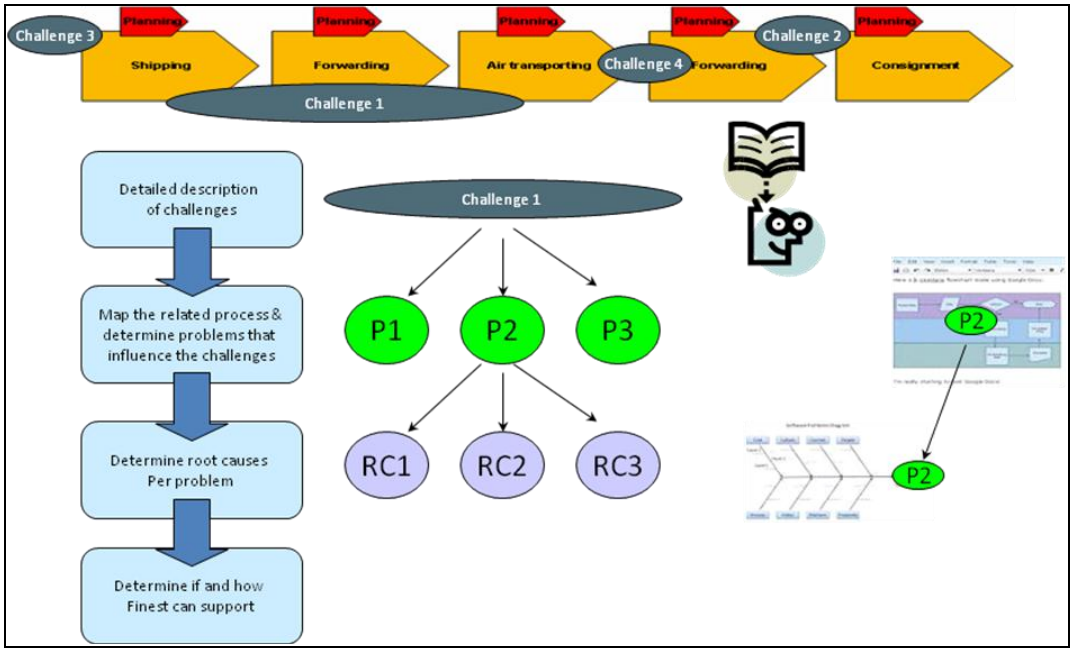


Figure 26: Illustration of process "from challenges to solutions" followed by the use cases

Annex 1.1. Use case 1 Story line - Fish Export from Norway to Brazil

1.1.1. Introduction to the Use Case 1

This first use case is built around the export of fish in containers from Norway to Brazil. The transport chain, schematized in Figure 27, described the cargo flow all the way from production to delivery. The project partners represented in the use case are the shipping operator (feedering operations) NCL, the container terminal operator Tyrholm & Farstad, and the Port of Ålesund. The use case focuses on the parts of this chain in which the three domain partners are engaged, in order to highlight their main processes and challenges, but especially the interaction among these 3 actors.

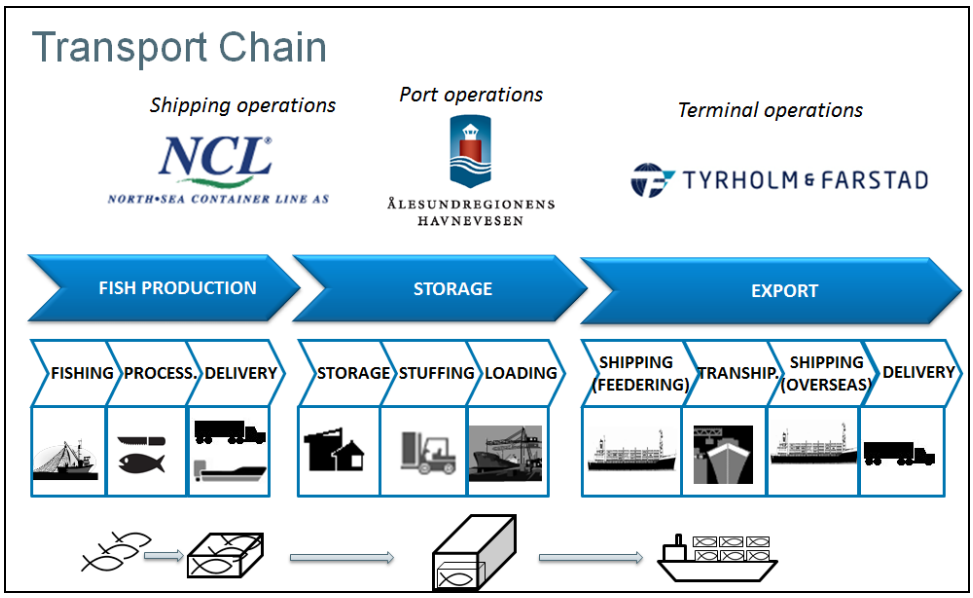


Figure 27: Transport chain for export of fish from Norway to Brazil in containers

This means that the activities related to fishing and processing, as well as the overseas part of shipping are not covered in detail in the use case.

The business processes constituting the use case have been updated from the previous deliverable. The processes related to booking of feeder shipping have been added, and the planning activities of the port and terminal have been updated and aligned. The Figure 28 below represents the general business processes of each of the main business activities:

- The booking of shipping services is conducted among the fish exporter, forwarder, overseas shipping line, and shipping agents. From the point of view of the feeder operator NCL, these processes belong to the "Marketing, sale and alignment phase.
- The processes related to Shipping operations are the ones of NCL. Starting with establishing schedule, receiving and confirming booking, then planning the operations, then executing the voyage, and finally completing and sending invoicing. This set of

generic processes is similar for any customer booking a shipment, and for any port and terminal visited along the vessel' s scheduled route.

- The processes related to the port call are the ones preparing port services, planning for ship arrival, handling of ship call, and invoicing after ship departure. These processes are almost the same for any ship visiting the port of Ålesund.
- Finally the processes related to terminal operations related to each port call cover the booking of cargo handling by the ship agent and cargo agent, the discharging and loading activities, and the confirmation and invoicing. These processes are similar for all container ships visiting the terminal.

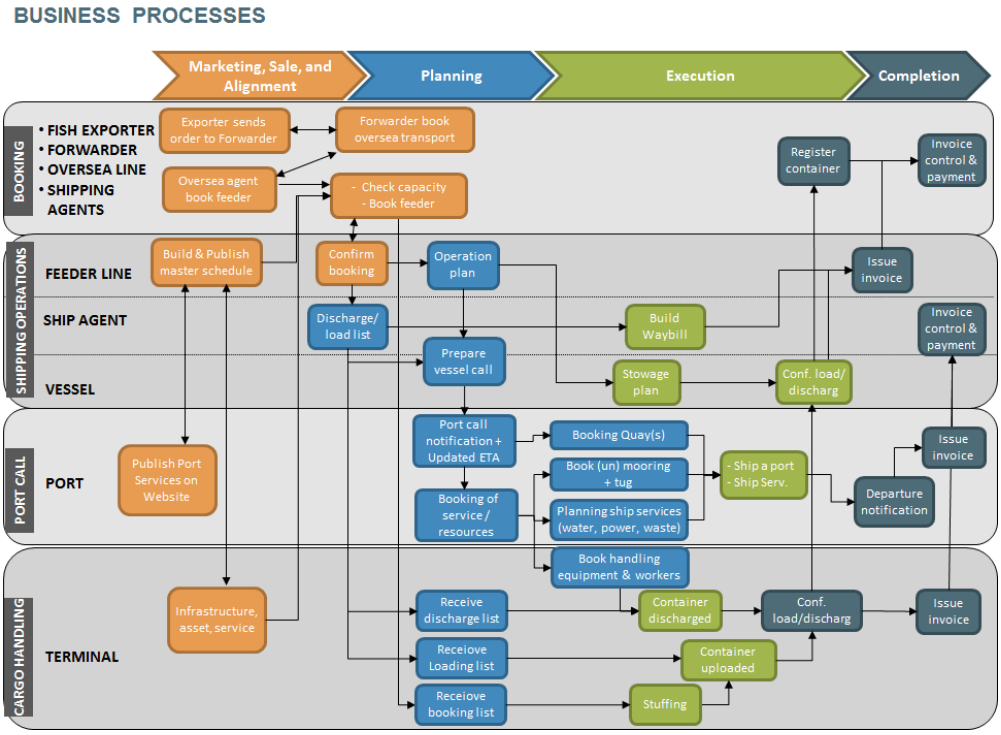


Figure 28: Main business processes of the use case 1

1.1.2. Main Challenges encountered in the use case

The Fish Export use case has identified three main challenges that are most hindering daily business and for which the use case partners believe Future Internet can play an important role in improving interaction and collaboration among parties in order to achieve higher efficiency.

1. Late Cancellations of Booking of Shipping Services

Comprising the feeder operator' problem of no-shows and dummy bookings, both resulting in loss of income due to too short time to react for ensuring capacity utilization.

2. Terminal Planning

Constant deviations and late information leading to rush work and low efficiency for the terminal.

3. Resource Coordination

Inefficiency in the coordination of resource booking and planning at the port/terminal related to port call.

These three main challenges are summarized in the figure below, which on a very high level shows that all three challenges are related to planning activities and replanning during the execution phase.

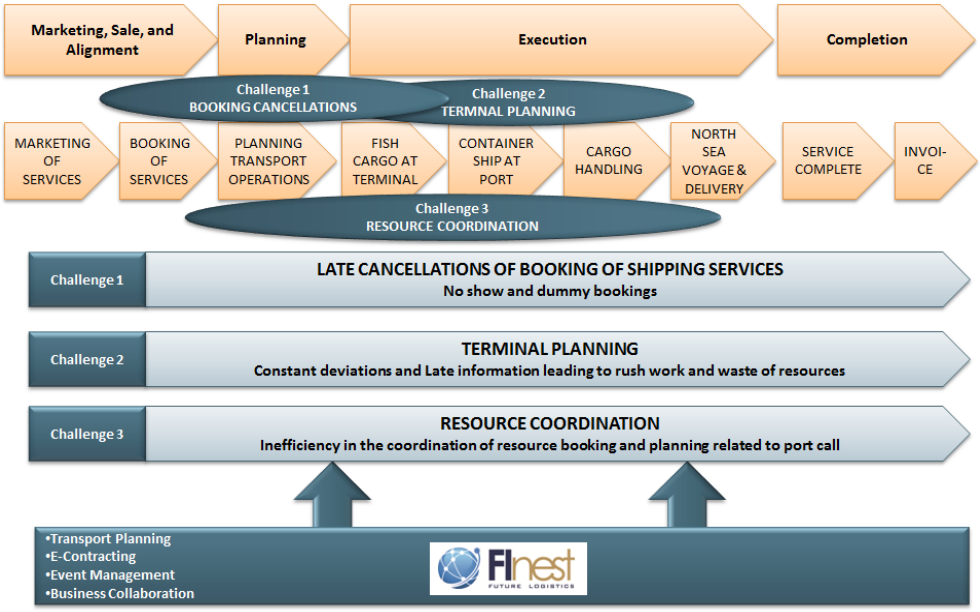


Figure 29: Main challenges encountered in Use Case 1

On a more detailed level, the next figure highlights the specific business processes affected by the main challenges expressed in the use case.

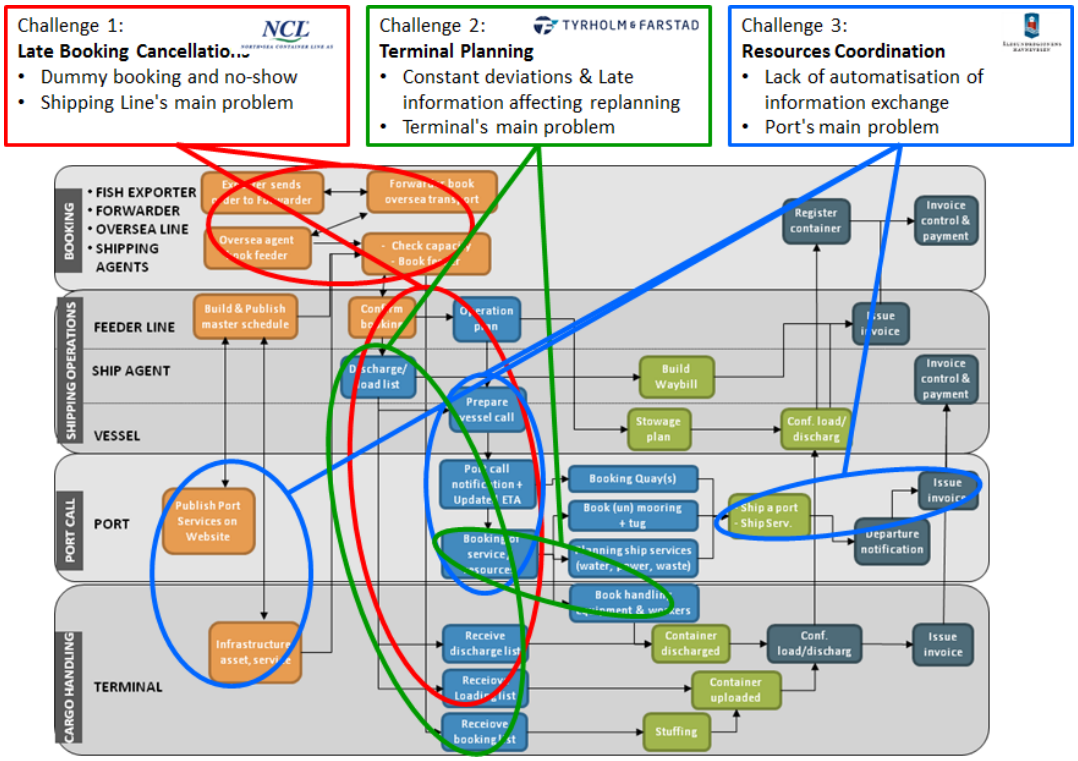


Figure 30: Link between main challenges and business processes

In the following chapters you will find per main challenge, the problems, underlying root causes, illustration through as-is scenarios, and ideas for solutions identified by the use case team.

1.1.3. Challenge 1.1: Late booking cancellations

1.1.3.1. Challenge description

This challenge is divided in two main challenges: "no-shows" and "dummy booking", presented below. Technically, only "dummy booking" is a problem of late booking cancellation, but "no-shows", which relates to delayed booking information flow has the same consequences, namely that the booking originally registered by the feeder operator is not honored, and that the ship must sail with less cargo onboard than originally planned, because the operator has no time to find replacement cargo. So both challenges described below can be related to a main challenge "late booking cancellation".

Table 11: Challenge description 1.1a: No-shows - Delayed booking Information flow

Challenge 1.1a	**"NO-SHOWS" - Delayed booking Information flow**
Category **Related domain challenge (D1.1)**[17]	2. Collaboration and communication 3. Planning and re-planning 4. Resource management 7. Reduction of manual effort through automation

[17] The "category" field refers to the domain challenges identified in WP1, D1.1 in M6, to which the use case main challenge presented is related.

Extensions **Specific use case challenges? (D2.2)**[18]	Information-related problems (quick access, right info, up-to-date, on-time)
What **is the problem?**	Information flow is manual and delayed through 5 different actors before coming to the Feeder Operator, who is preparing the Operation Plan and Stowage Plan.
Why **is this a problem?**	The challenge has following consequences (measures given as example): • "Tina" sailed with lower utilization (70%) = Loss of 30 % income for "Tina" voyage • Higher cost per container (KPI[19]) for "Tina" voyage • 30% lower utilization of "Tina" caused higher emission per container (KPI) • 100 empty containers shipped on later departure from Rotterdam with "Emma" • The 100 full containers where one week delayed (KPI) for Fish Exporter. • Later waybill date (KPI) gives later payment (KPI) to Fish Exporter • Lower stock rotation (KPI) at Fish Exporter and Feeder terminal • Increase the total value chain cost (KPI)
Where does this problem occur?	This problem appears in the execution phase, while originates from the planning phase.
When does this problem occur?	This problem occurs during 10 days before export of fish in containers
Who experiences this problem?	Mostly the **feeder shipping line**, bearing consequences of no-shows, but also the **terminal** who needs to replan, as well as the **overseas shipping line**.
How **to overcome the challenge**	• Integrated planning processes (and systems) • Integrated information flow between all 6 actors

Table 12: Challenge description 1.1b: Dummy Bookings - Late booking cancellation

Challenge 1.1b	**"DUMMY BOOKINGS" - Late booking cancellation**
Category Related domain challenge (D1.1)[20]	2. Collaboration and communication 3. Planning and re-planning 4. Resource management 7. Reduction of manual effort through automation
Extensions Specific use case challenges? (D2.2)[21]	• Booking changes: time pressure, low predictability of market demand • Data processing • Information-related problems (quick access, right info, up-to-date, on-time)
What is the problem?	The original booking from Fish Exporter is escalated at each booking level: the original volume is increased when presented to the Feeder Operator.

[18] The "extension" field refers to the additional challenges expressed in the use case in D2.2 in M6, to which the present main challenge relates to.
[19] The description of the challenge highlights particular key performance indicators that are directly relevant for reaching the company's strategic goals, and can be used later in the project for evaluating improvement enabled by FInest.
[20] The "category" field refers to the domain challenges identified in WP1, D1.1 in M6, to which the use case main challenge presented is related.
[21] The "extension" field refers to the additional challenges expressed in the use case in D2.2 in M6, to which the present main challenge relates to.

	Information flow is manual and delayed through 4 actors before coming to the Feeder Operator.
Why is this a problem?	The following consequences of this challenge are (measures are given as example): • 20% of booking backlog are cancelled • Reduce vessel utilization (KPI) from 100% to 85% • Higher cost per container (KPI) • Loss of income 15-20% for the Feeder operator • 85% utilization caused higher emission per container (KPI) • Generate new bookings for Feeder Operator and agent • Operation plan and stowage replanning for vessel • Replanning load and discharging for Feeder Agent and Feeder Terminal • Increase the total value chain cost (KPI)
Where does this problem occur?	This problem occurs between the fish exporter and the Overseas Line Agent.
When does this problem occur?	This problem occurs during 5 days before export of fish in containers
Who experiences this problem?	Mostly the feeder service shipping line, bearing consequences of no-shows, but also the terminal who needs to replan, as well as the overseas shipping line.
How to overcome the challenge	• Integrated re-planning processes (and systems) • Integrated information flow between all 7 Actors

1.1.3.2. Root cause analysis

There are two main reasons related to the problems of late changes in plans and need for replanning of shipping operations: "No shows" and "Booking Cancellations", both described respectively in the challenges above. The first problem, No Shows, is mainly about delayed booking Information flow due to late information, short planning window, and more explicitly due to manual transfer of information. The second problem, "Dummy booking" or "Booking Cancellations", is caused by short planning window too. But in addition, from the part of the exporter, problems related to production, license and other clarification documents-related problems are important causes of late cancellation of booking. Finally, an important problem which could be avoid thanks to better planning upstream in the supply chain in the reservation of capacity by customer for securing place onboard a ship for the desired voyage. Regardless of how this reservation of capacity is done, whether customers book several ships for a same shipment, or whether they book without knowing really the amount of cargo that will in fact be available, the problem is still the one of bookings being unreliable and the feeder operator not being able to do anything to avoid it.

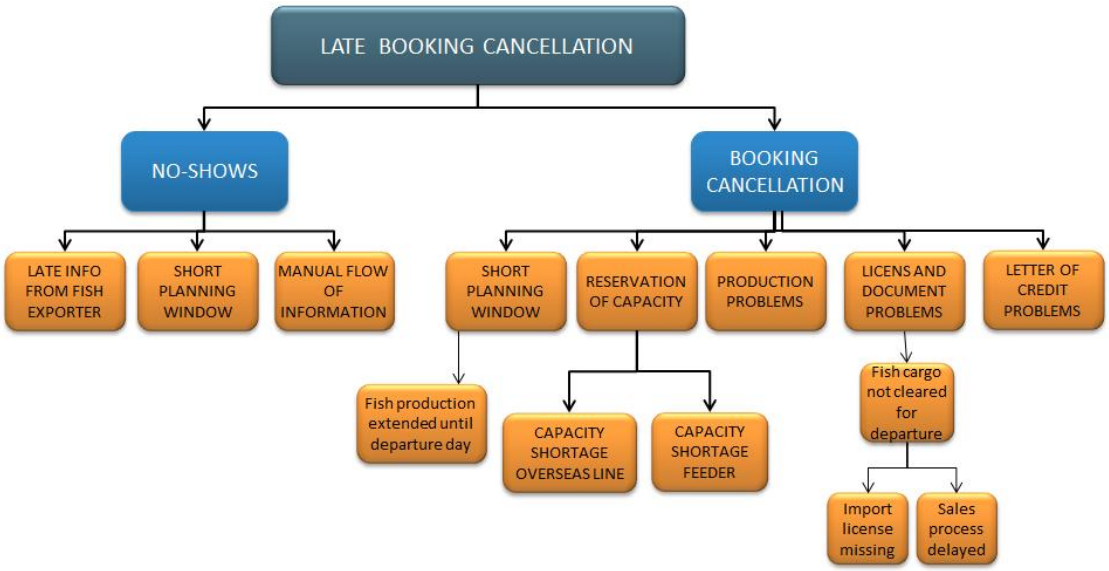


Figure 31: Root cause analysis – Challenge 1.1

1.1.3.3. As-is Use Case Scenario: 1.1 Late Booking Cancellation

The present section describes two as-is scenarios illustrating the challenges 1.1a and 1.1.b described above.

Table 13: As-is Use Case Scenario: 1.1a No Shows – Delayed booking information flow

UCS elements	Description
UCS name	NO SHOWS – Delayed booking information flow
ID	UCS1-1a
Goal	Booking of feeder shipping services (Norway-Rotterdam) for export of fish in RFR containers overseas. Booking information must arrive early enough so that repositioning of empty containers can be ensured.
Summary	The booking of feeder transport services is not done directly by the fish exporter, but goes via 5 different actors before the Feeder operator, and is dependent on the booking of overseas transport and repositioning of empty containers. A common problem is that the information flow is delayed and empty containers are retrieved too late, which postpone the shipment of fish cargo from Norway to Rotterdam.
Category	Planning, booking
Actors	Sea Carriers (Feeder operator, oversea operator); Agents (overseas line and feeder); Forwarder; Shipper (fish exporter)
Primary actor	Carrier: Feeder operator, bearing direct consequences of no-show.
Stakeholder	Shipper (fish exporter): delay in departure date Overseas line, Agents, Forwarder.
Preconditions	A fish exporter needs to export fish in containers
Triggers	The fish exporter contacts the forwarder for arranging transport.
Main success scenario[22]	1. *Fish exporter* (Actor 1) sends a message (forecast) to *Forwarder* (Actor 2) about future transport need (during 10 days before export of fish in containers). E.g. 100 * 40-feet RFR.

[22] In the as-is description, the purpose is to highlight a challenge and how it is handled. This means that the "main success scenario" refers to the most common scenario.

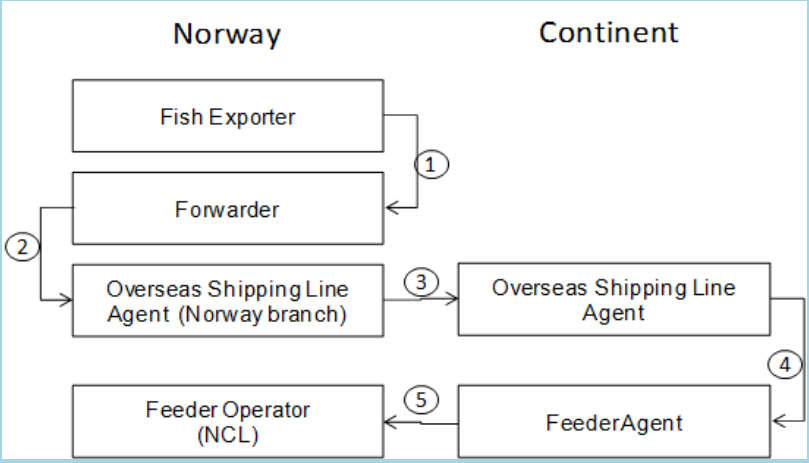
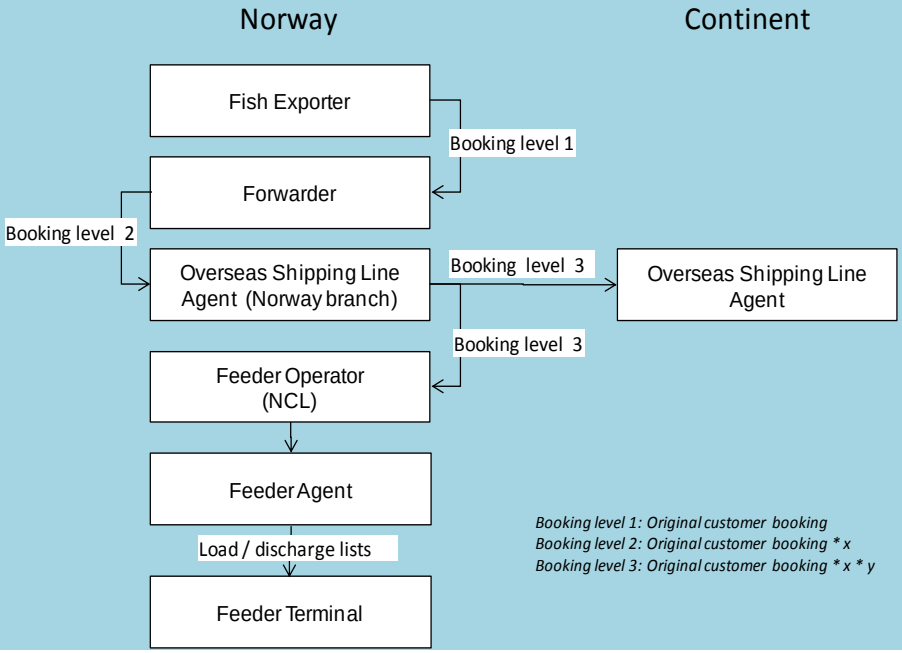
	2. *Forwarder* informs *Overseas Line Agent* (Norwegian branch office) (Actor 3). 3. *Overseas Line Agent* (Norwegian branch office) inform *Overseas line Agent at port of loading* in Rotterdam (Actor 4). 4. *Overseas Line Agent* at port of loading informs *Feeder Agent* (Actor 5). 5. *Feeder Agent* informs *Feeder Operator* (Actor 6) who prepares Operation Plan, Stowage Plan and Load/Discharge Lists.  6. 100 Empty containers are shipped from Rotterdam by the Feeder agent to the Port of Ålesund (where the fish cargo is stored) 7. Containers are stuffed and shipped by the Feeder operator to Rotterdam, where they are transshipped and further sent by overseas line.
Decision point	The handling of booking is a critical decision point in the use case, because the planning of feedering operations (operational plan, stowage plan, and discharge/loading list) are based on the bookings requests received.
Information processing	Most information flow is manual
Post conditions	Containers are shipped to Rotterdam.
Challenges	Information-related problems: delayed information flow, one-to-one communication, manual communication When information is delayed, physical operations also are delayed, which means that fish cargo is sent on a later departure.
Future Internet opportunities	• Integrated re-planning processes (and systems) • Integrated information flow between all 7 Actors

Table 14: As-is Use Case Scenario: 1.1b Dummy Bookings – Late booking cancellation

UCS elements	Description
UCS name	DUMMY BOOKINGS – Late booking cancellation
ID	UCS1-1b
Goal	Handling of late cancellation of bookings of feeder shipping services.
Summary	The Feeder operator (carrier) receives booking requests from customers about need for feeder transport from Norway to Rotterdam. Based on these bookings (number of containers, POO, POD), an operational plan is prepared for a given voyage, as well as stowage plan and discharge/loading list. Often, a short time before departure, bookings are cancelled, and the carrier does not have enough time to replan and rebook cargo, and the ship must sail with a lower load factor.
Category	Planning, Replanning, Booking
Actors	Sea Carriers (Feeder operator, oversea operator); Agents (overseas line and feeder);

	Forwarder; Shipper (fish exporter)
Primary actor	Carrier: Feeder operator, bearing direct consequences of no-show.
Stakeholder	Overseas line: also handicapped by cancellations Terminal: handicapped by multiple and late changes in bookings Forwarders and agents: much information handling for nothing
Preconditions	A fish exporter needs to export fish in containers
Triggers	The fish exporter contacts the forwarder for arranging transport.
Main success scenario	1. Booking level 1: *Fish exporter* (Actor 1) sends a message (forecast) to *Forwarder* (Actor 2) about future transport need (during 5 days before export of fish in containers). 2. Booking level 2: *Forwarder* informs *Overseas Line Agent* (Norwegian branch office) (Actor 3). 3. Booking level 3: *Overseas Line Agent* (Nor. branch) informs both Overseas line Agent *at port of loading* in Rotterdam (Actor 4) and *Feeder Operator* (Actor 5). 
Decision point	The handling of booking is a critical decision point in the use case, because the planning of feedering operations (operational plan, stowage plan, and discharge/loading list) are based on the bookings requests received. The problem highlighted in the use case is that a certain part of the bookings are not honored by the exporter and cancellation messages are sent too late to the feeder operator.
Information processing	Information flow is both manual and automated (EDI integration with shipping line and feeder agents), but most of the information flow is sequential and one-to-one communication from the fish exporter all the way to the feeder operator.
Post conditions	The ship has left, with less cargo onboard than originally planned
Challenges	• Booking changes: time pressure, low predictability of market demand • Data processing • Information-related problems (quick access, right info, up-to-date, on-time)
Future Internet opportunities	• Integrated re-planning processes (and systems) • Integrated information flow between all 7 Actors

1.1.3.4. Identification of possible solutions

The challenge of late booking cancellations can be handled either by avoiding late cancellations (reducing the number of cancellation), overcoming the financial consequences of late cancellations (offering reservation of capacity but imposing a deadline after which bookings are non-refundable), or find cargo to fill up for the late cancellation). The carrier envisions five main enablers necessary for overcoming the challenge of late cancellation. These needs enabled the identification of ideas for IT-enabled solutions, presented in the table below. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions (specified in italic).

Table 15: Needs and ideas for solutions related to challenge 1.1

Challenge[23]	Needs	Ideas for solutions
Late cancellations: Dummy booking + No-show	A. Open reservation of capacity (Maintain flexibility for customers)	**Online Market place**: • Collect and display transport needs and transport services offer ✓ *Part of "Planning", Demonstrator 4*
	B. Alternative cancellation windows & price models (Incentives for less cancellations)	**Booking Manager**: • Register booking according to status (reservation / confirmed booking) • Impossible to register several identical bookings
	C. Early warning of cancellation (for longer reaction time and replanning window)	**Booking manager**: • Register cancellations and update of booking list • Simultaneous warning of all actors (forwarder, shipping agents, terminals) ✓ *Part of Demonstrator 1 "Handling of late booking cancellations"*
	D. Search for new alternatives with match (find replacement to the cancelled booking)	**Match maker** • Integration with external market places • Identify available capacity short time before departure • Identify pending transport needs • Suggest best match • Send offer to shipper on behalf of carrier (both replacement bookings and rebooking of cancelled shipment) ✓ *Part of Demonstrator 1 "Handling of late booking cancellations" Link to "buying-Planning" Demonstrator 4*
	E. Offer alternatives to keep cancellation (to minimize the consequences of cancellations)	

[23] Please note that not all root causes are covered. A selection was made and focus was put on challenges and root causes "where Finest can help", i.e. for which the capabilities offered by F.i. and FInest can contribute to the envisioned solution.

1.1.4. Challenge 1.2: Terminal Planning

1.1.4.1. Challenge description

Table 16: Challenge description 1.2: Terminal Planning

Challenge 1.2	**Terminal Planning**
Category Related domain challenge (D1.1)	2. Collaboration and communication 3. Planning and re-planning 4. Resource management 7. Reduction of manual effort through automation
Extensions Specific use case challenges? (D2.2)	• Booking changes: time pressure, low predictability of market demand • Data processing • Information-related problems (quick access, right info, up-to-date, on-time)
What is the problem?	Changes in bookings until start of uploading. Loading activity depends on several factors: loading list ready, containers available, fish cargo available at terminal, fish cargo cleared for export, vessel at port and ready for loading, cargo handling equipment and workers available. Late changes in booking are the biggest problem.
Why is this a problem?	The late changes in booking create a need for replanning, rush work, waste of resources and reduced time for cargo handling. This affect the resource utilization and efficiency of the terminal, with following consequences: • increased resource for container handling (man/hours per container) due to replanning, loading-discharging-reloading, • reduced time for loading • risk of delays in departure (due to late loading) • risk of incomplete loading (due to reduced time for loading)
Where does this problem occur?	Typical for the container terminal, and occurs during the phase preceding the loading of the ship. It concerns the interaction between the container terminal and the shipping line / ship agent (discharge/loading list), the port (ship delayed), and the fish exporter / cargo agent (booking).
When does this problem occur?	The several factors affecting the loading activity occur most often very short time before loading/departure. In case events occur earlier in the process, the container terminal is often notified at a very late stage in the process.
Who experiences this problem?	Changes in booking, late information, reduced time for loading affect not only the **terminal**, but also the **shipping line** (ship schedule must be respected) and the **cargo agent** (cargo must be shipped out).
How to overcome the challenge	• Early information on updated booking to facilitate replanning. • Centralized information and automatic transfer to avoid errors and delays in information. • Better planning and more reliability from the part of the fish exporter / cargo agent. • More formal contracts related to booking of terminal services (more binding agreements)

1.1.4.2. Root cause analysis

The main problems related to the Terminal Planning challenge and their root causes are summarized in the diagram below. These can be divided into three main problems faced by the terminal:

- *High resource use*, in terms of time, man-hours, and physical activity related to the treatment of bookings.
- *Delay in ship departure* or *incomplete loading of ship*, both due to the reduced time for loading, which can be due to delay in ship arrival, or delay of cargo, or delay in loading list.

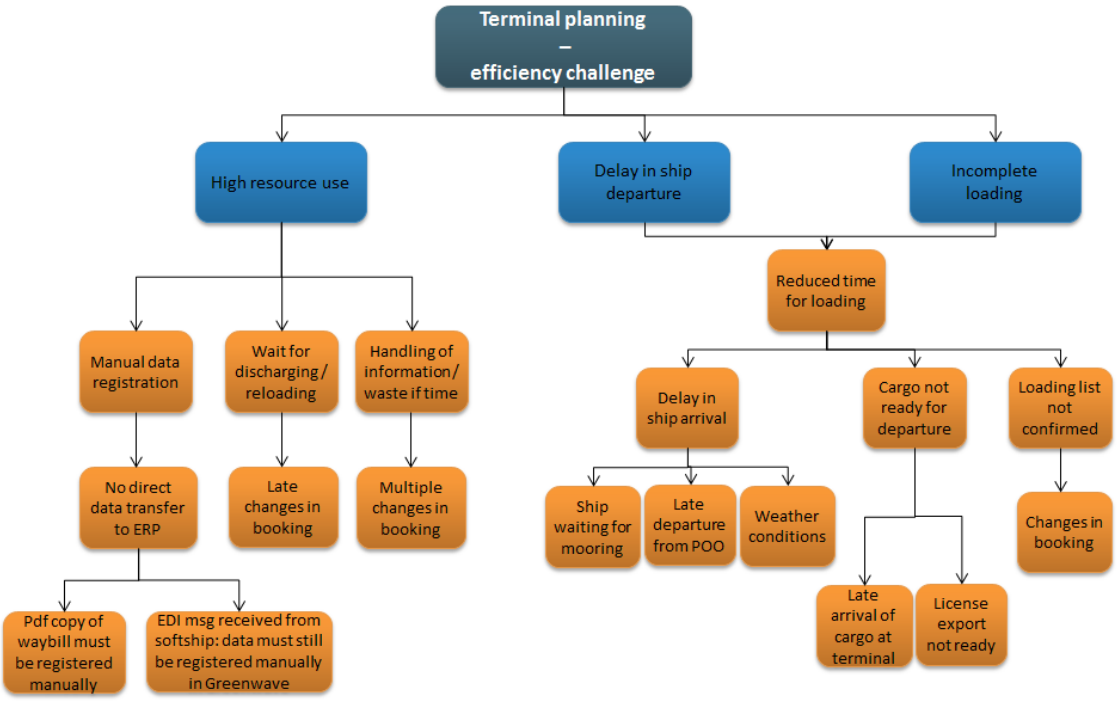
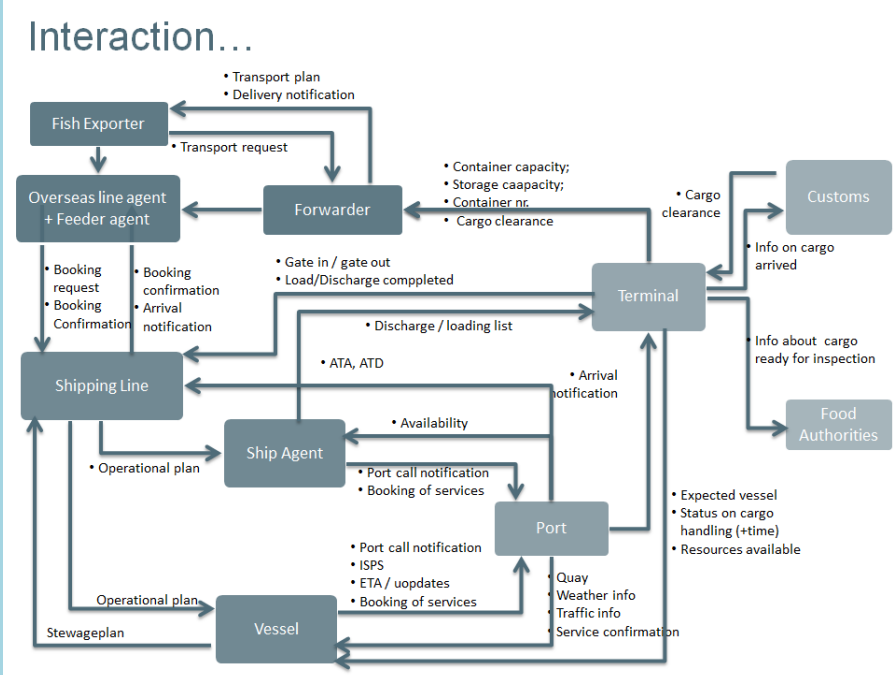


Figure 32: Root cause analysis – Challenge 1.2

1.1.4.3. As-is Use Case Scenario

Table 17: As-is Use Case Scenario: 1.2 Terminal Planning

UCS elements	Description
UCS name	TERMINAL PLANNING
ID	UCS1-2
Goal	Planning of discharge and loading activities based on information delivered by ship agent and cargo agent.
Summary	
Category	Planning
Actors	Terminal, feeder operator, ship agent, cargo agent, port
Primary actor	Terminal: hindered by constant and late changes in discharge / loading list
Stakeholder	Feeder operator, ship agent, cargo agent, Port,
Preconditions	A ship from the feeder operator is planning a port call at Ålesund for discharge and loading of containers
Triggers	The feeder operator sends information about need for discharge & loading to the

	Terminal
Main success scenario*	1. Waybill or EDI messages received => registration of information in Greenwave 2. Print out discharge list for cargo workers (or info directly available on PC onboard trucks) 3. Receiving booking list from agents, excel sheet, Sysped list, on mail 4. Incoming cargo in containers or on pallets 5. Stuffing containers at terminal 6. Receiving loading list from Softship 7. Print out load list for cargo workers, or directly available on PC onboard trucks 8. Loading complete, registration in depot system T3, manually or automatically from PC in trucks
Decision point *	
Information processing*	
Post conditions	the ship leaves the port.
Challenges	• Booking changes: time pressure, low predictability of market demand • Data processing • Information-related problems (quick access, right info, up-to-date, on-time)
Future Internet opportunities	• Early information on updated booking to facilitate replanning. • Centralized information and automatic transfer to avoid errors and delays • Better planning and more reliability from the part of the fish exporter / cargo agent.

1.1.4.4. Identification of possible solutions

The terminal operations are directly dependent on what happens on the side of the carrier, the cargo owner, and the port. In fact, all the information necessary for correct planning of terminal activity in delivered by one of these roles, which means that the improvement of planning and efficiency of terminal activity is highly dependent on improvement in planning and information sharing on the side of the carrier and of the port. In this use case, this means that:

- Improvements envisioned for the challenge of *late booking cancellations* (challenge 1.1) will be beneficial for the terminal, because information will come earlier, cancellations might be reduced, and last minutes booking of cargo available at the terminal may be enabled.
- Improvements envisioned for the challenge of *coordination of resources* at the port (challenge 1.3) will be beneficial for the terminal, because information will be more automatized, and booking of services from the port and terminal will be based on real time information on available capacity, which avoid a great number of interactions in order to synchronize resources.

The table below summarizes the ideas for solutions appropriate for the problems faced by the terminal. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions (specified in italic).

Table 18: Needs and ideas for solutions related to challenge 1.2

Root Causes	Needs	Possible IT Solution
Change in booking (Late notification)	• Real time information • Immediate notification of changes in TEP • Single source of information	**Early-warning**: Signalizing any cancellation of booking ✓ Part of demonstrator 1
Late Changes in Booking	• Improved planning upstream • Reduce number and frequency of cancellation • Reduce number of late cancellation • Enable the quick replacement of cancellation with cargo available at terminal	• **Booking manager** (carrier-shipper) with more binding booking • **Match maker** (carrier-shipper) enabling last minute booking of available cargo at terminal ✓ Part of demonstrator 1
Information Exchange	• Less one-to-one communication • single information source • Less manual processing of data • standard format • All trucks equipped with PC to remove paper communication	• Integration with backend system • Standard e-document (load/discharge list and booking list) for automatic transfer and registration
Ship delay	• Early warning • Single information source	**Port traffic information platform**: • Combining all information and real-time data related to port call and maritime traffic • Provide up-to-date info on planned port calls • Sends automatic warnings in case of changes in ETA/ETD (event characteristics to be defined by receiver of warning) ✓ Part of Demonstrator2
Cargo delayed	• Early warning • Right data	Early warning from cargo owner

1.1.5. Challenge 1.3: Resource Coordination

1.1.5.1. Challenge description

Table 19: Challenge description 1.3: Resource coordination

Challenge 1.3	RESOURCE COORDINATION:
Category Related domain challenge (D1.1)[24]	2. Collaboration and communication 3. Planning and re-planning 4. Resource management 7. Reduction of manual effort through automation
Extensions Specific use case challenges? (D2.2)[25]	• Lack of resource overview • Capacity constraints • Inefficient data processing • Information-related problems (quick access, right info, up-to-date, on-time)
What is the problem?	Lack of visibility about service & resources available and resource need at the port/terminal (services delivered at the port & terminal for the port users: ship services, cargo handling). Inefficiency in the coordination related to booking of services, and (re)planning of resources. This is mainly due to (i) lack of information availability or easy access, (ii) multiple communication channels, and (iii) lack of automatic transfer of data.
Why is this a problem?	Suboptimal resource coordination is a problem for both the port & terminal's service users (ship, shipping line, ship agent) and the port & terminal service providers. On the supplier side: • Unnecessary work for treating service bookings and changes • Reduced resource efficiency thus revenue for all service suppliers (in number of port call, number of services sold, port throughput etc.) and underuse of port & terminal capabilities • Sub-optimal services, or not always adapted to user needs (not availability) On the customer side: • Unnecessary work for finding information and book a service • Deviations at ports and terminals affect replanning. • Port & Terminal are often seen as main bottlenecks, which is one of the reasons why sea transport is still underused, (together with lack of awareness)
Where does this problem occur?	This challenge concerns the interaction between the port/terminal and its customers (mainly the ship / ship agent).
When does this problem occur?	- Marketing of port & terminal services, - Planning of port call & booking of port / terminal services. - Planning of resources based on service bookings.

[24] The "category" field refers to the domain challenges identified in WP1, D1.1 in M6, to which the use case main challenge presented is related.
[25] The "extension" field refers to the additional challenges expressed in the use case in D2.2 in M6, to which the present main challenge relates to.

Who experiences this problem?	In the present case, the focus is on port & terminal service suppliers and ship & ship agents as customers, but resource coordination is a common challenge in the transport and logistics domain.
How to overcome the challenge	It is suggested a Resource Hub as a system for centralizing all information activity, resource coordination, booking of services, event monitoring. This system shall enable integration among all systems used by the port and port users, centralize information, enable automatic data transfer and treatment of information, support to resource planning using real-time information, and support to event-handling,

1.1.5.2. Root cause analysis

The main problems related to the Resource Coordination challenge and their root causes are summarized in the diagram below. The three main problems identified are:

- *Difficulty in finding information about service at, from and to the port*. This problem is a general information centralization and availability challenge, and concerns all roles in the transport and logistics domain. In the diagram, one of the root cause identified in the low awareness about sea transport (underuse of potential, thus lower port throughput). Although the port would benefit directly from improved information sharing about sea transport, this is not a root-cause directly related to the resource coordination, and therefore out of the scope of this analysis.
- *Inefficient process for booking port and terminal resources and services*. Today each port call includes a higher number of interactions and messages. Besides, the ship has seldom access to real-time information when preparing a port call.
- *Resource availability conflict*. The most direct problem related to coordination of resources is that there are very often problems of resource unavailability, and coordination among the carrier (the ship) and the port and terminal services providers is inefficient.

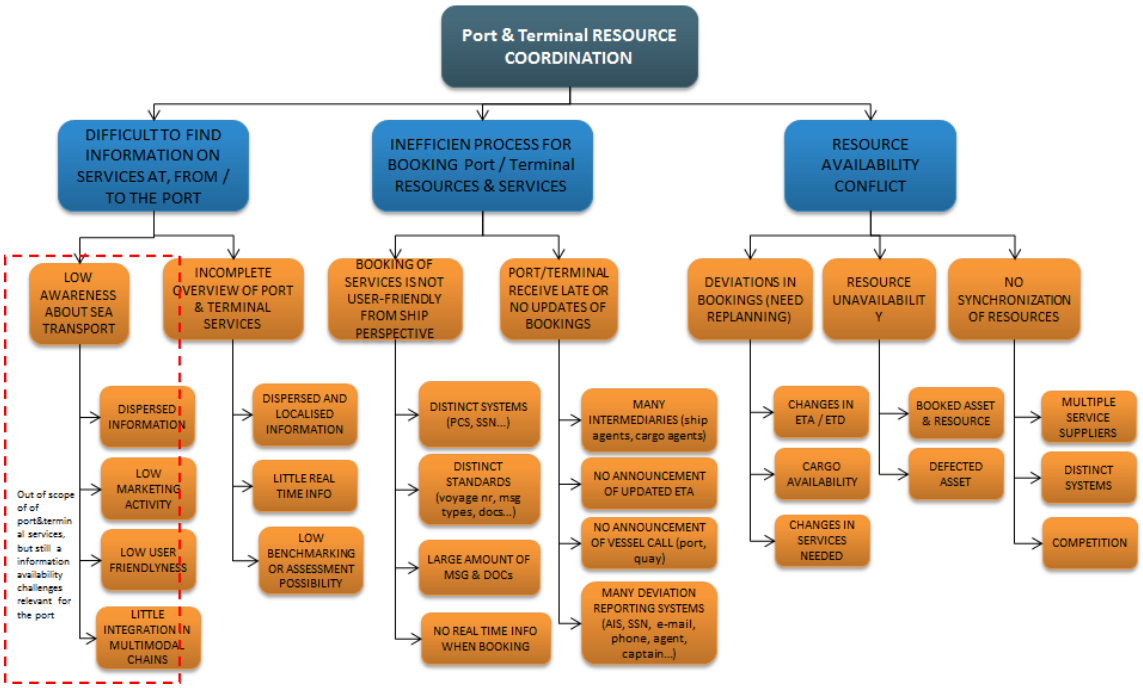


Figure 33: Root cause analysis – Challenge 1.3

1.1.5.3. As-is Use Case Scenario

Table 20: As-is Use Case Scenario: 1.3 Resource Coordination at Port

	Description
Use case name	RESOURCE COORDINATION AT PORT
UCS ID	UCS1-3
Goal	Seamless handling of ship arrival: Reducing redundancy, errors in information transfer and increase preparedness
Summary	Handling of ship arrival corresponds to the operational phase from planning of port call (when a ship announces it to the port) until the port call is completed (the ship has arrived and left).
Actors involved	Actors: Port, Vessel, Ship agent , Shipping Line, Terminal Systems: Port Community System (inPort), SafeSeaNet, AIS
Primary actor	Port (port control): responsible for handling port call; main decision maker.
Stakeholder	• Terminal (receive info about ship arrival and need for cargo handling services) • Ship services suppliers (receiver of information related to booking of ship services) • Local authorities (receiver of ISPS information and info about arrival of cargo) • Local community (receiver of information related to local maritime traffic)
Preconditions	Ship needs to call at port for loading and discharging of cargo
Triggers	Port call announcement
Main success scenario	The main processes engaged in this scenarios are: 0. A container operator communicates an operational plan to a ship and ship agent. The voyage includes a call at Ålesund port. 1. The agent or captain communicates the planned port call to the Port, including ETA, POO, POD, Cargo, Stowage Plan and Discharge/Loading List.

A similar notification (with more security-related information, as well as booking of pilot[26]) is registered in SafeSeaNet.
2. The Port registers this information in the PCS as *expected port call*, and allocates a berth, plans the ship services, and sends confirmation to ship.
3. Port control informs the stakeholders about the port call.
4. The Terminal (who received the information also directly from the ship agent) registers the request for discharge & loading
5. The ship arrives at the port: AIS data about ship entering port district is sent to PCS, or the captain calls the Port control. The port confirms the quay.
6. Ship services are accomplished (port)
7. Discharge / loading are done by the cargo workers (Terminal); confirmation is sent to ship agent.
8. The ship leaves the port

Interaction among the main actors/stakeholders are illustrated in the diagram below:

Decision Point

- ***Criticality of decision:***

The handling of ship arrival is a critical decision point in the use case. The actual time of berthing is dependent of both the real time of arrival of the vessel, the availability of the quay, and other resources of the port and the terminal.

- ***Time perspective:***

This scenario offer several time perspectives:

- "Long term": from several months to one week before port call, i.e. planning phase for all actors. No need for immediate information transfer.
- "Medium term": from 3 to 1 day before port call. The shipping line is in its execution phase (voyage), while the port is planning the port call. In this phase, it is important that the information is as complete and correct as possible.
- "Short term": within 12 hours before arrival, ship is en route. Both ship and port are in their execution phase. In this phase, the immediate and early transfer of information is crucial, because deviations like delays can occur, which requires rapid replanning.
- "Real time": In this phase the ship is its execution phase while the port / terminal have not started any planning phase because no port call was announced. This requires full overview of capacity, complete information availability and immediate information transfer, in order to enable real time booking of port and terminal services.

Information processing

Information Input:

Information content/object	***Sender***	***Communication channel***	***Receiver***
Planned port call (long term)	Ship Agent, Shipping Line	Email, phone, EDIFACT, fax	Port
ETA (medium term)	Ship/captain Ship Agent	Email, fax	Port SSN
ETA / delay	• Ship/captain • AIS	• Phone, VHF, • Xml	• Port • PCS
Arrival notification	Ship / captain	VHF, Phone	Port

Information Output:

[26] Pilot services are excluded from the use case from simplification purposes, because not handled by the port, but by the cost guard.

	Information content/object	***Sender***	***Communication channel***	***Receiver***
	Planned port call (long /medium term)	Port	Web site, Phone	Local community, Authorities
	Planned port call (medium term)	Port	PCS	Ship Services Terminal
	Berth allocation	Port	Email, fax, phone	Ship/captain Ship agent
	Arrival notification	Port	PCS or phone, email	Ship service suppliers, quay owner, terminal/cargo workers
Extensions	• **Cancellation or change in ETA,** ship delay or earlier arrival (announced): May occur between step 2 and 5. The port and terminal must replan according to changes. If no resource available, a solution must be found in collaboration with the ship / ship agent. • The ship is delayed or arrives earlier, but **no announcement** was made. Occurs at step 5. This is handled ad hoc by port / terminal. At worse, the ship must wait for available quay. • **Simultaneous arrival:** Occurs at step 5. Handled in an ad hoc manner, in a way that does not favor one shipping line, and in close dialogue between the terminal and the Port.			
Alternative paths (optional)	There are no particular alternatives for handling of port call, except from the mode for information exchange: • manual mode: phone, email, VHF • automatic mode: SafeSeaNet / AIS are used.			
Post conditions	The port call is completed; the ship has departed.			
Challenges	Challenges identified: • heavy workload • much information/ communication • capacity allocation problem Main causes: • Much manual/double registration of information (due to various actors / info systems) • Much one-to-one communication • Often late information , or no information			
Future Internet opportunities	• Enable captains/ships to enter their port call notification directly into the PCS, including ETA (and all related info), booking of ship services, quay/berth location, pilot service. • Automatic update of ETA based on AIS information registered directly into PCS, providing automatic warnings • Enable automatic distribution of port call related information to port community (ship services, pilots, terminal) • Replace paper notes by one single information exchange window.			

1.1.5.4. Identification of possible solutions

The table below summarizes the ideas for solutions appropriate for the Resource Coordination challenge, faced by the port, but also the terminal. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions (specified in italic).

Table 21: Needs and ideas for solutions related to challenge 1.3

Root Causes	Needs	Ideas for solutions
LOW AWARENESS ABOUT SEA TRANSPORT	• More coordinated marketing of sea transport • Simplified regulations • Centralization of information	A **"information center"** for the entire maritime transport community, combining: - up-to-date information on any TSD - Simulation tools (as a support for TEP) ✓ *Partly presented in DEMO2* (only for information on destination (port & terminal services)
INCOMPLETE OVERVIEW OF PORT & TERMINAL SERVICES	• Centralization of information • Easy-to-find information • Centralization of real-time data • Benchmarking of services • Support for planning	
BOOKING PORT / TERMINAL SERVICES: LOW USER-FRIENDLYNESS	• A single login for any registration of port call and booking of all related services • A single platform for any destination (port/terminal) • Harmonization of information (voyage nr) and messages • Automatic retrieval of information from existing systems • Booking based on real-time information on resource availability • Handling of booking confirmation •	A **"booking portal** "enabling: - Captain or ship agent to register all information (legal and commercial) related to port call in a same place - Access to all existing registration systems (SSN) - Send booking request and automatic updates to the concerned suppliers/stakeholders, - The port/terminal service suppliers to confirm booking directly in the platform. - Access to real-time information about resource availabilities so that the booking can be as accurate as possible. - Prepares a resource plan centralizing all resources booked, and showing real time status of resource booking. ✓ *Part of DEMO2*
	Centralization of reporting	**Single window** for centralizing all mandatory legal reporting Already tackled by Single Window concept (e-Freight/e-maritime)
LATE OR NO UPDATES OF PORT CALL AND BOOKINGS OF SERVICES	• Notification a.s.a.p. of any changes in ETA / ETD • Notification a.s.a.p. of any changes in services / resources needed • Correct information • Centralization of information	A **"booking portal"** that allows for: - direct updates in plan, - Automatic reception of deviation messages (directly from AIS system, or other local system etc.) - Distribution of warning messages, so that all stakeholders receive simultaneous notification about updated ✓ *Part of DEMO2*
DEVIATIONS IN BOOKINGS		
RESOURCE UNAVAILABILITY	• Up-to-date information about all port & terminal resources available • Access to this information at the time of booking • Automatic warning of resource unavailability, automatic change in resource plan or need for the ship to rebook resources.	A **"booking portal"** that: - Indicates the real-time information about resource availabilities so that the booking can be as accurate and immediate as possible. - Coordinate the bookings and sends the booking request automatically to the suppliers; and register confirmations. - Prepares a resource plan centralizing all resources booked, and showing real time

		status of resource booking. ✓ *Part of DEMO2*
LACK OF SYNCHRONIZATION OF RESOURCES	• One place featuring all services and resource available in real-time • Accessible by all service suppliers from a single destination (port call) • Connection to all local/back-end systems	A **"resource coordination"** portal : - With access to all information about service suppliers, by destination - Access to real-time information - Enable automatic sending of booking requests to suppliers - Enable booking confirmation through the portal - Able to prepare resource plan based on any booking criteria and constrains - Provide information to suppliers about all port calls and related resources requested / booked. ✓ *Part of DEMO2*

Annex 1.2. Use case 2 Story line - Import of Fashionable Goods from Asia to Europe

1.2.1. Introduction to the Use Case 2

The second use case has been modified because the transport of fashionable goods from China to Amsterdam has more practical relevance then shipping machinery parts from Kiev to Amsterdam.

- In the first step the goods are being trucked from different locations in China to Xiamen.
- In Xiamen the forwarder consolidates all different goods.
- The forwarder transports the consolidated shipment to the carrier's warehouse.
- Air transport including handling is done by carrier.
- The forwarder picks up the goods at the airline.
- The forwarder arranges the customs declaration.
- The forwarder executes the deconsolidation.
- The forwarder trucks the shipment to the consignee.

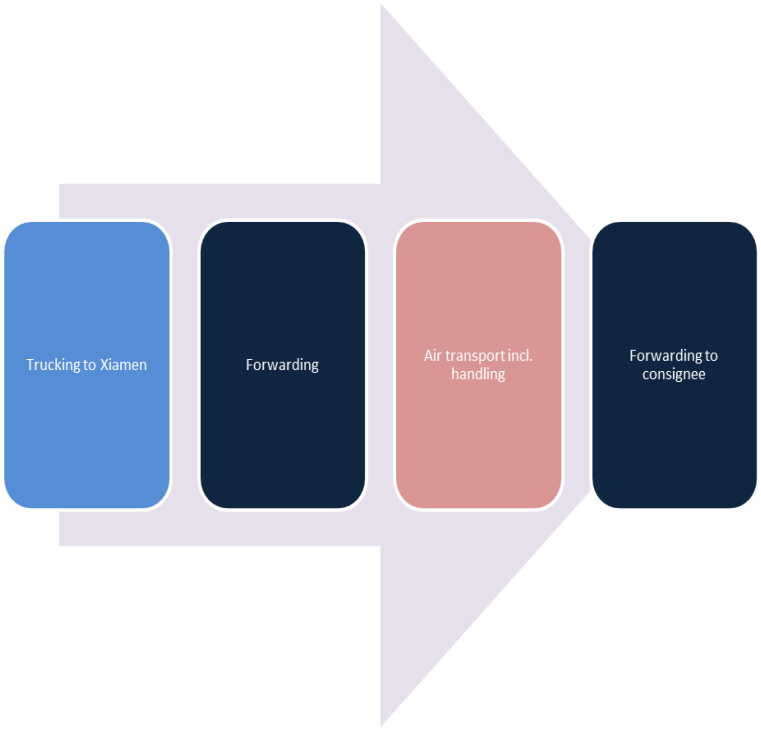


Figure 34: Rough overview whole process.

Figure 34 shows the process diagram of the whole transport chain starting with the finished fashionable goods in several production plants in China ending with the consignee.

The stakeholders involved in this use case are Kühne+Nagel as the forwarder and Air France - KLM as the carrier. The trucking is executed by trucking companies, under the responsibility of the forwarder. These processes are summarized in Figure 35 and Figure 36 below.

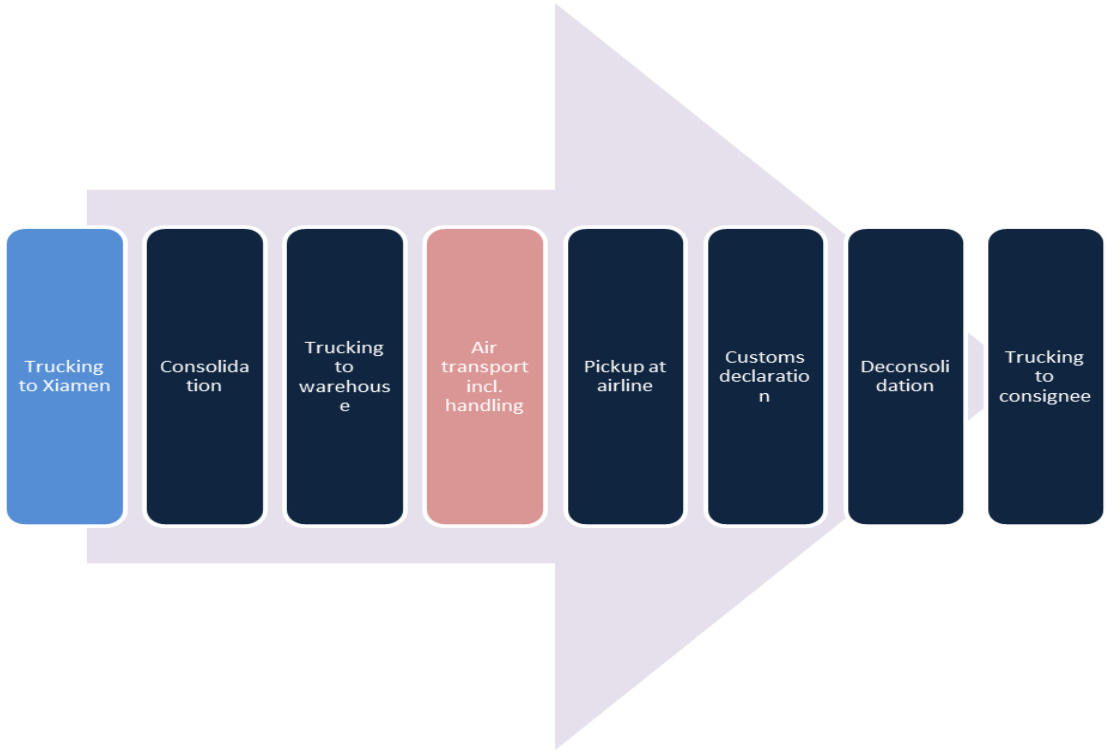


Figure 35: Detailed forwarder process.

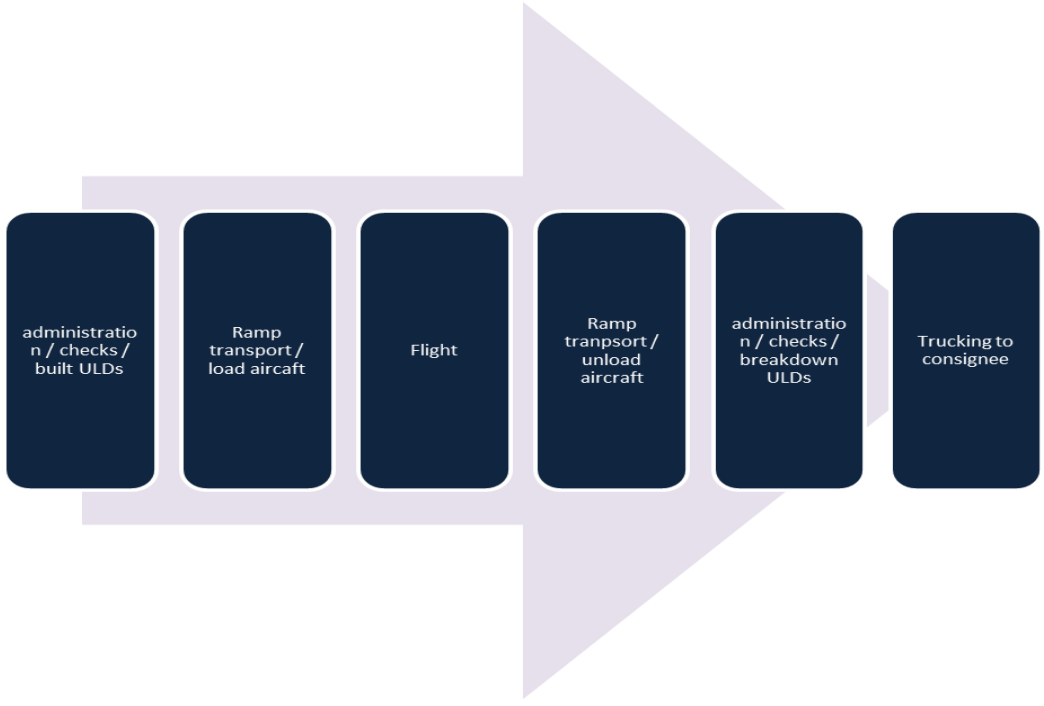


Figure 36: Detailed Air freight carrier process. (summarized)

1.2.2. Main Challenges encountered in the use case

Based on the results of the high level use case description the main challenges in use case 2 (Airfreight, K+N /Air France-KLM Cargo) have been identified and analyzed. The figure below shows the main process steps with its sub steps, including the main challenges.

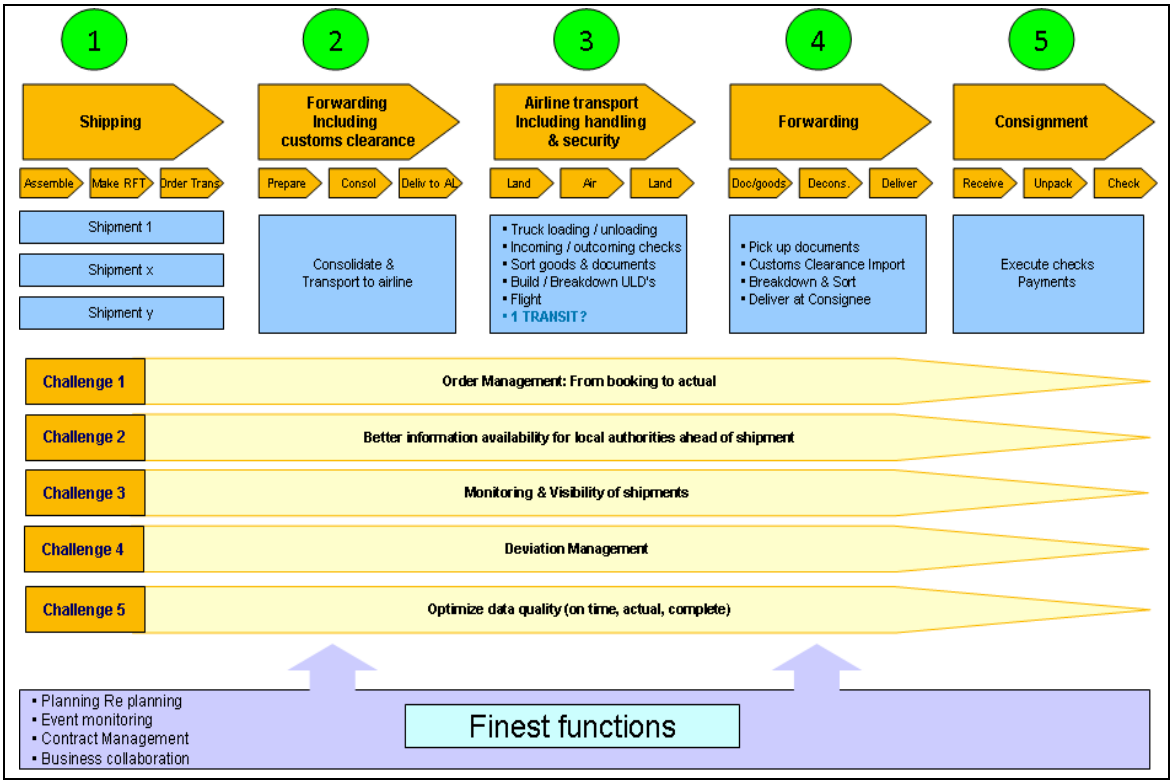


Figure 37: Main challenges encountered in Use Case 2

By investigating the whole process flow five main generic challenges have been determined. These main challenges were chosen because they are generic for forwarding and airfreight industry and have a big impact on the whole transport chain.

The challenges are:

- **Order Management: Reducing the gap from booking to actual**

  This challenge addresses the problem of high, low or no shows and late cancellations which means that in many cases the actual goods that have to be transported differ from the booking in amount / weight / size.

- **Better information availability for local authorities ahead of shipment**

  For example: Customs needs to know exactly what is being shipped at what time. They need this information with the right quality on time to make a good risk assessment and determine if a shipment needs to be checked. Both planned and unplanned checks of customs disturb the cargo processes.

- **Monitoring and Visibility of shipments**

Information availability of shipments is not always available for all logistic stakeholders who need to react. There is also a timing lag in the information availability. This is causing late reaction on deviations, causing disruptions in the process.

- **Deviation Management**

  Ad-hoc deviations occur very often, for example a late arriving truck at the carrier warehouse due to traffic jams or an offload of a shipment by the airline because there was more freight delivered by the forwarder then booked. Deviations are not standard, and therefore inefficient. It has also an effect on client satisfaction because contractual agreements might not be met. Data availability for making the right and fast decisions when deviations occur is the main challenge here. This will decrease the impact of the deviation on the transport plan.

- **Optimize Data quality (on time, actual, complete)**

  Data quality is an underlying problem of all the above challenges. Therefore this challenge has been taken out. Disruptions will occur when the information flow is not synchronized with the physical flow.

In the following chapters you will find per main challenge, the problems, underlying root causes, illustration through as-is scenarios, and ideas for solutions identified by the use case team.

1.2.3. Challenge 2.1: Order Management

1.2.3.1. Challenge description

Table 22: Challenge description 2.1: Order Management

Challenge 2.1	**Order Management**
Category **Related domain challenge (D1.1)**[27]	2. Collaboration and communication 3. Planning & Re-planning 5. Monitoring of operations throughout the process 6. Visibility of shipments
What **is the problem?**	When shipping goods, there is often a gap between the booking information and the actual shipment, because the planning is not aligned and/or available info not shared. We have gaps between - The booking and the AWB - The AWB and the physical freight (together they form the shipment) The booking and the physical freight
Why **is this a problem?**	The gaps above cause the following: - Delay of shipments (forwarder or carrier cannot accept the freight until the gaps are fixed) - Shipper will not get his shipments on time in full at the consignee - Forwarder cannot consolidate efficient - Carrier cannot optimize their use of assets & delivers lower quality Invoice sent are not always conform the shipment which causes a lot of rework for many parties in the supply chain

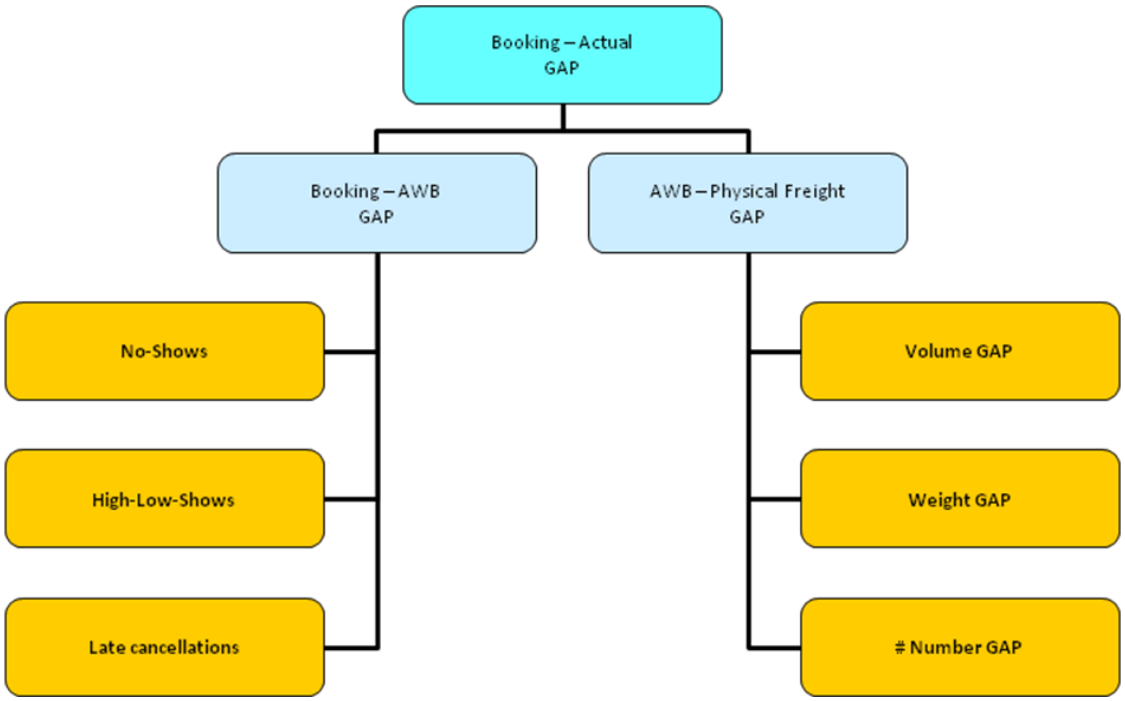
[27] The "category" field refers to the domain challenges identified in WP1, D1.1 in M6, to which the use case main challenge presented is related.

Where does this problem occur?	This problem occurs in all phases, both at forwarder and carrier.
When does this problem occur?	This problem occurs in all phases, both at forwarder and carrier
Who experiences this problem?	All stakeholders experience this problem, both the sales organization as operations experience this gaps
How to overcome the challenge	In the current state replenishment needs from consignee, production planning and transport needs from shipper are somewhere available, but not for forwarder and carrier

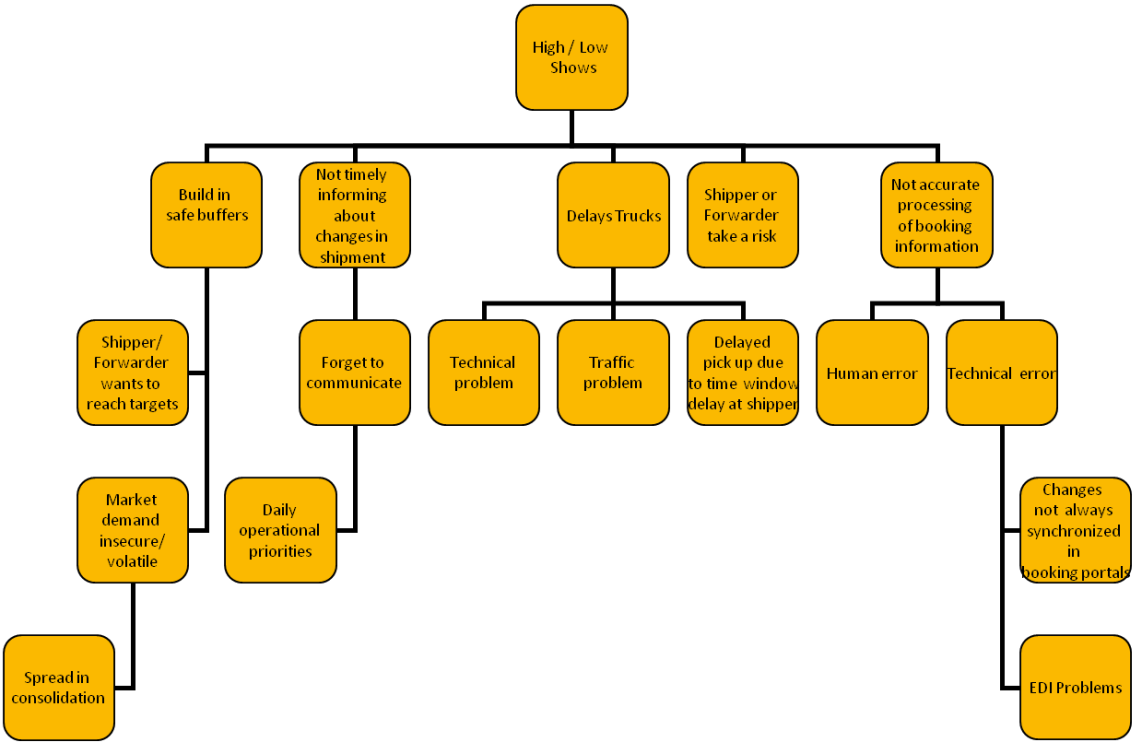
Both forwarder and carrier need to have the same information about the dimensions and numbers of goods which have to be transported. Diverse transport problems will occur when the booking differs from the actual goods to be shipped.

1.2.3.2. Root cause analysis

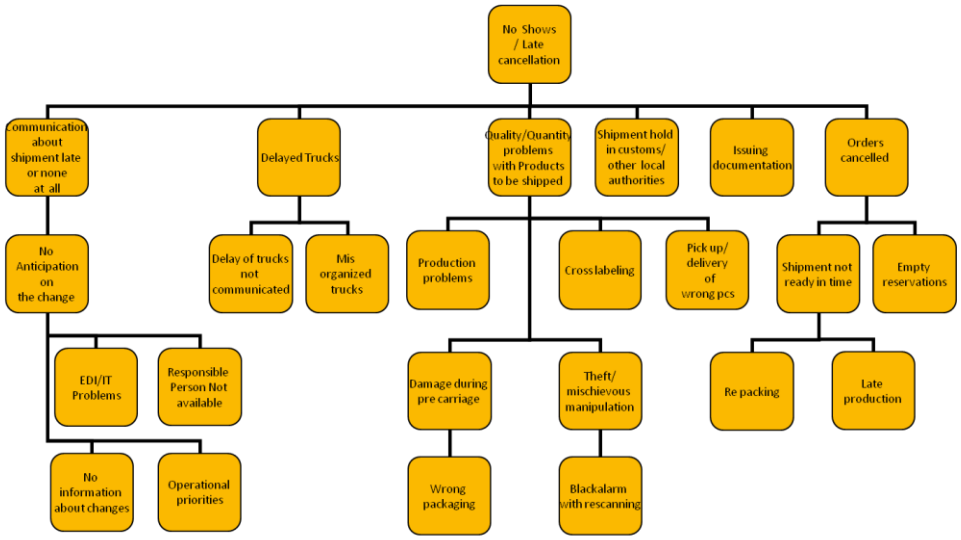
Reducing the gap between booking and actual is a challenge because of two main problems.



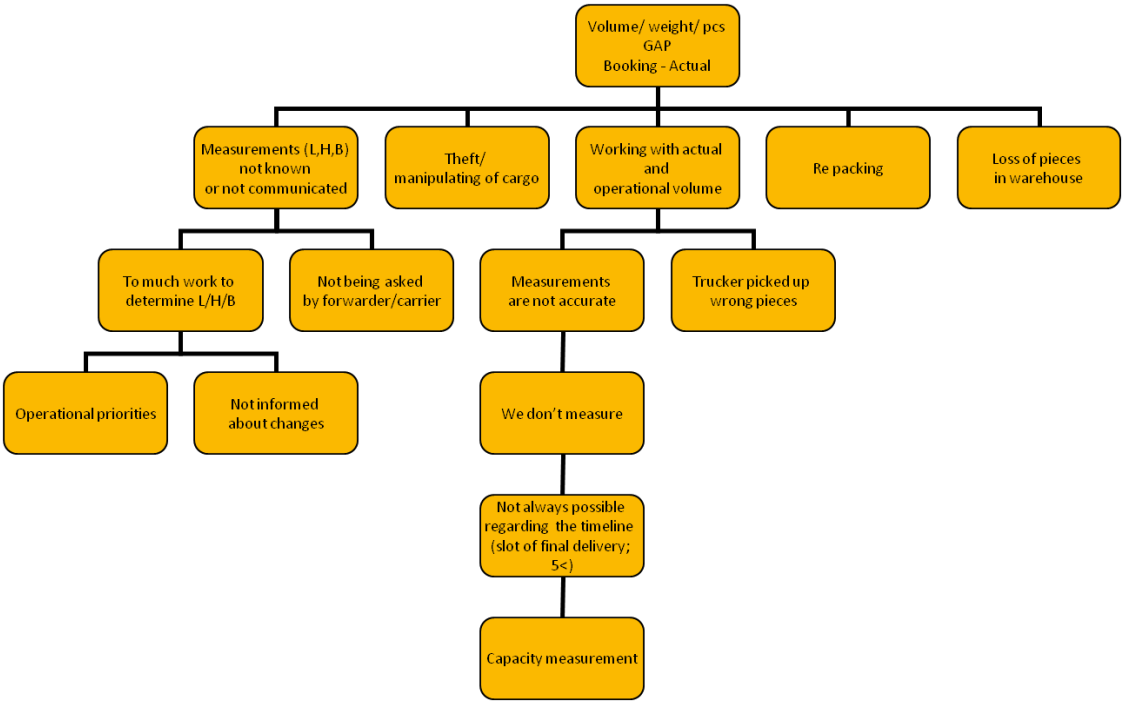
As shown in the figure above the gap between booking and actual can be divided in two kinds of gaps: The one between booking and the actual air waybill (both paper documents) and the one between the air waybill (paper) and the physical freight. These gaps cause problems like no shows or high / low shows and late cancellations.



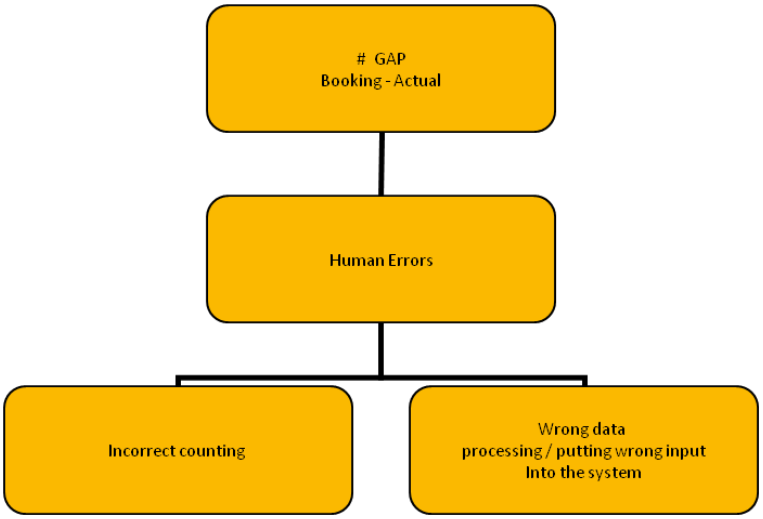
The figure above depicts the detailed root cause analysis for the problem of high or low shows. Deviations regarding the amount of goods can be caused for example by traffic jams.



In the picture above the problem of no shows and late cancellations is analyzed. This problem can be caused by late or wrong communication, delayed trucks, quality or quantity problems, the hold of shipments due to local authorities, issuing documentation or cancelled orders.



The problem of gaps regarding volume, weight or amount of goods is caused by communicating wrong measurements, thievery, working with actual and operational volume (which can differ), re-packing or the loss of pieces in a warehouse where the goods have been temporarily stored.



All kinds of gaps result from misinformation. The number gap between booking and actual can also be caused by human errors regarding incorrect counting or wrong data processing into the system.

1.2.3.3. As-is Use Case Scenario

Table 23: As-is Use Case Scenario: 2.1 Order Management

UCS elements	Description
UCS name	Order Management

UCS ID	UCS2-1
Goal	In many shipments there is a gap between the booking information and the shipment, because planning is not aligned/info not available. We have gaps between: The booking and the AWB, The AWB and the physical freight and the booking and the physical freight. This use case wants to reduce these gaps and make the process more efficient.
Summary	Several shipments of fashionable goods are being trucked from different locations in China to Xiamen. All shipments are fashionable goods (e.g. shoes, clothes, sunglasses). The forwarder consolidates the different shipments in Xiamen and transports it to the warehouse of the carrier. Air transport, including handling by carrier. The forwarder picks up the goods at the airline in AMS and arranges the customs declarations. The forwarder executes the deconsolidation and forwards it to the Consignee.
Actors	• **Shipper:** does the transport request • **Forwarder** (KN): KN AMS / KN SHA used ITC system CIEL FA for order processing and KN Login for visibility, C2K for data exchange with airlines and terminals >
• **Carrier:** Customer support officer who facilitates the booking in the booking system. Operational employees in the warehouse who physically check the freight dimensions. Employees from the documentation department who check all documents. The carrier is using many different systems for booking and operational planning and execution. • **Authorities:** Customs officer who checks cargo (both information and physical check)
Primary actor	The consignee, shippers starts in this use case with the replenishment/transport request. KN SHA is collecting the shipment from the origin. AFKL supports the freight air transport.
Stakeholder	Shipper, Forwarder, Airline, Customs, Airport Terminal Operator, Customs, Consignee
Triggers	Some examples: Replenishment of consignee, transport request of shipper, Pick up of the shipment at the origin, transport request from forwarder
Main success scenario	Shipping an airfreight shipment from SHA (PRC) to EU (AMS) with no unplanned stops due to gaps between in/between documentation, the planned and actual physical freight.
Decision point	Shipper: does the shipper need transport, when, how much, which modality? Forwarder: Latest acceptance time of the delivery at the forwarders warehouse Carrier: Latest acceptance time of the delivery at the air carrier warehouse
Information processing	Consignee – Shipper: Purchase order. Shipper – Forwarder: Kind of freight -> transport request. Forwarder – Carrier: Kind of freight, dimensions, handling request e.g. Medicine, Flowers, via phone, fax, booking portal Carrier – Forwarder: Confirmation to forwarder Forwarder – Customs: Customs declaration. Carrier – Customs: Export and entry messages to customs, EDI Carrier – Forwarder: Notified delivery, via EDI
Extensions	All extensions which can take place are mentioned in the root causes
Alternative paths	If the actual freight differs from the booking information their might be a delay. Or the forwarder or the carrier might re plan the freight on another day/transport
Post conditions	Shipment is customs cleared and can be delivered to the consignee; Shipment is compliant to all legal rules from safety perspective, customs perspective, etc. Products to be shipped are not under embargo.

Challenges	Challenge 1 Order Management lead to several issues or failures (see attachment). The challenge is to decrease the existing gaps.
Future Internet opportunities	Business Collaboration functions that share information on time between supply chain partners to deal with those changes in demand.

1.2.3.4. Identification of possible solutions:

Table 24: Needs and ideas for solutions related to challenge 2.1

Challenge / Root Causes[28]	Needs	Ideas for solutions
• Volatile Market demand • Forget to communicate due to daily operational priorities • Human Errors, wrong processing of information/data input • Not informing other partners about changes • Traffic Jams	• Correct booking information • Being informed about changes as soon as possible/when the moment it occurs	• A collaboration platform that delivers in real time information to all parties in the supply chain, when a deviation occurs in the process from booking to the actual shipment. • A booking intelligence application that combines booking information from different supply chain partners and gives a trigger when inconsistencies occur. For example: products, dimensions versus weight.
Measurements often are bottle neck, creating wrong dimensions for further planning	The right dimensions of the freights, on different aggregation levels, from smallest package to total.	Weighing at the source / shipper, sharing via the Finest Platform to all relevant parties.

Regarding the different root causes of this challenge there could be several solutions which fulfill the needs of every process step.

1.2.4. Challenge 2.2: Better information availability for local authorities ahead of shipment

1.2.4.1. Challenge description

Table 25: Challenge description 2.2: Better information availability for local authorities ahead of shipment

Challenge 2.2	**Better information availability for local authorities ahead of shipment**
Category Related domain challenge (D1.1)	2. Collaboration and communication 3. Planning & Re-planning 5. Monitoring of operations throughout the process 6. Visibility of shipments

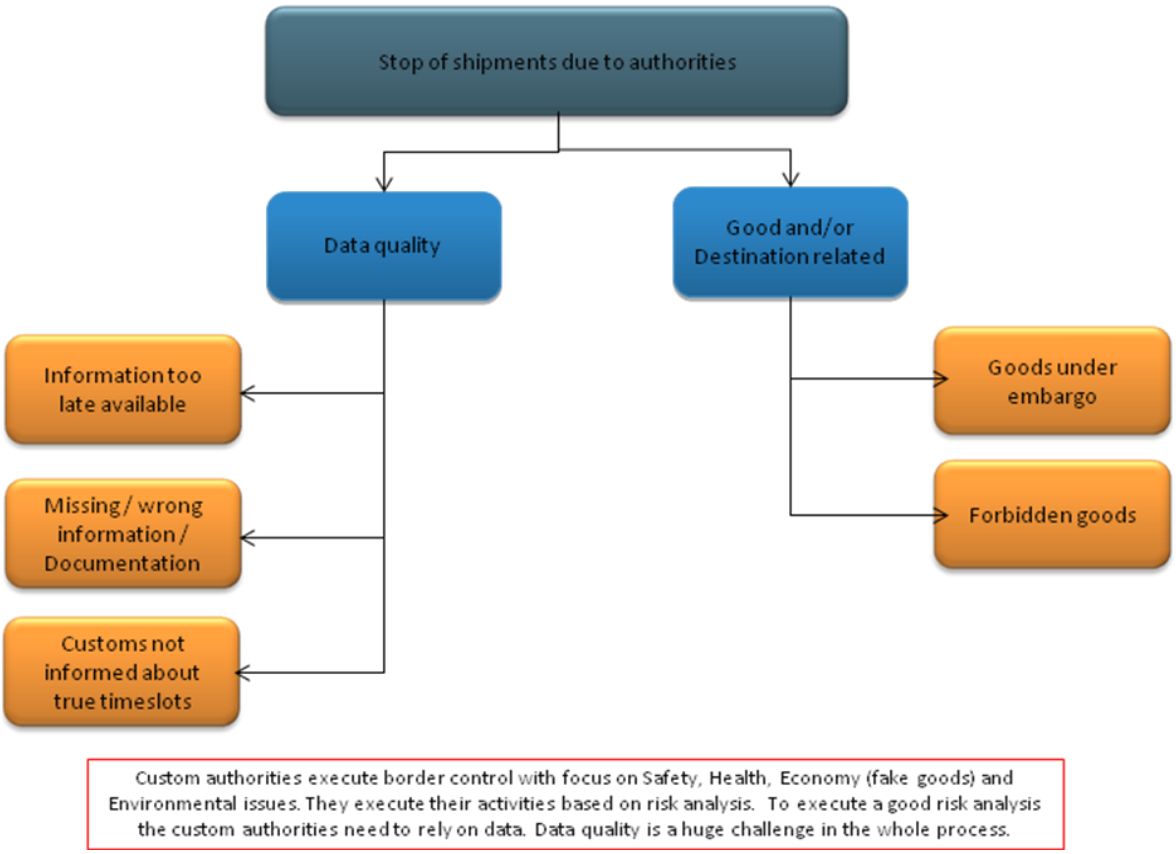
[28] Please note that not all root causes are covered. A selection was made and focus was put on challenges and root causes "where Finest can help", i.e. for which the capabilities offered by F.i. and FInest can contribute to the envisioned solution.

	7. Reduction of manual effort through automation
What is the problem?	Local customs can stop shipments which causes a delay in the whole chain, especially when the stop of a shipment is not communicated. Sub questions: Can we reduce the number of shipment stops and can we communicate better when a shipment is stopped?
Why is this a problem?	The stop of a shipment is a problem when: - It is a unplanned stop - When the stop is not communicated to partners involved When a stop occurs it increases workload for several parties in the supply chain, and possible delays for shipper and consignee
Where does this problem occur?	This problem occurs in the warehouse of the carrier, within the customs zone. execution phase, both hinder forwarder and carrier
When does this problem occur?	This problem occurs in the execution phase
Who experiences this problem?	Stopping shipments is a problem for Customs (they don't have the right information), Forwarder and Carrier (they might get fines, disruption of operational processes), Shipper and Consignee (delay of shipments).
How to overcome the challenge	The problem can be caused, related to insufficient data quality, or combination between goods to be transported and destination.

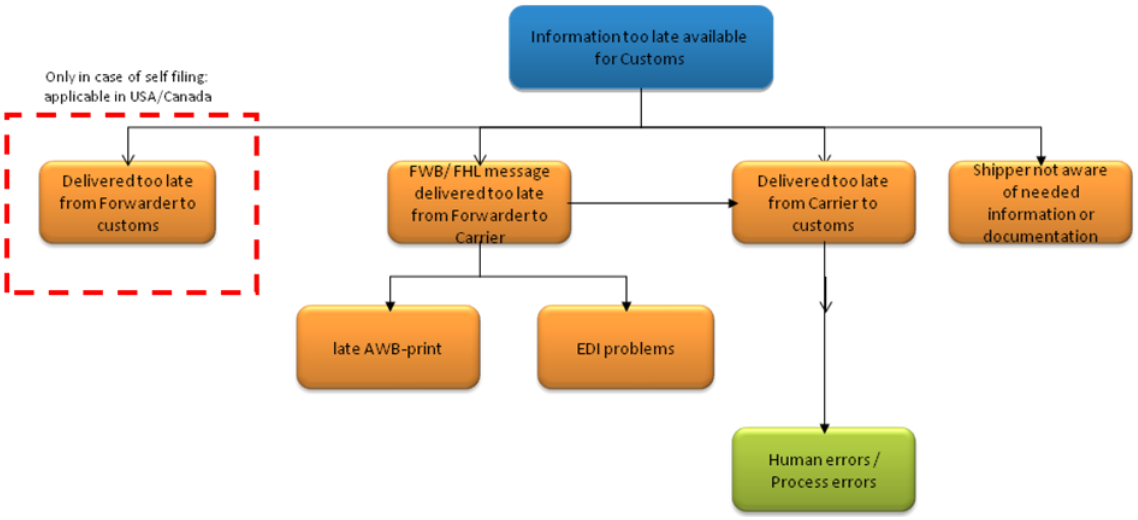
In the case that local authorities are not informed in time the shipment might be stopped due to custom control. By increasing the quality of communication with authorities (on time, in full, with the right quality) this problem could be reduced because possible stops can be planned. If all stakeholders know that the shipment will be stopped at a certain point of time they can change their schedule up front.

1.2.4.2. Root cause analysis

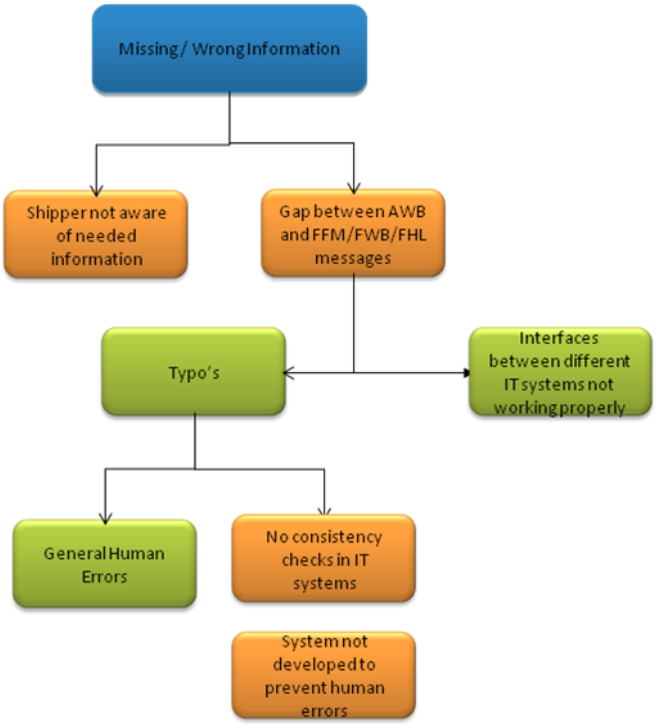
The shipment could be stopped due to authorities if for example customs aren't informed in time.



A stop of the shipment can be caused due to reasons of data quality which means that information is wrong or too late available or due to the kind of goods or the destination.



In the case that the information is too late available this could be caused by delivering the freight waybill too late from forwarder to carrier either due to EDI problems or a late air waybill print.



Another possibility for a deviation caused by authorities is that information about the goods could be incomplete or wrong which could be caused for example by typos that cause a gap between the freight documentation.

1.2.4.3. As-is Use Case Scenario

Table 26: As-is Use Case Scenario: 2.2 Better information availability for local authorities

UCS elements	Description (with example based on UC2 and 3 examples of scenarios)
Name	Better information availability for local authorities ahead of shipment
ID	UCS2-2
Goal	The final goal is to eliminate all discrepancies by local authorities due to not being compliant to standards. Make sure information is delivered on time, in full, with the right quality for local authorities.
Summary	Several shipments of fashionable goods are being trucked from different locations in China to Xiamen. All shipments are fashionable goods (e.g. shoes, clothes, sunglasses). The forwarder consolidates the different shipments in Xiamen and transports it to the warehouse of the carrier. Air transport, including handling by carrier. The forwarder picks up the goods at the airline in AMS and arranges the customs declarations. The forwarder executes the deconsolidation and forwards it to the Consignee.
Category	Business Collaboration Manager: making information available for the local authorities within human intervention
Actors	• **Shipper:** has the transport request. • **Forwarder:** Arrangement of transport, react fast and flexible on deviations • **Carrier:** Sending flight manifest to customs • **Authorities:** Customs officer who checks cargo (both information and physical check)

Primary actor	The consignee, shippers starts in this use case with the replenishment/transport request. KN SHA is collecting the shipment from the origin. AFKL supports the freight air transport.
Stakeholder	Shipper, Forwarder, Airline, Customs, Airport Terminal Operator, Customs, Consignee
Triggers	Information send too late; discrepancies between documentation and physical freight; Risk assessment of Customs
Main success scenario	No stops of shipments by local authorities due to not being compliant to standards
Decision point	Customs: does the custom want to stop the shipment or not?
Extensions	• Shipments put in quarantine for necessary action from local authorities
Alternative paths	When a shipment is stopped they probably miss the flight. Re-planning needs to be executed.
Challenges	All information related. The right information, corresponding/consistent with the actual shipment, on time, in full available for customs
Future Internet opportunities	An information platform which makes information available for all parties involved. For example: necessary information for customs is send automatically, with no or less human interfaces. This reduces the human errors, improves quality

1.2.4.4. Identification of possible solutions

Table 27: Needs and ideas for solutions related to challenge 2.2

Challenge / Root Causes	Needs	Ideas for solutions
• Information too late available	• Information being exchanged with several supply chain partners, including authorities, without or with a minimum of human interface	• A collaboration platform that delivers in real time information to all parties in the supply chain, including authorities. This system also monitors deadlines and gives triggers on time when information needs to be sent to be in the 'safe zone'
• Missing or Wrong information	• The right information on time in full	• Data quality management in within the platform • Next "step" in transport can only be initiated if all necessary input (correct, weight, dimension etc.) is filled in
• Shipper not aware of information needed or documentation	• Shippers and forwarders fill in and deliver all the required documents	• A push system for shippers & forwarders regarding the right information delivery system. Based on the booking & product, the system forces the shipper to fill in all relevant documents.

In order to face the challenge and its root causes, several business needs and possible solutions can be derived. In the case that information is too late available there is a need that data is centrally stored and immediately is available for all stakeholders as long as they are allowed to see and use this information. This could be realized by providing a collaboration platform that

delivers all necessary information to all parties in real time. To solve the problem of missing or wrong information there is a need for the right information. This could be solved by data quality management within the platform with for example logic checks. For example wrong units could be identified. Another possible solution is that the next process step can only be initiated if all data is provided to the system.

1.2.5. Challenge 2.3: Monitoring and visibility of shipments

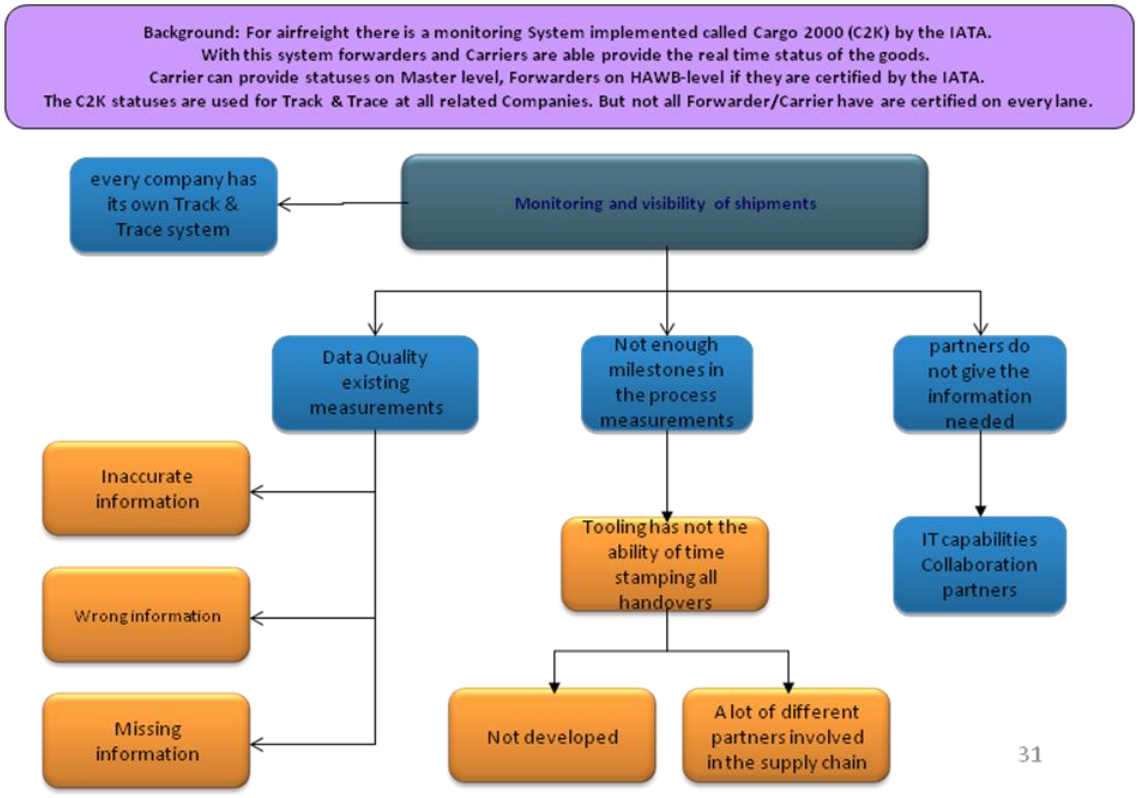
1.2.5.1. Challenge description

Table 28: Challenge description 2.3: Monitoring and visibility of shipments

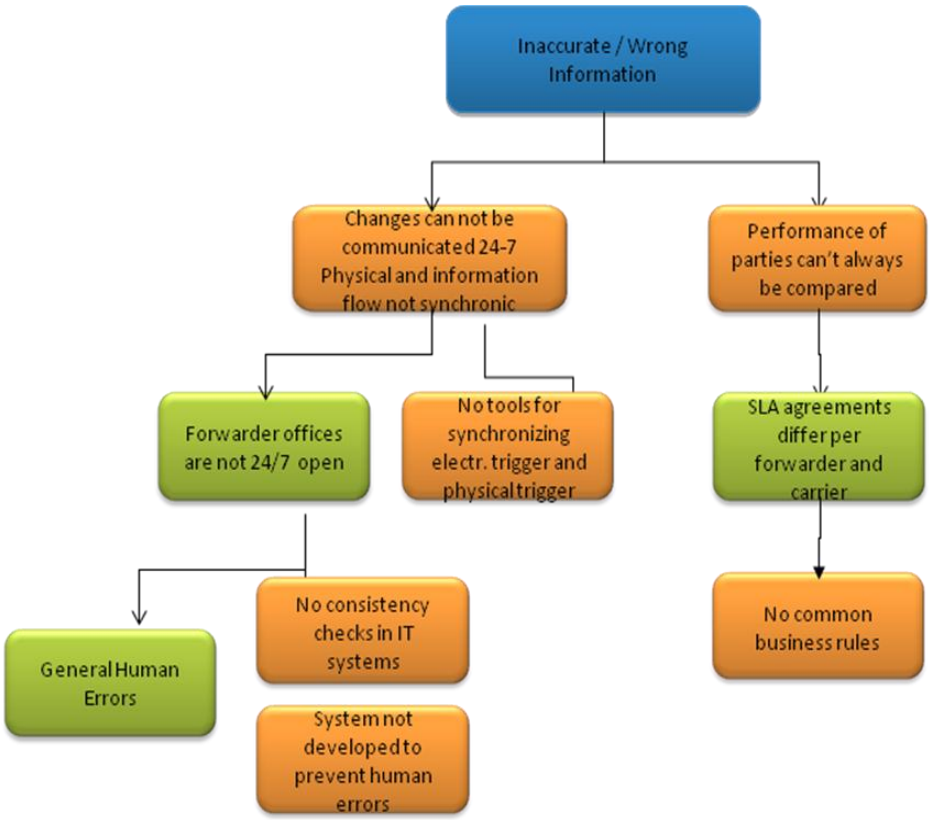
Challenge 2.3	**Monitoring and visibility of shipments**
Category Related domain challenge (D1.1)	2. Collaboration and communication 3. Planning & Re-planning 5. Monitoring of operations throughout the process 6. Visibility of shipments
Extensions Specific use case challenges? (D2.2)	Deviation Management
What is the problem?	Following up and monitoring of the process helps to react on deviations on short notice and also to find the improvement points in the process. It is the basis for continuous improvement. In the current situation information availability for monitoring and visibility is not always available.
Why is this a problem?	React on short notice may increase the shipments delivered on time in full, even when and before problems occur.
Where does this problem occur?	This problem can occur in all phases, both at forwarder and carrier
When does this problem occur?	This problem occurs in all phases, both at forwarder and carrier
Who experiences this problem?	Operators who monitor the status of shipments

Being informed by monitoring tools about process interruptions immediately when a deviation occurs makes it possible for all stakeholders to react earlier.

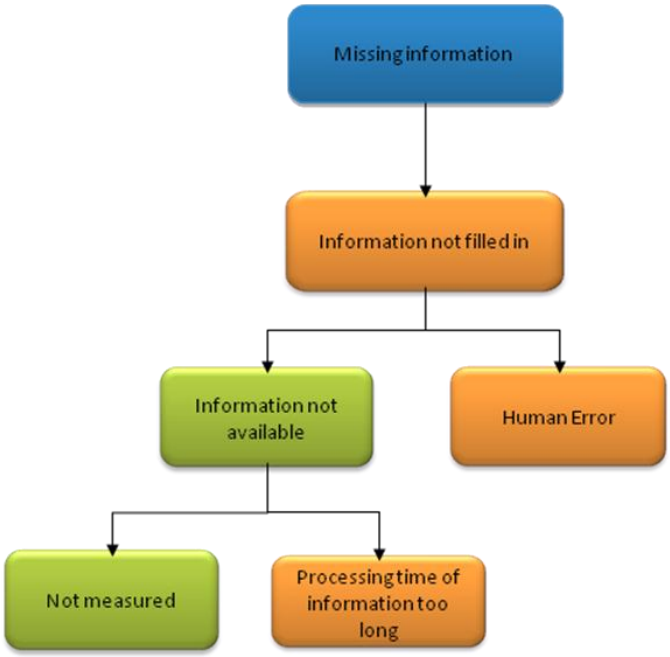
1.2.5.2. Root cause analysis



An insufficient monitoring and visibility system is caused by several reasons. One problem is that every stakeholder has got its own system which cannot be used by other companies so that data is isolated, not shared automatically. Also a poor data quality or not enough milestones can be a reason for problems.



Inaccurate or wrong information can be caused for example by the problem that changes cannot be communicated 24/7. The physical flow is in that case not automatically synchronized with the information flow.



If not all requested data is provided to the system some information could be missing. This can have the reason that not all data is available due to the lack of measurement or human errors.

1.2.5.3. As-is Use Case Scenario

Table 29: As-is Use Case Scenario: 2.3 Monitoring and Visibility of shipments

UCS elements	Description
Name	Monitoring and Visibility of shipments
ID	UCS2-3
Goal	To have as soon as possible all relevant information available when changes occur, both in the sales process (a booking is changed) and in the execution phase.
Summary	Several shipments of fashionable goods are being trucked from different locations in China to Xiamen. All shipments are fashionable goods (e.g. shoes, clothes, sunglasses). The forwarder consolidates the different shipments in Xiamen and transports it to the warehouse of the carrier. Air transport, including handling by carrier. The forwarder picks up the goods at the airline in AMS and arranges the customs declarations. The forwarder executes the deconsolidation and forwards it to the Consignee.
Category	• Business Collaboration Manager: making information available for the local authorities within human intervention • Event Monitoring: monitoring based on milestones, triggering when deviations occur • Planning / Re-Planning's module: acting when changes occur
Actors	• **Shipper:** has the transport request, wants to be informed when changes occur • **Forwarder**: Arrangement of transport, react fast and flexible on deviations • **Carrier**: Air Transport of goods including preparations • **Authorities**: Customs officer who checks cargo (both information and physical check)
Primary actor	The consignee, shippers starts in this use case with the replenishment/transport request. KN SHA is collecting the shipment from the origin. AFKL supports the freight air transport.
Stakeholder	Shipper, Forwarder, Airline, Customs, Airport Terminal Operator, Customs, Consignee
Triggers	All changes in the process or in the freight information can be a trigger, depending on the business rules which are created
Main success scenario	All necessary information available for all relevant parties, when changes occur.
Decision point	1) Is it a deviation or not? Therefore we need business rules 2) how to deal with deviations? Can we repair within original timeframe or do we need to re-plan?
Extensions	• For example: delays, damages and how this are handled. • For example: retrieving of additional offers before choosing the carrier.
Post conditions	Transport Order Created
Challenges	The main challenge is getting information with the right quality as soon as possible
Future Internet opportunities	See item "category"

1.2.5.4. Identification of possible solutions:

Table 30: Needs and ideas for solutions related to challenge 2.3

Challenge / Root Causes	Needs	Ideas for solutions
Data Quality existing measurements	Time stamping done without human interface	A collaboration platform that collects data from containers via tags. This should be a solution where the internet of things is combined with the Finest Collaboration Manager to exchange the data.
Not enough milestones	Time stamping done without human interface	Use of RFID chips included in every shipment
IT capabilities Supply Chain Partner	Low threshold tooling available for supply chain partners, via internet. Assumption: all partners have access to internet	A Collaboration Platform, accessible via the internet where tooling can be downloaded and used.

If business wants to act on deviations in an early stage, the time between milestones should be appropriate. More milestones available in a monitoring system will support early detection of problems.

Another need is the automatic time stamping without human interaction and synchronizing the physical flow with the information flow.

If we want to monitor the whole supply chain, all stakeholders should be able to share process information. The will set up the need for a tool with low implementation cost. This will also enable small logistic enterprises to use the tools.

1.2.6. Challenge 2.4: Deviation Management

1.2.6.1. Challenge description

Table 31: Challenge description 2.4: Deviation Management

Challenge 2.4	Deviation Management
Category Related domain challenge (D1.1)	2. Collaboration and communication 3. Planning & Re-planning 5. Monitoring of operations throughout the process 6. Visibility of shipments
What is the problem?	Ad-hoc deviations occur in many ways. Some examples in forwarder-air cargo area are: - shipment is to late delivered due to a late arriving truck at the carrier warehouse - A Shipment is off loaded by airline because there was more freight

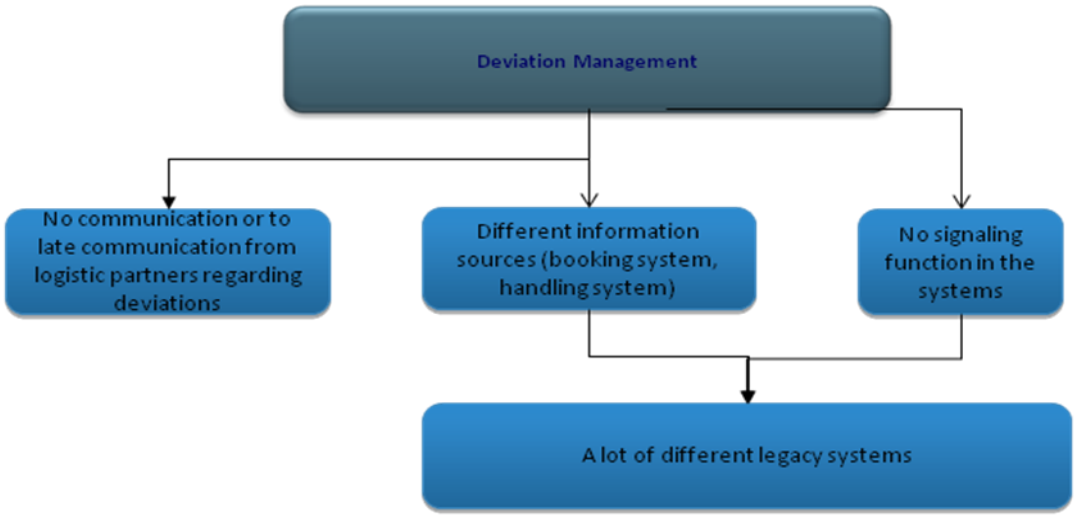
	delivered by the forwarder then booked
Why is this a problem?	Deviations are not standard, and therefore inefficient. It has also an effect on client satisfaction because contractual agreements might not be met.
Where does this problem occur?	This challenge occurs in the whole process. From shipper to forwarder to carrier to forwarder to consignee.
When does this problem occur?	This challenge is about deviations in the transport execution. Deviations in the handling is covered in challenge 1: Booking Management
Who experiences this problem?	Transporter, forwarder, carrier
How to overcome the challenge	Common platform such as Cargo 2000.

Deviations occur in the T&L domain and they are not standard and therefore inefficient.

Though some deviations can be decreased by problem solving techniques, there still will be events which cannot be prevented. In that case we want to reduce the impact of deviation.

Therefore a good deviation management can help every stakeholder to minimize the impact of unforeseeable events or delays, providing information as early as possible, to optimize decision making.

1.2.6.2. Root cause analysis



Scope / Explanation:

The Root Cause analyses focuses on the challenges in the process of managing deviations.

It does not focus on reasons why deviation occur.

Problems in deviation management often occur due to no or late communication between the stakeholders or different data sources, causing different views on the actual situation and therefore hindering optimal decision making. This can be caused by the usage of different legacy systems, information fragmented available.

1.2.6.3. As-is Use Case Scenario

Table 32: As-is Use Case Scenario: 2.3 Deviation Management

UCS elements	Description
Name	Deviation Management
ID	UCS2-4
Goal	Having the right information and tools immediate available for deviation management. We want the handling/processing of deviations to be executed efficient and effective.
Summary	Several shipments of fashionable goods are being trucked from different locations in China to Xiamen. All shipments are fashionable goods (e.g. shoes, clothes, sunglasses). The forwarder consolidates the different shipments in Xiamen and transports it to the warehouse of the carrier. Air transport, including handling by carrier. The forwarder picks up the goods at the airline in AMS and arranges the customs declarations. The forwarder executes the deconsolidation and forwards it to the Consignee.
Category	• Business Collaboration Manager: making information available for the local authorities within human intervention • Event Monitoring: monitoring based on milestones, triggering when deviations occur • Planning / Re-Planning's module: acting when changes occur

Actors	• **Shipper:** has the transport request, wants to be informed when changes occur • **Forwarder:** Arrangement of transport, react fast and flexible on deviations • **Carrier:** Air Transport of goods including preparations • **Authorities:** Customs officer who checks cargo (both information and physical check)
Primary actor	The consignee, shippers starts in this use case with the replenishment/transport request. KN SHA is collecting the shipment from the origin. AFKL supports the freight air transport.
Stakeholder	Shipper, Forwarder, Airline, Customs, Airport Terminal Operator, Customs, Consignee
Triggers	The trigger of this process comes from the event manager
Main success scenario	All necessary information available for the processing of deviations, for all relevant parties, when changes occur. Everybody can act immediately and based on the right information.
Decision point	This depends on many factors. Shipper, forwarder and carrier may decide.

1.2.6.4. Identification of possible solutions

Table 33: Needs and ideas for solutions related to challenge 2.4

Challenge / Root Causes	Needs	Ideas for solutions
No Communication or too late communication from logistic partners regarding deviations	• Immediate and fast communication between supply chain partners when deviations occur	• Collaboration platform for fast communication regarding planning and re-planning and new input for the event manager
Different information sources, no overview and time consuming	• Information, necessary for deviation management centrally available. All parties have the same information	• Same as above
Insufficient signaling function	• Automatically Trigger function	• Same as above

Like the other challenges the deviation management depends from the right information at the right time available for every stakeholder. Therefore a collaboration platform, making data and information centrally available for everyone who is allowed, at the same time could be a solution here, too.

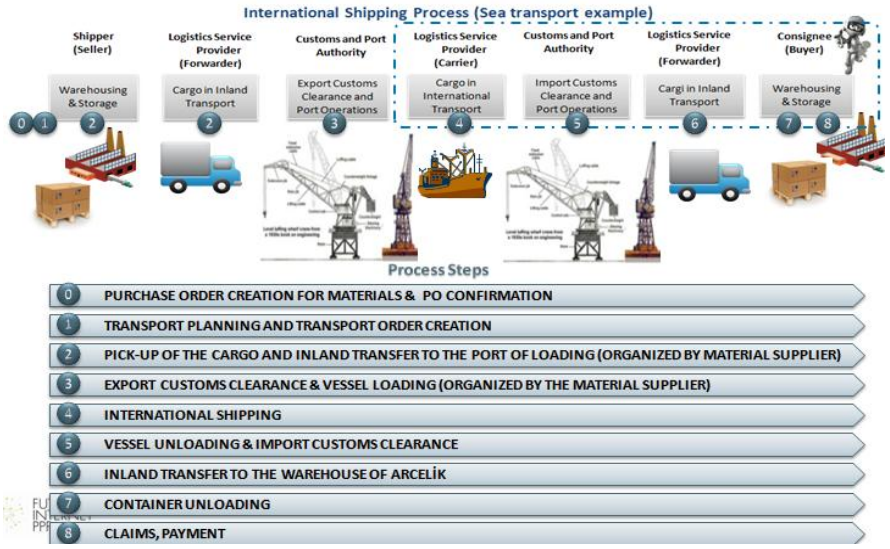
Annex 1.3. Use case 3 Story line - Global Consumer Goods Production and Distribution

1.3.1. Introduction to the Use Case 3

Three main use case scenarios were described at "(D2.2) High Level Specification of Use Case Scenarios" to create a better understanding of the logistics processes and the needs of Arcelik. However one of the selected scenarios, namely "Import from EU", was eliminated before the detailed use case description phase; since the processes described in this scenario are identical to the ones described in "Import from Fareast " scenario, except customs clearance procedures which are not included in the scope of the FInest project. The summary of the use case scenarios that are elaborated at this document, are given below together with their visual representations:

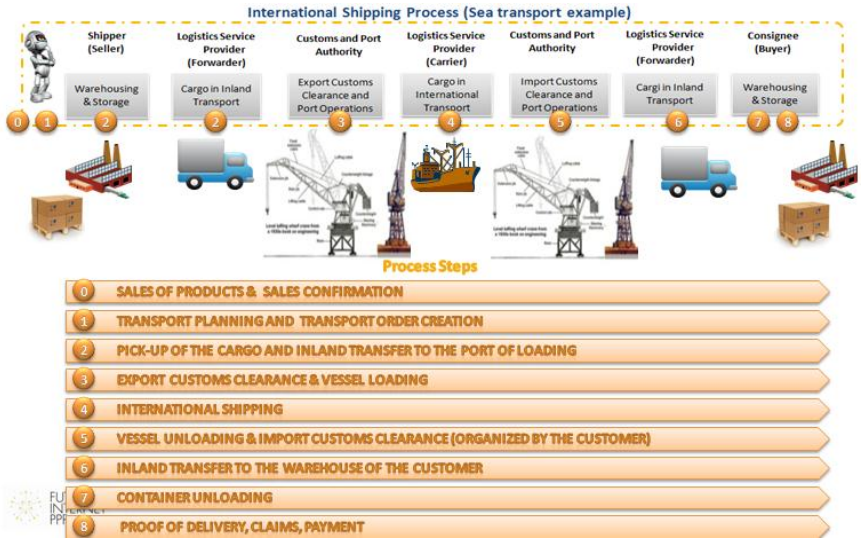
- **Import from Far East (Short Name: Import)**

Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance.



- **Export from Turkey to UK (Short Name: Export)**

Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.



1.3.2. Main Challenges encountered in the use case

To consolidate and prioritize the challenges that were identified at the high level use case description step, an internal study was conducted in Arcelik and the critical processes that consume most of the time spent for import & export operations were determined with the intention of addressing the main problems of the companies that outsource their logistics activities. The study revealed the bottlenecks and improvement directions and as a result five different challenges are deemed to be essential for the logistics process management. Below figure visualizes the identified challenges and the actors & activities that are affected by them.

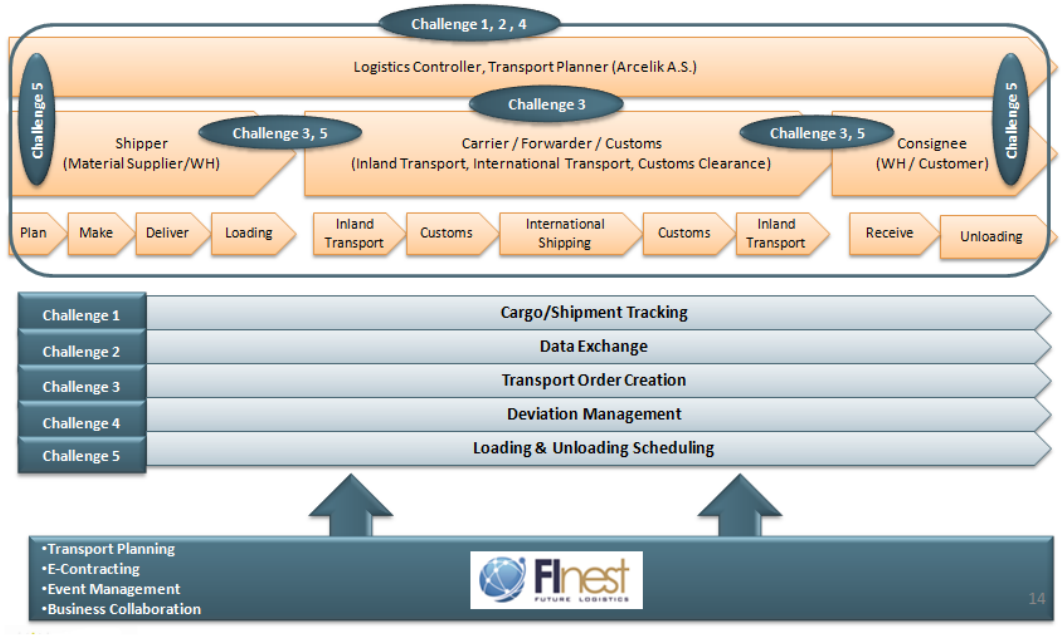


Figure 38: Main challenges encountered in Use Case 3

- ✓ First challenge is ***"Cargo/Shipment Tracking"*** which addresses the problems that companies might have while tracking the status of their cargo and linking status information with their operational plans.
- ✓ Second challenge is ***"Data Exchange"*** which addresses the necessity of simplifying and optimizing the information and document exchange through automation.
- ✓ Third challenge is ***"Transport Order Creation"*** which is mostly related with the communication problems between the transport responsible, who does the transport planning on behalf of shipper or consignee, and the logistics service providers during the order management process.
- ✓ ***"Deviation Management"*** refers to the problems encountered when a deviation/disruption occurs or about to occur which in turn may lead to unfavorable consequences.
- ✓ The last challenge is ***"Loading and Unloading Scheduling"*** which addresses the problems that might occur during pick-up and drop-off of the cargo due to planning problems stemming from the inexistence of a real-time cargo tracking mechanism.

In the following chapters you will find per main challenge, the problems, underlying root causes, illustration through as-is scenarios, and ideas for solutions identified by the use case team.

1.3.3. Challenge 3.1: Cargo / Shipment Tracking

1.3.3.1. Challenge description

Table 34: Challenge description 3.1: Cargo/Shipment Tracking

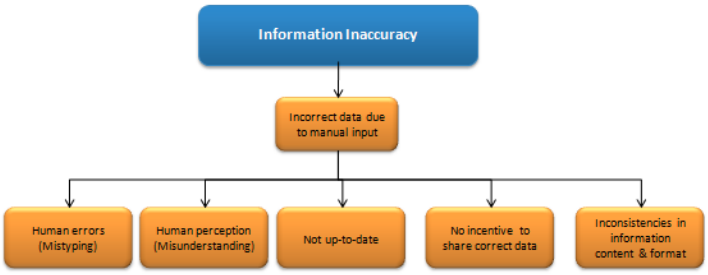
Challenge 3.1	**Cargo/Shipment Tracking**
Category Related domain challenge (D1.1)	6. Visibility of shipments throughout the process 7. Reduction of manual effort through automation 3. Planning and re-planning
Extensions Specific use case challenges? (D2.2)	• No real-time tracking and event monitoring • Limited visibility in transport processes • Limited visibility in customs clearance status • No alert system available for deviation handling
What is the problem?	• Time consuming and a complex process • Takes manual input • Information content depends on the capabilities& support of LSP • Time delay in the information input
Why is this a problem?	Cargo/ Shipment tracking (location, process, and timing) are a crucial input for planning. Some of the undesired consequences are listed as: Cost of expedited shipments because of information delays, extra man-hours spent, loss of sales, planning errors, production problems, lack of flexibility.
Where / When does this problem occur?	Anytime between the materials/products are ready for shipment till their arrival to the destination point.
Who experiences this problem?	All stakeholders
How to overcome the challenge	Real time shipment tracking system with (semi) automated information input that supports re-planning and provides improved visibility.

Logistics service clients, especially manufacturing firms, need to know whether the transport process of their cargo is going in line with their plans. They need to be informed immediately about possible deviations/disruptions to take action on short notice to prevent unfavorable consequences. Since there are various different dynamic parameters that have an impact on the ongoing processes, the logistics responsible, who is responsible from planning the transport of the cargo, should have a tool that monitors the cargo continuously. Many logistics service providers (also ports, airports etc.) have services available on their websites by which their clients can monitor the status of their cargo. However it is time consuming for the client company to track its shipments one by one using such services. Instead companies prefer to have or build their own tracking tools which provide visibility to all of their shipments in one platform and store the relevant data & documents. Most of such tools rely on manual input from the logistics service providers; hence it is hard to assure that status data is always up-to-date. That's why logistics responsible need to communicate with the logistics providers frequently to get real-time data or assure that the data in the tracking system is up-to-date which makes the process time consuming and sometimes complex.

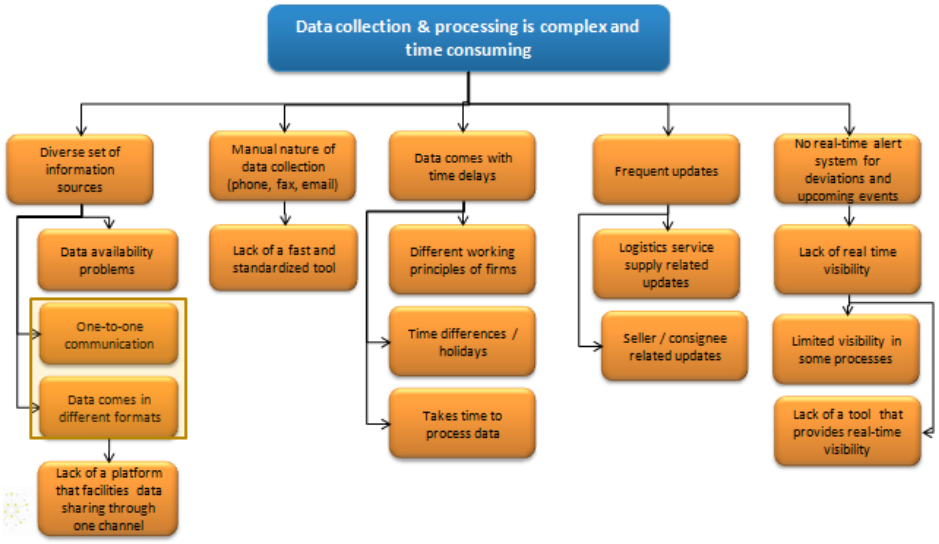
1.3.3.2. Root cause analysis

As mentioned above, there are two main reasons which make cargo/shipment tracking a challenge:

- The reliability of the data at the tracking tools is questionable because data is not always correct and up-to-date.
- Collection of real-time data is complex and time consuming.



As shown in the figure above, data reliability problem originates from the manual data inputting to cargo tracking systems since human may make mistakes; he may misunderstood some relevant information and does not update the data on time. In some cases person in charge of inputting data doesn't have incentives to do it and another possibility is that input from different sources about the same entity may be different from each other.



The process of searching for the actual (real-time) data might be complex and time consuming because there can be various different information sources and transport responsible needs to get in contact with those sources one by one which may in turn result in information with different content/formats. In some cases he can't reach information since it is not available on the time of his request. Additionally communication media such as phone, email are used very frequently which might also create delays in information transfer.
Other sources of delays can be different working principles of firms, time differences & holidays. Sometimes the data source has their own information sources and they also need time to collect and process data.
Another reason which makes the process time consuming is that critical inputs like expected time of departure (ETD), expected time of arrival (ETA) are updated frequently and transport responsible must keep track of all those changes. Not only the logistics service providers but also consignees (e.g. customer of a manufacturing firm) can change their requests which may lead to changes in the plans and all of those changes should be monitored continuously. Therefore real-time visibility can provide significant benefits to the involved parties which will in turn reduce the necessity of manual communication between the actors in the chain. However in some of the processes such as customs it might not be possible to have visibility.

1.3.3.3. As-is Use Case Scenario

Table 35: As-is Use Case Scenario 3.1: Cargo/Shipment Tracking

UCS elements	Description
UCS name	Cargo/Shipment Tracking
ID	UCS3-1
Goal	Ensure on-time delivery in full, receive information about deviations on time and trigger re-planning (if necessary), ensure security of the cargo along the supply chain, foresee bottlenecks and problems to take precautions on-time, ensure high customer satisfaction
Summary	Import: Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal

<table>
<tr><td></td><td>warehouse after customs clearance.
Export: Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.</td></tr>
<tr><td>Category</td><td>Visibility of shipments throughout the process, Reduction of manual effort through automation, Planning and re-planning</td></tr>
<tr><td>Actors</td><td>Actors: Logistics Responsible, Shipper (Material Supplier of Arcelik or Arcelik itself), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself) , Customs Broker
Systems: Logistics portal of Arcelik, SAP, internal tracking systems and websites of logistics service providers</td></tr>
<tr><td>Primary actor</td><td>Logistics Responsible: Responsible for Logistics planning , transport monitoring and handling the deviations during execution to achieve high delivery performance</td></tr>
<tr><td>Stakeholder</td><td>Customs Authorities, Port Authorities</td></tr>
<tr><td>Preconditions</td><td>Confirmed purchase order between Shipper and Consignee and the products are/will be ready for shipment</td></tr>
<tr><td>Triggers</td><td>Logistics service provider arranges pick-up</td></tr>
<tr><td>Main success scenario</td><td>The summary highlights the main steps for the shipment tracking; however the process is a highly dynamic process and all activities that affect the ongoing processes are of interest. Deviations might occur at each step described below. If there is a deviation and re-planning is necessary, Logistics responsible updates plans and coordinates all parties involved.
Logistics responsible creates transport order on the logistics portal and checks the status of the booking from the portal manually.
Forwarder picks the product up and performs the transport till the port of loading and delivers the containers to the carrier and Logistics responsible checks the details about the pick-up.
Logistics responsible checks the status of customs clearance and provides additional information and documents where necessary.
Materials/products are loaded on a vessel and Logistics responsible is informed about details by LSP (ETD, ETA, Container number, B/L number, truck plate number etc.).
International leg of the transportation occurs and Logistics responsible checks whether there is a deviation on the journey details (on transshipments, route etc.) or not.
When the cargo arrives to the port of discharge, Logistics responsible learns the ATA and checks if the process is going as expected.
After the customs operations are completed, the container is loaded on a truck and transferred to its final destination and the Logistic responsible checks the status of the cargo till its arrival point.</td></tr>
<tr><td>Decision point</td><td>* The Criticality of decision:
Shipment Tracking is essential to foresee bottlenecks/problems and to take action on short notice. The status of the cargo is a critical input for decisions regarding re-planning. Logistics responsible should determine whether it is necessary to change plans or not.
* Time perspective:
The time frame covers the entire transport execution process, from the departure of the cargo from the loading point till the arrival of it to its final destination.</td></tr>
<tr><td>Information processing</td><td><u>Information Input:</u><table><tr><th>Information content/object</th><th>Sender</th><th>Communication channel</th><th>Receiver</th></tr></table></td></tr>
</table>

	Shipping Order Form/ Pre-Order Record	Material Supplier / Order Management Dep. of Arcelik	Email / SAP	Logistics Responsible
	Truck plate, Loading details, B/L information, Vessel Information, Voyage Information, Container number, Port of Loading, Port of Discharge, Transshipments, Schedule Changes, ETD, ETA,ATD, ATA, Arrival Confirmation, Loading place, Loading date and time, Customs Clearance status	Logistics Service Provider, Customs Broker	Email, phone, fax, logistics portal of Arcelik	Logistics Responsible

Information Handling:

- Collection and consolidation of data and checking with plans (Logistics Responsible)

Information Output:

Information content/object	***Sender***	***Communication channel***	***Receiver***
* Shipment Status information (Where, Which process) * Event and trigger information *Time line information *Workload and performance reporting	Logistics Responsible	Email, phone, fax, Logistic Portal of Arcelik	Production Planning, Order Management, Sales Department, Customer, Customs Broker, Logistics Service Provider, Port Authority

Post conditions	Planning/Re-planning
Challenges	* Time consuming process * Manual input * No real-time tracking and event monitoring * Limited visibility in customs clearance status * No alert system available for real-time deviation handling
Future Internet opportunities	Event Processing Module

1.3.3.4. Identification of possible solutions

The table below summarizes the ideas for solutions appropriate for the problems faced in the Cargo/Shipment Tracking challenge. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions.

Table 36: Needs and ideas for solutions related to challenge 3.1

Root Causes[29]	Needs	Ideas for solutions
INFORMATION INACCURACY	• Visibility of the status of the shipment (considering the points of interest) • Right data, standard format, on-time	A **"monitoring"** portal: • Takes **(semi) automated input** from the tracking systems of logistics service providers regarding the status of the cargo • **Status of the cargo (or event)** is visible to all relevant parties on their request (search option) • **(semi) integration** with ERP systems so that electronic extraction of data can be realized (if necessary) • Manual inputting option for cases where electronic data extraction is not possible • **Standardized format** for manual inputs where system gives alerts if the input is not in line with the standards defined => Planned to be included in DEMO for **AUTOMATED SHIPMENT TRACKING** (After M12)
DATA COLLECTION AND PROCESSING IS COMPLEX AND TIME CONSUMING	• Right data, standard format, on-time • Less manual communication • Less manual processing • Trigger re-planning with ease • Workload monitoring	A platform that supports **automatic** data transfer regarding the status of the cargo & deviations and creates **alerts** for deviations: • Data sharing through one channel leads to one truth for all the relevant parties hence data is retrieved from **one source** • Enable defining **points of interests/alert rules** • Enable defining **expected performance criteria** for points of interests • **Real-time alerts** for deviations are generated automatically by comparing actual performance with expected performance criteria and alerts are notified to the transport planner and other related parties • In case of critical deviations (alerts) system does not allow further processing without confirmation • Alerts that are **directly connected to re-planning** • **Automatic record of changes** (e.g. a change in ETA results in change in plans and change in records) =>Planned to be included in DEMO for **AUTOMATED SHIPMENT TRACKING** (After M12) =>Partially included in **DEMO 4 ELECTRONIC PLANNING**

The table above details the solution ideas to eliminate the main root causes of the problems. In order to cope with information inaccuracy, reliability of the data could be improved by automation in other words by having automated input through integration or electronic data

[29] Please note that not all root causes are covered. A selection was made and focus was put on challenges and root causes "where Finest can help", i.e. for which the capabilities offered by F.i. and FInest can contribute to the envisioned solution.

extraction in order to avoid human related problems. However to achieve this, Logistics service providers should have their own real-time tracking systems and the client must have the power to enforce them to share this information with them to some extent. Using RFID based electronic data extraction techniques is also considered to be a sound solution method; however technological complexities and infrastructural requirements should be judged cautiously.
FInest brings the opportunity to share data through one channel which means one truth for all parties involved; this will reduce the burden on logistics responsible resulting from the problematic nature of data collection. A platform where points of interest can be defined and real-time alerts for deviations that can be linked to re-planning can bring significant benefits. To handle with the processing burden due to frequent updates, the record of changes in the systems could be automatic in other words a change in one parameter will change the records of all related parameters in the system automatically which in the end reduce the manual effort spent for information processing.

1.3.4. Challenge 3.2 - Data Exchange

1.3.4.1. Challenge description

For international shipping and customs clearance, the accompanying documents should be complete and accurate. In order to avoid problems at the customs, there is a flow of data & documents or document copies in parallel with the physical movement of goods. "Data exchange" challenge addresses problems associated with data and document exchange through the chain. Most of the documents are created and/or transferred through the chain manually which leads to extra man-hours spent for the processes and information related problems which in turn results in an increased overall throughput time for the transport process. Overview of the challenge is given below:

Table 37: Challenge description 3.2: Data exchange

Challenge 3.2	**Data exchange**
Category Related domain challenge (D1.1)	2. Collaboration and communication 7. Reduction of manual effort through automation
Extensions Specific use case challenges? (D2.2)	• Need for electronic data (info, document) exchange • Need for automatic record of changes • Need for an alert system for deviations • Limited Information visibility
What is the problem?	• Manual communication (phone, fax, email) • Manual data registration to systems • Manual tracking of data/document transfer
Why is this a problem?	Data transfer requires much manual work and this results in: extra man-hours spent on data exchange, decreased speed of the sub-processes, increased overall throughput time of the logistics process, information related problems
Where / When does this problem occur?	All phases of the transport process
Who experiences this problem?	All stakeholders

How to overcome the challenge	Automation, e-transfer of data and/or documents/document copies (where necessary), e-billing

1.3.4.2. Root cause analysis

The problems stem from delays in document/data transfer, data reliability problems, manual nature of processing data and legal restrictions.
The root causes of delays in document/data transfers are depicted in the figure below:

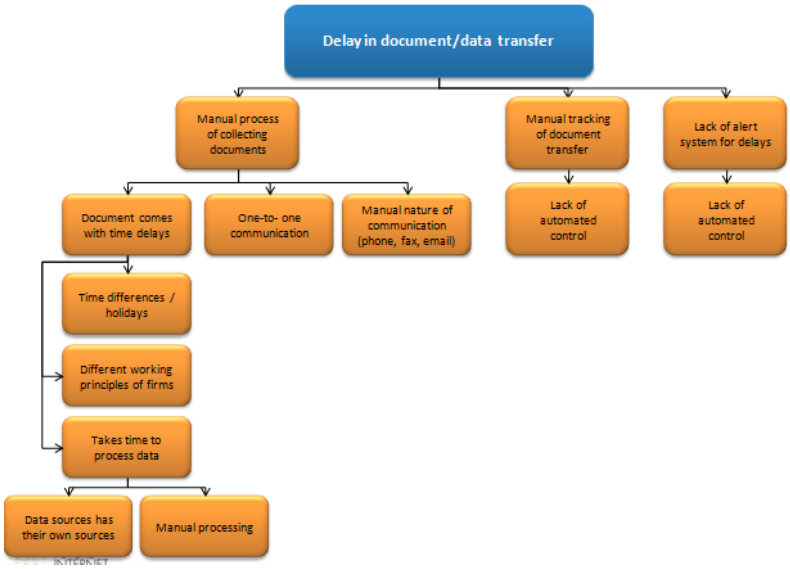
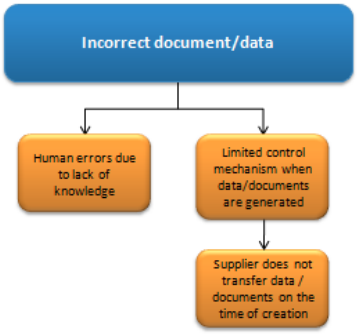
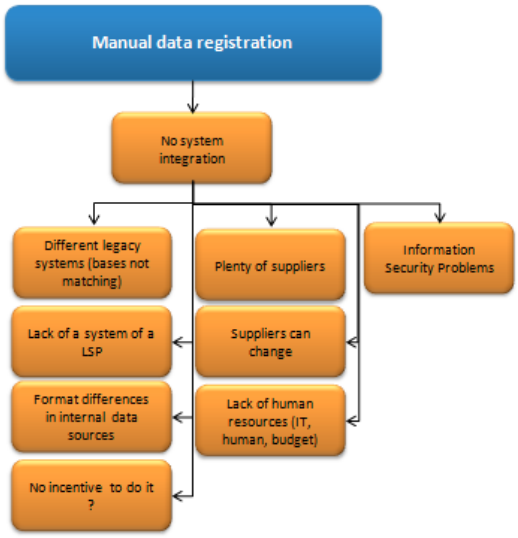


Figure 39: Root cause analysis – Challenge 3.2

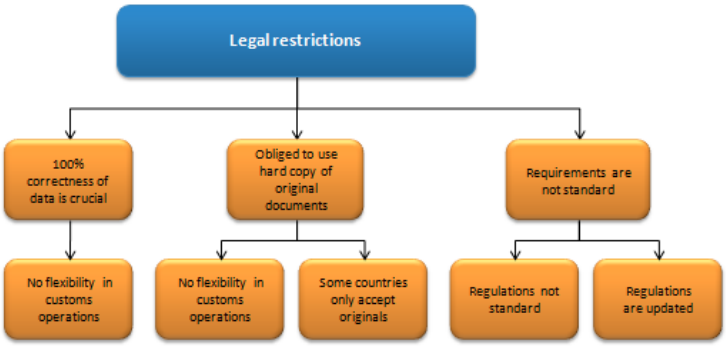
As mentioned before, delays in the information transfer are mostly due to one-to-one communication, manual communication & data processing. Not only data collection but also tracking of data/document flow is most of the time done manually in many firms due to lack of an alert system that automatically sends notifications to involved parties to assure that actions are taken on-time to assure a smooth data/document flow.



Data reliability problems as well originate from human errors and most of the time errors in data/documents are realized too late at the execution phase, due to lack of a control mechanism when they are generated before their transfer through the chain.
Another problem that causes in the process is manual registries. Data is available in many different legacy systems which are not communicating with each other; this in turn leads to a data processing burden in order to copy the data to all relevant systems.



The main root cause for this problem is the lack of integration among different legacy systems. It is not really manageable to have integrated systems with all partners for a company like Arcelik since there are numerous service suppliers involved. Having one-to-one integration is costly and requires human resources for the integration projects. Also service providers can change frequently and spending much time and budget for a provider that can change within one year is not economical.



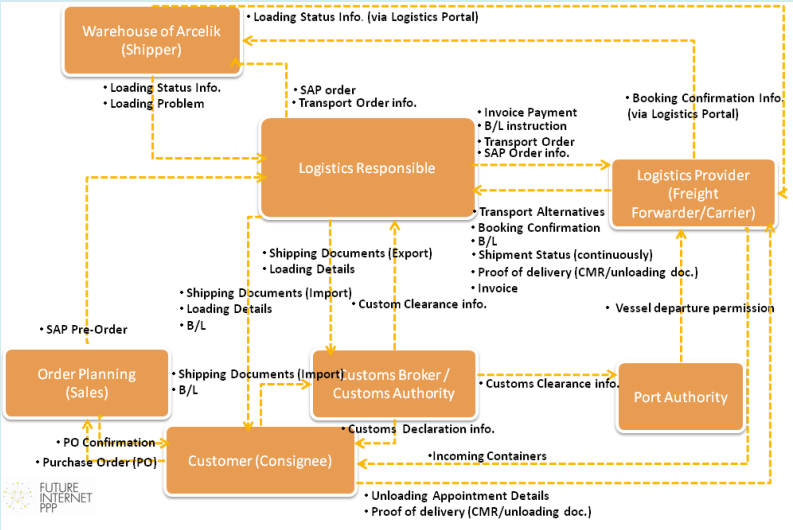
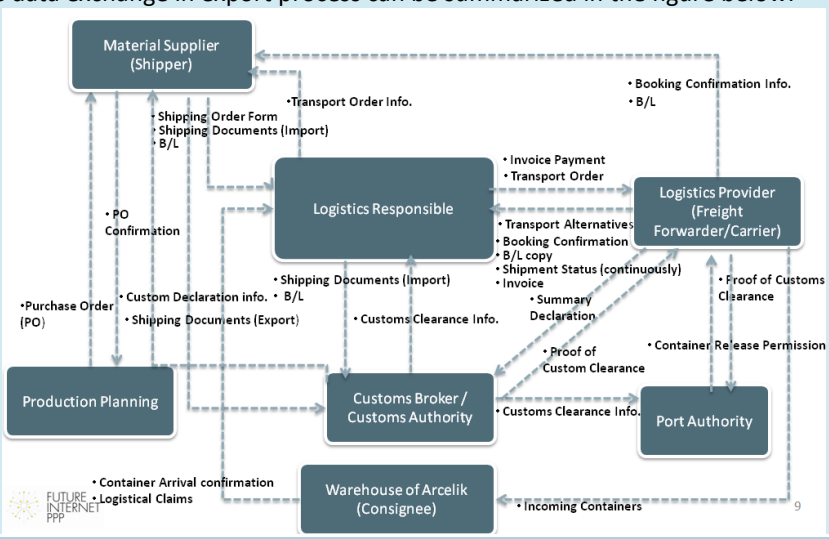
Legal restrictions also create problems in the process because 100 % correctness of data is crucial without any flexibility. Therefore data/documentation should be checked cautiously. Also customs may propose rules such as having original printed documents, signatures on documents etc. which may prevent the electronic transfer of the documents. Additionally the rules of the customs can change from country to country; therefore it is hard to standardize the process for tracking and controlling purposes.

1.3.4.3. As-is Use Case Scenario

Table 38: As-is Use Case Scenario 3.2: data Exchange

UCS elements	Description
UCS name	Data exchange
ID	UCS3-2
Goal	Ensure on-time delivery in full, ensure the transfer of right information in the right format at the right time, prevent deviations and delays in the process
Summary	Import: Purchased items (raw materials) from the material supplier at Korea are

	loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance. Export: Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.
Category	Collaboration and communication, Reduction of manual effort through automation
Actors	Actors: Logistics Responsible, Shipper (Material Supplier of Arcelik or Arcelik itself), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself) , Customs Authorities/Customs Broker, Port Authorities Systems: Logistics Portal of Arcelik, SAP
Primary actor	Logistic Responsible: responsible for coordinating the data transfer between business partners
Preconditions	Confirmed purchase order between Shipper and Consignee and the shipper needs transport
Triggers	The materials/finished goods are ready for shipment
Main success scenario	Logistics responsible monitors the data/document transfer manually to take action on short notice for delays and errors. The summary given below highlights the milestones in data flow for import & export processes at Arcelik. A more detailed flow is depicted at the figures given thereafter in information processing section. • Logistics responsible creates the transport order using the information he collected manually and sends it to Logistics service provider using logistics portal. He also informs shipper about the order via email. Sometimes informing logistics service provider about the order by phone or email is necessary since they might not check the booking portal on-time. • Logistics service providers confirm the booking via logistics portal and inform Logistics responsible and the shipper via email. • When the products/materials are ready for pick-up, Shipper sends correct shipping documents to Logistics responsible and Logistics service provider via email or fax. • Waybill is created by the Logistics service provider and transferred to shipper and logistics responsible via post or email. • The Shipper/Logistics responsible sends the documents to customs broker via email and export customs clearance is done without any delays. • When the vessel arrives to the arrival port, Consignee/Logistics responsible sends the documents to customs broker at the right time and import customs clearance is done. • The Consignee is informed about the incoming container via phone or email and unloading appointment is scheduled by phone or email. • When the products arrive to their destination point, proof of delivery and Logistics claims is sent to Logistics responsible via email.
Decision point	Data exchange takes place in all phases of the process and Logistics responsible should take action to prevent unfavorable consequences of delays and errors.

Information processing	The information flow in import process can be summarized in the figure below:  The data exchange in export process can be summarized in the figure below: 
Post conditions	Payment of invoice to Logistics Service Provider
Challenges	• Manual communication (phone, fax, email) • Manual data registration to systems • Manual tracking of data/document transfer
Future Internet opportunities	Automation, e-transfer of documents, e-billing

1.3.4.4. Identification of possible solutions:

A portal through which exchange of data and documents/document copies can be realized properly can be considered as a sound solution for the problems explained in the previous section. Also the process visibility and alert definition features are of importance. Standardized input templates can be defined and the system may automatically check whether the inputted information is correct (in terms of the standards and user defined alert rules & control functions) and notifies the user immediately in cases of errors. However ensuring the correctness of data is very difficult since one has to know what the correct information is in order to validate the content. Additionally software such as eForms are starting to be used by many 3PLs nowadays;

therefore data exchange problem is becoming less of an issue. More details about the envisioned solution can be found in the table below.

Table 39: Needs and ideas for solutions related to challenge 3.2

Root Causes	Needs	Ideas for solutions
DELAY IN DOCUMENT / DATA TRANSFER	• Improved communication • Information sharing through one channel • Less manual processing • Alerts for delays in document / data flow	A portal that facilitates data/document exchange: • Automated creation and electronic transfer of **some documents** through system (e.g. freight invoice, Packing List) • Monitoring the status of data/document transfer • Automatic alert creation for delays in data/document transfer and responsible are notified. =>Transfer of documents is becoming less of an issue with eForms starting be used by a number of 3PLs. Therefore such delays could be eliminated by using such services.
INCORRECT DOCUMENT/ DATA	• Right data, standard format, on-time	A portal that: • Checks the correctness of some documents/data (e.g. compares the freight invoice value with agreement in the contracts, or do user defined checks for frequent errors) • Standardized format for documents where system gives alerts if the input is not in line with the standards & rules defined. => Ensuring 100% correctness of data is very difficult since one has to have the right data for validation, therefore this need is excluded from the scope of envisioned solution.
MANUAL DATA REGISTRATION	• Less manual data processing • Link purchase orders/sales orders to transport orders for process management purposes	A portal that: • Automatically links the data / documents related with the transport order to purchase/sales order which may require (semi) automated Input & (semi) Integration with ERP systems. => Customization and a backend IT organization support on an ongoing basis might be necessary for automated input & integration, therefore excluded from the scope of envisioned solution; however reference to purchase orders/sales orders is a must for a manufacturing firm to monitor/synchronize its operations.
LEGAL RESTRICTIONS	• E-document • E-customs	=>We assume that it is not possible to solve the problems related with legal restrictions since the requirements are not standard for all countries; therefore this part is also excluded from the scope.

1.3.5. Challenge 3.3 - Transport Order Creation

1.3.5.1. Challenge description

Third challenge is transport order creation which addresses the challenges confronted on pre-booking and cost estimation processes to support transport planning and it also includes booking and booking confirmation. Detailed description of the challenge is given in the table below:

Table 40: Challenge description 3.3: Transport Order Creation

Challenge 3.3	**Transport Order Creation**
Category Related domain challenge (D1.1)	1. Pre-planning and cost estimation 3. Planning and re-planning 2. Collaboration and communication
Extensions Specific use case challenges? (D2.2)	• E-booking and online confirmation • Need for better overview of alternative transport means • Planning and Re-planning with ease • Spot buying with ease
What is the problem?	Before creating a transport order, the person in charge should have an overview of the available alternatives. Creating such an overview: • is a manual process • is time consuming • requires input from many different sources • requires handling data with different formats
Why is this a problem?	Since no system is available that can automatically collect and merge data from the different data sources, transport mode selection decision is dependent on • data collection speed • data quality • evaluation skills of the logistics responsible • available time frame
Where / When does this problem occur?	Transport order creation process in planning phase
Who experiences this problem?	Logistics responsible (Shipper or Consignee)
How to overcome the challenge	Solution that will facilitate transport order creation process by providing an overview of contracts , available capacity and standards of transport means, schedule information, historical performance of logistics service providers and historical operational data.

1.3.5.2. Root cause analysis

Transport Order Creation is a challenge mainly because of the three main reasons that are depicted below:

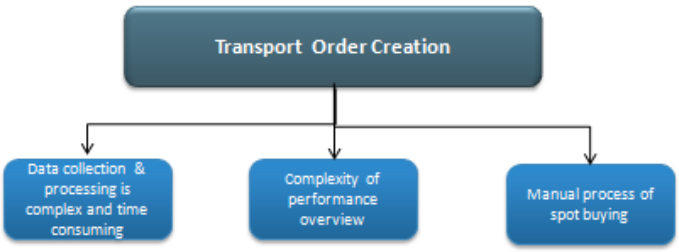
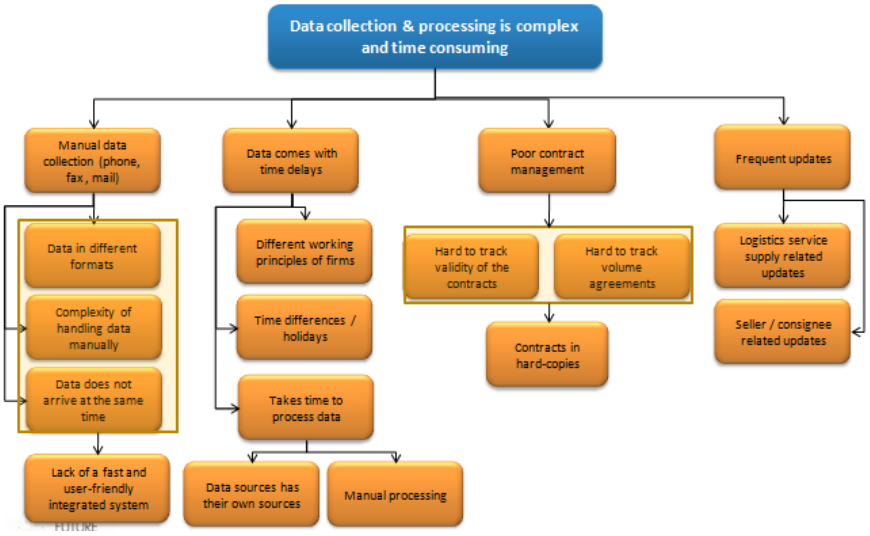


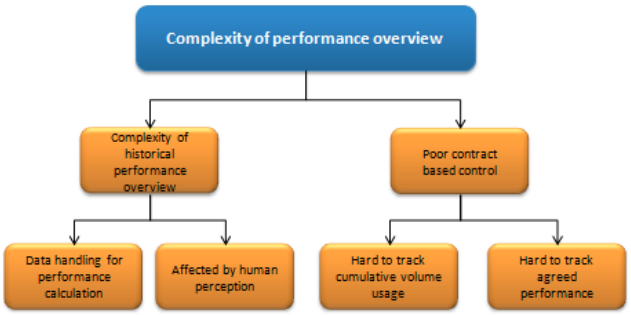
Figure 40: Root cause analysis – Challenge 3.3

Data collection regarding transport services is most of the time is done manually; therefore the problems due to human errors are again existent. Additionally performance of the logistics service providers are of importance since service quality is also one of the main criteria considered while purchasing of the transport service. And finally spot buying process is not always simple.

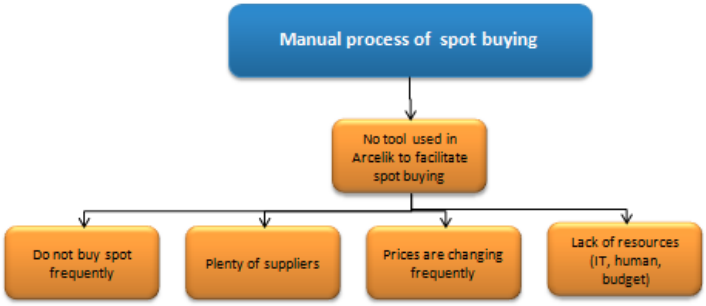
The main root causes of data collection complexity can be seen in the figure below:



The root causes which make transport order creation process complex and time consuming are similar with the ones explained previously for the cargo/shipment tracking challenge. One additional root cause is poor contract based control due to hard copy contracts and not having all the relevant information in the electronic format. That's why it is not easy currently to fully link contract information with transport order creation.
As mentioned before quality of the services of the LSPs is a critical input for transport buying decision; however measuring quality of the services may require extensive data handling and KPI management. Also service quality may be affected by human perception.



Additionally, it is hard to keep track of contract related parameters (e.g. volume agreements and actual cumulative usage) manually since most of the contracts are hard copies and may not reachable by everyone easily.



Spot buying is also problematic in the sense that logistics responsible has to collect data from sources on short notice since spot buying is generally an emergency choice for firms and the prices are not standard most of the time. Therefore the process may result in delays since it takes time to communicate with plenty of logistics providers due to a lack of a tool that can do it automatically.

1.3.5.3. As-is Use Case Scenario

Table 41: As-is Use Case Scenario 3.3: Transport Order Creation

UCS elements	Description
UCS name	Transport Order Creation
ID	UCS3-3
Goal	Creating an overview of the alternative transport means, ensure cost efficiency, effective contract management, on-time delivery in full
Summary	Import: Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance. Export: Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.
Category	Pre-planning and cost estimation, Planning and re-planning, Collaboration and communication

<table>
<tr><td>Actors</td><td>Actors: Logistics Responsible, Shipper (Material Supplier of Arcelik or Arcelik itself), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself)
Systems: Logistics Portal of Arcelik, Websites of LSPs</td></tr>
<tr><td>Primary actor</td><td>Logistic Responsible: responsible for transport order creation, main decision maker.</td></tr>
<tr><td>Stakeholder</td><td>• Customs Broker/Authorities, Order Management, Production Planning</td></tr>
<tr><td>Preconditions</td><td>Confirmed purchase order between Shipper and Consignee, the shipper needs transport</td></tr>
<tr><td>Triggers</td><td>Shipping Order form /Pre-Order Record is filled in and sent to Logistics Responsible</td></tr>
<tr><td>Main success scenario</td><td>The main processes involved in the use case (import) are summarized below:

<u>Summary of use-case scenario:</u>
• Material Supplier of Arcelik sends information about incoming products with a shipping order form to Logistics responsible via email.
• Logistic responsible request information from LSPs about transport schedules, routes, ETA, ETD, freight cost via email or phone.
• Using the information on the shipping order form, inputs from LSPs and inputs from available contracts, Logistics responsible creates an overview of transport alternatives by consolidating data and standardizing the format.
• Logistics responsible selects the best option available considering lead time, freight cost, historical performance of the logistics service providers, the volume agreements on the contracts and cumulative volume usage in the contract period and creates a transport order using logistics portal accordingly.
• Logistics responsible informs logistics service provider via email and warns him to check his order on a short notice from the portal.
• Logistics service provider checks the order and confirms it via portal. If he cannot supply the service, he rejects it.
• In cases of rejection from all contracted parties, logistics responsible checks the spot market manually and communicate with service providers via phone, email and collects quotations; then selects one and sends a transport order via email.</td></tr>
<tr><td>Decision point</td><td>• Criticality of decision:
Having a complete overview of the transport alternatives is an essential input for transport alternative selection decision of Logistics responsible.
• Time perspective:
The time frame could vary depending on the production timeline and the date the products are needed by the Consignee. The information need can be quite urgent if the time frame is short.</td></tr>
<tr><td>Information processing</td><td><u>Information Input:</u>
<table>
<tr><th>Information content/object</th><th>Sender</th><th>Communication channel</th><th>Receiver</th></tr>
<tr><td>Shipping Order Form</td><td>Material Supplier</td><td>Email</td><td>Logistics Responsible</td></tr>
<tr><td>Pre-Order Record</td><td>Prod. Planning Dep. of Arcelik</td><td>SAP</td><td>Logistics Responsible</td></tr>
<tr><td>Vessel, Voyage, ETD,ETA, Route Details</td><td>Logistics Service Providers (Freight Forwarder, Carrier)</td><td>Email, phone, fax</td><td>Logistics Responsible</td></tr>
<tr><td>Freight</td><td>Logistics Service Providers (Freight Forwarder ,Carrier),</td><td>Email, phone, fax, contract</td><td>Logistics Responsible</td></tr>
</table></td></tr>
</table>

	Contract Manager		
Agreed Volume	Contract Manager	Contract	Logistics Responsible
Cumulative Volume	Operational Data	SAP, Historical data	Logistics Responsible
Order quantity, product type, volume, weight, box type, destination etc.)	Shipper (Material Supplier/Production Planning dep. of Arcelik)	Email, fax, SAP	Logistics Responsible

Handling

- Evaluation of the alternatives considering the shipment requirements

Information Output:

Information content/object	***Sender***	***Communication channel***	***Receiver***
Overview of alternatives	LSPs, Contract Manager	Email, phone, fax, contacts	Logistics Responsible
Transport Mode Selection	Logistics Responsible	Email, Logistic Portal of Arcelik	LSPs

Alternative path	• Logistics responsible can act on behalf of the shipper or the consignee depending on the Incoterms. • For some transport lanes, transport order is always issued to the dedicated LSPs.
Post conditions	Transport Order Creation
Challenges	• Manual process • Time consuming and complex • Requires input from many different sources • Requires handling data with different formats
Future Internet opportunities	Solution that will facilitate transport order creation process by providing an overview of contracts, available capacity and standards of transport means, schedule information and historical performance of logistics service providers with a possibility of e-booking & e-confirmation.

1.3.5.4. Identification of possible solutions:

The envisioned solution is a "booking portal" through which communication and collaboration between actors is facilitated. The user needs and solution ideas to overcome the root causes of the challenge are listed in the table below. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions.

Table 42: Needs and ideas for solutions related to challenge 3.3

Root Causes	Needs	Ideas for solutions
DATA COLLECTION & PROCESSING IS COMPLEX AND	• Right data, standard format, on-time • Overview of schedules, voyages, transshipments	A **"booking"** portal: • Enables **extracting transport demand data** from ERP systems through integration • Enables **manual inputting** transport demand

TIME CONSUMING	• Overview of contracts • Improved communication • Less manual data processing • Planning & booking with ease • Booking confirmation & billing with ease • Transport plans overview • Open orders and shipments status tracking	data or **uploading** it using a standardized template where electronic extraction is not possible • That takes **service information electronically** from LSPs (schedule, voyage details etc.) • Creates **overview of alternatives** using contracts (e-contracting) and criteria defined (best price, best lead time etc.) • Provides **cost estimation** to transport planner • Enable automatic sending of **booking requests** to logistics service providers when planning is completed • Enable **booking confirmation** through the portal • Enable **monitoring** the status of the booking => Part of **DEMO 4: E-PLANNING**
COMPLEXITY OF PERFORMANCE OVERVIEW	• Overview of contracts • Data handling for performance calculation • Less manual data processing • Contract based control with ease	A **"booking"** portal: • Takes **agreed performance criteria** from the contracts • Historical booking / transport data recording • Calculating KPIs comparing agreed performance with actual performance for the transport plan (automated contact based control)
MANUAL PROCESS OF SPOT BUYING	• Overview of contracts • Less manual processing	A **"booking"** portal that facilitates spot buying: • Publish the service request on market place • Get quotations • Enables sending booking requests to spot service providers • Enable **booking confirmation** through the portal • Enable **monitoring** the status of the booking =>Partially presented in **DEMO 4 : E-PLANNING** (publish request on market place)

1.3.6. Challenge 3.4 - Deviation Management

1.3.6.1. Challenge description

Deviation management as mentioned before stands for deviation handling, on-time and easy information sharing when deviations / disruptions occur or about to occur to avoid unfavorable consequences. Description of the challenge is as follows:

Table 43: Challenge description 3.4: Deviation Management

Challenge 3.4	**Deviation Management**
Category Related domain challenge (D1.1)	5. Monitoring of operations throughout the process 6. Visibility of shipments throughout the process 2. Collaboration and communication
Extensions Specific use case challenges? (D2.2)	• Planning and Re-planning with ease • No real-time tracking and event monitoring • No alert system available for deviation handling

What is the problem?	Uncertainties and possible deviations have a direct impact on supply chain operations and information related to possible disruptions is not shared among partners efficiently (on short notice, with details).
Why is this a problem?	Uncertainties are hard to predict and information sharing about disruptions are generally not on-time. Disruptions have a direct impact on shelf availability, on-time delivery performance, customer satisfaction level, loss of sales and company prestige and reliability and may result greater financial losses if companies does not respond on time.
Where / When does this problem occur?	Anytime
Who experiences this problem?	All stakeholders
How to overcome the challenge	A platform that eases up-to-date information sharing among partners, Early warning mechanism that triggers re-planning with ease

1.3.6.2. Root cause analysis

The main root cause that makes deviation management a challenge are delays after the event occur and limited early warning possibility.

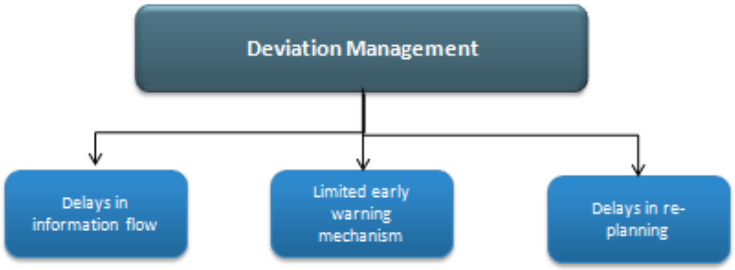
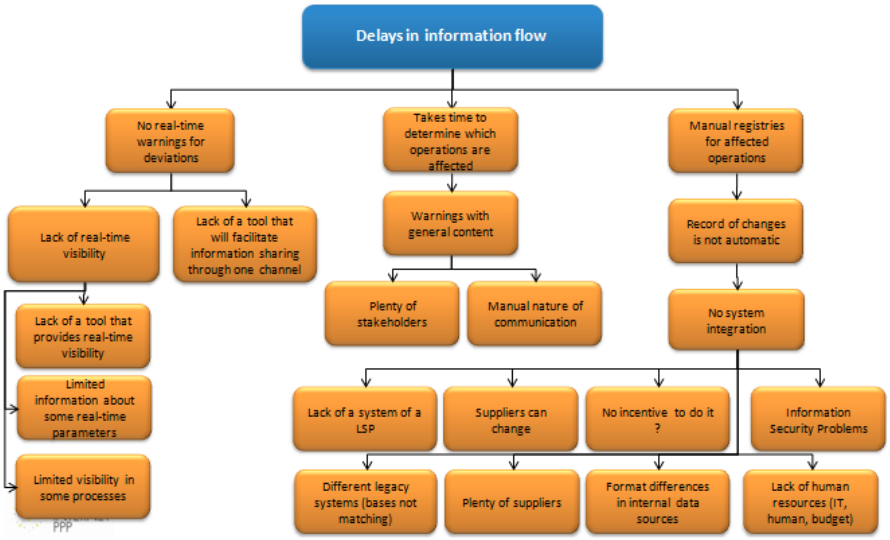
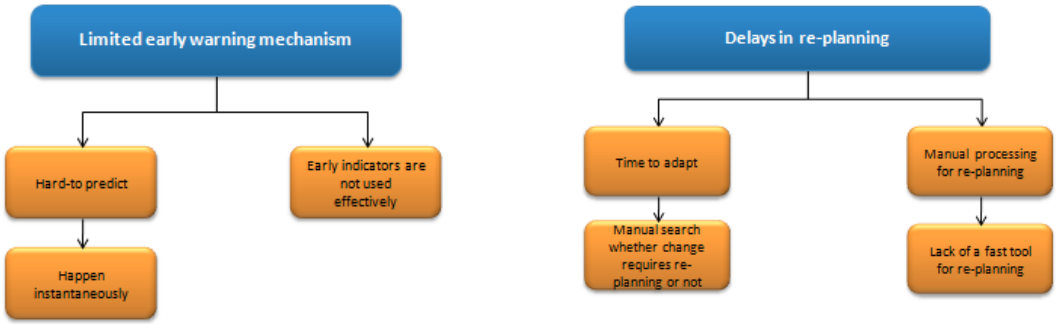


Figure 41: Root cause analysis – Challenge 3.4

Main reasons for the delays in information flow are depicted in the figure below. When a disruption occurs it is communicated within the chain one-to-one which results in time delays. Additionally preliminary information most of the time arrives with a much general content (without details); therefore it takes time to figure out which part of the supply chain is affected and decide whether is it necessary to take action for the change or not.



Additionally, manual data processing due to lack of integration between different legacy systems can also create delays in information transfer when deviations occur.
There are two main reasons (Figure x) which makes hard to establish a proper early warning mechanism to foresee possible deviations beforehand: instantaneous nature of disruptions and complexity of identifying right early indicators.



Finally immediate re-planning is not always possible since it may require time for individuals to adapt to the new environment and also manual processes involved in the re-planning phase.

1.3.6.3. As-is Use Case Scenario

Table 44: As-is Use Case Scenario 3.4: Deviation Management

UCS elements	Description
UCS name	Deviation Management (Disruptions to the transport services)
ID	UCS3-4
Goal	Ensure on-time delivery in full ,trigger re-planning at the right time to prevent delays in the process, high customer satisfaction level, prevent loss of sales, prevent loss of company prestige, reliability and goodwill of customers
Summary	Import: Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they

<table>
<tr><td></td><td>are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance.
Export: Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.</td></tr>
<tr><td>Category</td><td>Visibility of shipments throughout the process, Reduction of manual effort through automation, Planning and re-planning</td></tr>
<tr><td>Actors</td><td>Actors: Logistics Responsible, Shipper (Material Supplier of Arcelik or Arcelik itself), Logistics Service Provider (Freight Forwarder, Carrier), Consignee (Customer of Arcelik or Arcelik itself) , Customs Broker
Systems: Logistics portal of Arcelik, SAP, Internal tracking systems and websites of logistics service providers</td></tr>
<tr><td>Primary actor</td><td>Logistic Responsible: responsible for trigger re-planning for deviations</td></tr>
<tr><td>Preconditions</td><td>The transport is planned.</td></tr>
<tr><td>Triggers</td><td>Disruption/deviation happens/about to happen.</td></tr>
<tr><td>Main success scenario</td><td>The process is summarized below:
The Logistics service provider informs the Logistics responsible about the deviation.
The Logistics responsible checks the scope of the affected operations and determines whether it is necessary to trigger re-planning or not (after a certain time period).
The Logistics responsible informs business partners about the change and re-planning is made in cases where it is required.</td></tr>
<tr><td>Decision point</td><td>* The Criticality of decision:
Decision of the Logistics responsible to act or not is critical when a deviation occurs/about to occur. He should have the right information with right format at the right time to take action on a short notice to prevent possible problems.
* Time perspective:
The time frame covers the entire transportation execution process, from the departure of the cargo to the arrival to its final destination.</td></tr>
<tr><td>Information processing</td><td><u>Information flow:</u>
<table>
<tr><th>Information content/object</th><th>Sender</th><th>Communication channel</th><th>Receiver</th></tr>
<tr><td>General information about deviation/ disruption</td><td>Logistics Service Provider</td><td>Phone, fax, email</td><td>Logistics Responsible</td></tr>
<tr><td>Request of detailed information about affected operations</td><td>Logistics Responsible</td><td>Phone, fax, email</td><td>Logistics Service Provider</td></tr>
<tr><td>Detailed information about affected operations(continuously)</td><td>Logistics Service Provider</td><td>Phone, fax, email</td><td>Logistics Responsible</td></tr>
<tr><td>Information about affected operations</td><td>Logistics Responsible</td><td>Phone, fax, email</td><td>Production Planning, Customer, Order Mgmt.</td></tr>
<tr><td>Re-planning requirements</td><td>Production Planning, Customer, Order Mgmt.</td><td>Phone, fax, email</td><td>Logistics Responsible</td></tr>
</table>
<u>Information Handling:</u></td></tr>
</table>

	• Logistics responsible coordinates the information flow between the LSP and production planning/order management departments and customers of Arcelik • If the deviation requires re-planning, Logistics responsible re-plans the shipment and enters the details of the new plan manually to SAP and Logistics Portal
Post conditions	Re-planning if necessary
Challenges	• Plenty of variables • Delays in information flow • Limited early warning mechanism • Delays in re-planning • Manual process • Time consuming and complex
Future Internet opportunities	Up-to-date information sharing among partners, Early warning mechanism and a platform that will facilitate re-planning

1.3.6.4. Identification of possible solutions:

The combining the envisioned features of "booking" and "monitoring" portals seems a plausible way to solve problems mentioned in the previous section. Sharing disruption information through one platform with all relevant parties will ease the communication process and prevent time delays for the communication of the data. More detailed description of the solution ideas are stated below. It is important to note that the possible solutions illustrated by the Demonstrators (developed in cooperation between WP2 and the technical WPs) are included in the list of ideas for solutions.

Table 45: Needs and ideas for solutions related to challenge 3.4

ROOT CAUSES	Needs	Ideas for solutions
DELAYS IN INFORMATION FLOW	• Improved communication • Information sharing through one channel • Less manual processing of data	ame as Cargo/Shipment Tracking: **“monitoring”** portal: • Takes **(semi) automated input** from the tracking systems of logistics service providers regarding the status of the cargo • **Status of the cargo (or event)** is visible to all relevant parties on their request (search option) • **(semi) integration** with ERP systems so that electronic extraction of data can be realized (if necessary) • Manual inputting option for cases where electronic data extraction is not possible • **Standardized format** for manual inputs where system gives alerts if the input is not in line with the standards defined => Planned to be included in DEMO for **AUTOMATED HIPMENT TRACKING** (After M12)

LIMITED EARLY WARNING MECHANISM	• Early indicators	A **"platform"** that: • Enables defining **points of interests, early indicators /alert rules** • Enables defining **expected performance criteria** for points of interests • **Real-time alerts** for deviations are generated and notified to the transport planner and other related parties • Enables sharing **disruption information / critical changes at early indicators** through one channel • Ability to determine which operations are affected in case of disruptions => Planned to be included in DEMO for **AUTOMATED SHIPMENT TRACKING** and DEMO for **EVENT TRIGGERED REPLANNING** (After M12)
DELAYS IN RE-PLANNING	• Right data, standard format, on-time • Overview of schedules, voyages, transshipments and contracts • Less manual communication • Less manual data processing • Re-planning & re-booking with ease • Transport plans overview • Open orders and shipments status tracking	Direct link to **"monitoring"** portal to **"booking"** portal: • **Trigger re-planning** using the real-time alerts • Option to **close/cancel the alert** if the change does not require re-planning • Creates **overview of alternatives** using contracts and provides **cost estimation** to transport planner • Enable automatic sending of **booking requests** to logistics service providers and getting **booking confirmation** through the portal • Enable **monitoring** the status of the booking • If the booking is cancelled or updated, informs all the relevant parties =>Partially included in DEMO 4: E-Planning and planned to be included in DEMO for **EVENT TRIGGERED REPLANNING** (After M12)

1.3.7. Challenge 3.5: Loading and Unloading Scheduling

1.3.7.1. Challenge description

The final challenge is loading and unloading scheduling which is related with synchronizing the usage of resources/assets through (real-time) appointments that are made between shipper/consignee and logistics service provider for the pick-up and drop-off time of the cargo. Overview of the challenge is given below:

Table 46: Challenge description 3.5: Loading & Unloading Scheduling

Challenge 3.5	Loading & Unloading Scheduling
Category Related domain challenge (D1.1)	4. Resource management 3. Planning and re-planning 2. Collaboration and communication 5. Monitoring of operations throughout the process
Extensions Specific use case challenges? (D2.2)	• Planning and Re-planning with ease • Need for loading & unloading appointment making system

What is the problem?	Loading & Unloading time is planned but actual timing may vary depending on several reasons. Lack of real-time visibility of processes, it is not possible to schedule & update appointments real-time and update workload plans to optimize operations and asset utilization.
Why is this a problem?	Crucial input for warehouse workforce optimization, Cost and Time savings, Shipment prioritization, On-time delivery performance in full (OTIF)
Where / When does this problem occur?	Point of loading and point of discharge
Who experiences this problem?	Logistics responsible, Logistics service provider, Warehouses (Shipper, Consignee)
How to overcome the challenge	A on-line platform where loading & unloading is (re) planned with ease based on real-time location of the cargo

1.3.7.2. Root cause analysis

The main root cause for the problem is that software used in Arcelik is not flexible enough to cope up with real-time changes; therefore problems are observed due to lack of a fast and convenient resource/asset planning system which can respond to real-time changes and update plans using the real time status of the cargo.

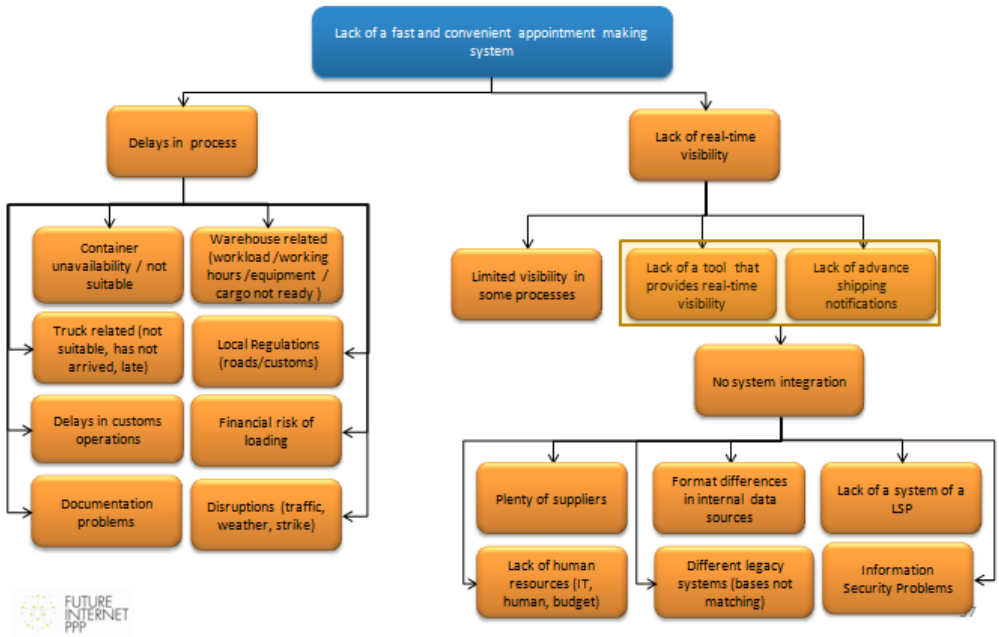


Figure 42: Root cause analysis – Challenge 3.5

Delays are inevitable if planning is not accurate / or flexible enough to cope with changes. Apart from planning, delays in loading & unloading operations can happen because of various reasons depicted in the figure above. Additionally real time information is not utilized in resource management software in Arcelik due to lack of real time visibility and lack of system integration with partners. As mentioned before having one-to-one integration with numerous partners in the chain is not manageable for companies like Arcelik, therefore a cloud based solution where information sharing is done via cloud technology is something Arcelik expects a lot to benefits from.

1.3.7.3. As-is Use Case Scenario

Table 47: As-is Use Case Scenario 3.5: Loading and Unloading Scheduling

UCS elements	Description
UCS name	Loading and Unloading Scheduling
ID	UCS3-5
Goal	Ensure coordination between actors, warehouse resource optimization, cost and time savings, shipment prioritization, on-time delivery performance in full (OTIF)
Summary	Import: Purchased items (raw materials) from the material supplier at Korea are loaded on containers/trucks and transported to the port of loading (Busan Port). Then containers are customs cleared and loaded on a vessel and shipped to the Gebze Port in Turkey. After the ship has arrived to Gebze Port, the containers are unloaded from the vessel to the unloading area at the port. After that they are loaded on to a truck and transferred either to a bonded warehouse or to a normal warehouse after customs clearance. Export: Finished goods are loaded on containers/truck and containers are transferred to the port of loading (Gemlik Port) in Turkey. After customs clearance at Gemlik Port, they are loaded on a vessel and shipped to UK. After the vessel has arrived to Felixtowe Port in UK, containers are unloaded from the vessel and transferred to the warehouse of customers after customs clearance.
Category	Resource management , Planning and re-planning, Collaboration and communication, Monitoring of operations throughout the process
Actors	Logistics responsible, Logistics service provider, warehouses (shipper, consignee)
Primary actor	Logistic responsible: responsible for coordinating the communication between shipper/consignee and LSPs.
Preconditions	Cargo is ready for pick-up/ Truck will arrive to the warehouse.
Triggers	LSP gets in contact with shipper / consignee for making an appointment.
Main success scenario	The main success scenario can be summarized as follows: • Shipper/Consignee decides on a suitable time for loading/unloading and informs logistics service provider or vice versa. • Logistics service provider confirms the expected arrival time to the warehouse (appointment confirmation). Logistics responsible coordinates communication between parties when problems occur. • The truck arrives to the warehouse at the agreed time and is suitable for realizing the delivery. • At that time, the workload at the warehouse is suitable for proceeding with the operation since it was planned before. • The truck is loaded/unloaded on-time.
Decision point	Shipper/Consignee has to decide when to schedule the appointment in coordination with the LSPs. Additionally real-time updates of schedules considering the real-life status are of importance to prevent delays in the process.
Challenges	• Truck arrival time is not known precisely beforehand due to lack of real-time information flow or real-time appointment (re) scheduling system • Loading & unloading time depends on the workload and available resources (plans) • Frequent updates on information content
Future Internet opportunities	An on-line platform where loading & unloading can be planned and updated with ease based on real-time status information.

1.3.7.4. Identification of possible solutions:

Solution ideas for this challenge are given at the below.

Table 48: Needs and ideas for solutions related to challenge 3.5

Root Causes	Needs	Ideas for solutions
LACK OF A FAST AND CONVENIENT APPOINTMENT MAKING SYSTEM	• Real time visibility of information • Timely monitoring of vehicles on road • Advanced shipping notifications • Alerts for deviations • Defined resources • Defined constraints • Integrated systems with actors involved	**Real time information input** for loading & unloading planning: • Linked to **"booking"** portal • Automatic real-time information input from **"monitoring"** portal regarding the status of the shipment (deviations etc.) • **Real time** updates (input to change resource plan) depending on status of the shipment • Facilitates **communication** between shipper/consignee and logistics service provider • Enables **appointment making** on the defined time interval depending on capacity and working hours of warehouses and local regulations • **Pre-organized** daily schedules for a frozen period • (Semi) automated prioritization of loading & unloading depending on constraints defined => "Appointment making" problem require customization and IT backend support and can be handled by various kind of software that are available on the market such as 4Sight, C3 Solutions and Descartes; therefore related needs can be solved using such services/software. => Real-time shipment status monitoring will be planned to be a part of "AUTOMETED SHIPMENT TRACKING DEMO" after M12, which will facilitate and optimize resource/asset management within the warehouses.