DigLogs

Transferability plan

Activity title: 5.4 Transferability plan

5.4.2 Data collection

Responsible partner: **Involved partners:**			
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1. Introduction

DigLogs aims to create the technological solutions, models and plans to establish the most advanced digitalized logistic processes for multimodal freight transport and passengers' services in the Italy-Croatia area. This project will have a significant impact on the quality, safety and environmental sustainability.

Transferability plan accounts for the possibility of transferring the knowledge and the know-how gained through the process of implementation of the project's work plan. Sheer amount of the practicality gained with the tried-out solutions bridges the gap among the project partners who are in front of the decision-making process of advancement to the next level of their own business conduct.

While there is plenty of information available on different solutions in ports regarding the digitalization of logistic processes used in many cities across the Croatian-Italian border, in most EU studies less attention is given to the methodological approach for the successful transfer of these measures. In the real world, what can be observed is the implementation of measures usually imported from elsewhere, where they were part of a successful case, often without a careful assessment of whether transferability conditions are ensured, and thus ending up as failures.

For this scope, transferability is defined as "**the ability to transfer/adopt in a given city/port successful measures previously adopted elsewhere, and achieve comparable results**"

The exercise of transferability is all about looking properly at the enablers (success drivers) and the conditioning barriers affecting the adoption of measures. For this, it is necessary to systematize what barriers to policy implementation exist in each target case.

The aim is thus to undertake an assessment of transferability and finally propose a framework supporting the adoption of digital logistic processes in new settings. It will assess whether port logistic measures adopted in the reviewed stock of experience (both in the pilots and as synthesized at the EU level in previous projects) are actually transferable and under what specific conditions.

2. Pilot descriptions

In the following subchapters, a description of all Diglogs pilot actions will be presented, as follows:

- Pilot 1: WMS 4.0 – Dry Port Case Study (PP2 - Elevante)
- Pilot 2: PCS automation – Deliveries Planning (PP5 - Actual, PP6 – Polo Inoltra)
- Pilot 3: Mobile Safety/Security (PP4 - UNITS)
- Pilot 4: Application for Data Flows Management (PP7 – Port of Rijeka Authority)
- Pilot 5: Innovative solution for Access Control (PP8 – Port of Šibenik Authority)
- Pilot 6: M2M Dialogue (PP9 – Port of Rovinj Authority)
- Pilot 7: Spatial Data Management System (PP1 - CFLI)

2.1. Pilot 1 description - WMS 4.0 – Dry Port Case Study

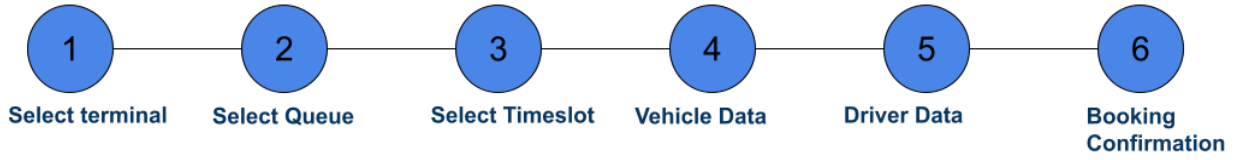
WMS 4.0 is the Pilot Action carried on by Elevante in the framework of Diglogs Project, which will take place in the intermodal rail-road terminal of Gorizia (SDAG), Friuli Venezia Giulia Region, Italy with the following aims:

- to demonstrate how multimodal transport arrangements among a heterogeneous set of logistics operators including carriers, logistic providers, transport operators and authorities can be thoroughly and conveniently optimised by exchanging real-time information concerning planned delivery schedules; and
- to overcome existing transport challenges affecting the very last mile of the multimodal transport chain by making the execution of road transport activities from the destination railroad terminal in Gorizia (SDAG), Friuli Venezia Giulia Region, Italy to the final goods delivery destinations in the most efficient, convenient, and seamless way.

A relevant tool of WMS that will be implemented in the Pilot Action is a Decision Support System (DSS), implemented in the form of an open-source platform providing optimised transport arrangements for last-mile transport segments by making use of specific algorithms and coordinated data from multiple stakeholders

One of the main objectives of the DSS is to implement a **Truck Appointment System (TAS),** which will enable a communication exchange between the inland terminal and truck operators, and to support the terminal manager in the optimum scheduling of operations. By allocating specific time slots to trucks via a booking system, the terminal operator will be able to optimize:

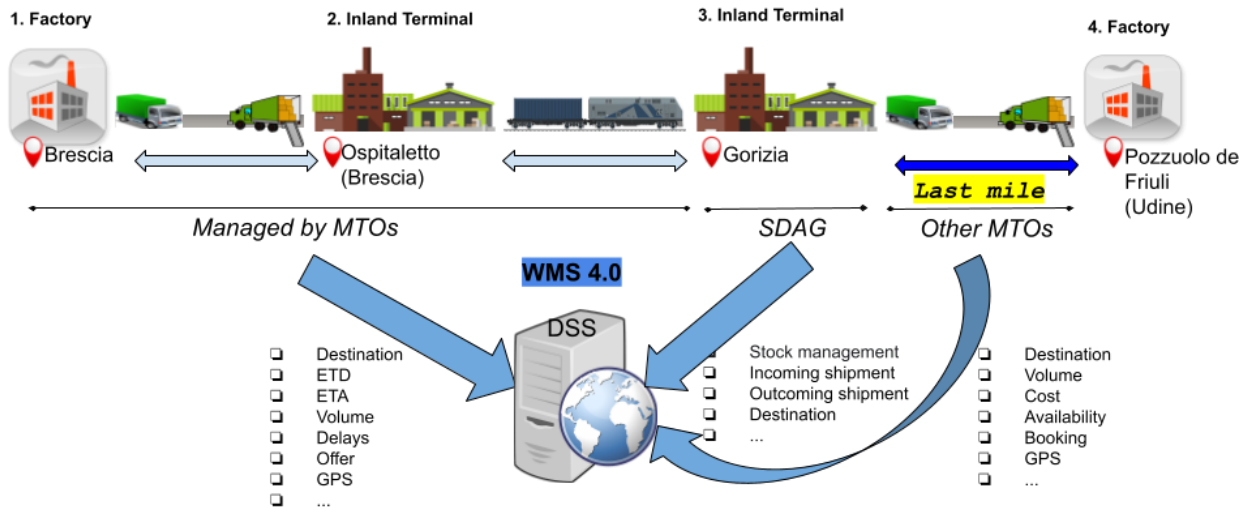
- the flows of incoming vehicles (specifying the gate, vehicle inspection, potential parking slot where to wait, etc.)
- resources utilisation and operations management to the expected volume
- traffic conditions to the terminal premises and surrounding areas
- communication between the terminal and the drivers informing on delays, etc.



TAS - Booking creation

In addition to the above, the TAS will also be pivotal to advising (Multimodal Transport Operators) (MTOs) on possible free trucks locally available to perform transport operations for the last mile segment. Upon collecting a heterogeneous set of information from multiple actors regarding the final delivery destination, goods type, vehicle sizes, costs of shipments, the DSS will be able to calculate and offer an array of possible scheduling solutions from different logistics operators. Besides, MTOs can put out requests for offers to truckers for the shipment of goods from the terminal through to the final destination. To this end, WMS 4.0 will create a continuous communication channel between MTOs and drivers/transport companies, aimed at optimising cargo delivery to destination by allocating specific time slots and keeping multiple actors informed (e.g., terminal, transport operators, truck companies) on unexpected delays or disruptions.

In summary, the DSS pilot will consist of testing a centralised collaboration platform with MTOs, aimed at collecting from them useful data about their services (e.g., time schedules, origin/destination, delays, ETA/ETD) and providing scheduling support to carriers, other MTOs, dry ports and public authorities. The web application envisaged as part of the pilot will firstly be deployed at Gorizia terminal and will subsequently be open to other dry ports and MTOs in the Programme area, willing to upload their data.



WMS 4.0

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	• transport challenges affecting the very last mile of the multimodal transport chain from both operational, economic, and environmental perspectives. • enable the interconnection between MTOs, terminal operators and carriers via a single digital access platform. • allow MTOs, terminal operators and carriers to be timely informed and to synchronise their delivery schedules.
2. Goal(s) of the pilot project	• Develop a DSS making use of a purposely developed **TAS**, implemented in the form of an open-source platform providing optimised transport arrangements for last mile transport segments by making use of specific algorithms and coordinated data – as outlined above – gathered from multiple stakeholders; the DSS will also enable a

	continuous communication exchange between the MTO, inland terminal and truck operators, and will therefore also be pivotal to supporting the terminal manager in the optimum scheduling of their operations. To this end, data records from MTOs to monitor and update goods delivery statuses will be imported; moreover, data records from Inland terminal to monitor and update on storage levels will also be acquired.
3. Technology to pilot	1. Development of web application accessible by browsers (Chrome, Opera, Mozilla Firefox, IE, Safari) from all devices provided by internet access 2. Digitizing and centralized data information flows becomes from courier, MTO and Inland terminal 3. Real time data access, transformation and storage in a centralized place using real time integration Architecture like Representational State Transfer (REST) Framework or Simple Object Access Protocol (SOAP) 4. Development of user profiles accessible as courier, MTO and Inland terminal operator. Profile's data will be available for direct system to system access via HTTP API
4. Pilot project description	• WMS 4.0 is the Pilot Action which will take place in the intermodal rail-road terminal of Gorizia (SDAG), Friuli Venezia Giulia Region, Italy with the overarching aim to demonstrate how multimodal transport arrangements among a heterogeneous set of logistics operators including carriers, logistic providers, transport operators and authorities can be thoroughly and conveniently optimised by exchanging real-time information concerning planned delivery schedules. • WMS 4.0 foresees a DSS that will be linked to SDAG's WMS, to enable the interconnection between MTOs, terminal operators and carriers in one single digital access platform

5. Resources needed	• WMS: a software application, designed to support and optimize warehouse functionality and distribution centre management, specifically facilitating the management of daily planning, organizing and staffing, as well as providing support to control the utilization of available resources; to move and store freight into within and out of a warehouse; and to assist staff in the performance of material movement and storage in and around a warehouse. • no. 5 staff members from Elevante participating to the project team. • An external supplier for the development and delivery of the DSS
6. Cost/benefits analysis (if any)	- n/a

2.2. Pilot 2 description - Deliveries Planning

Deliveries Planning is an innovative IT solution, based on Big Data and PCS automation, aimed at better planning multimodal deliveries, based on real-time and predicted traffic conditions, service prices, transit times, schedules & ITU requirements comparisons, automatically suggesting or enabling selection of best travel routes before or during the trip. This tool is a specialized Decision Support System that calculates and suggests routes by processing normalized real-time data coming from external sources and systems used by the port community. Deliveries planning solution can be easily connected to the existing Port and Maritime information systems both as sources and as targets of the Delivery Planning Solution.

The pilot solution has been named DELPLAN, and structured in 2 main phases.

The first phase is concerning the multimodal route planning, which consist in setting up a shipment, selecting a place of departure (any Italian or Croatian provinces) and a place of delivery (any Italian or Croatian provinces), an ETD and an ETA, and the state of the cargo (e.g. solid palletized or not palletized, bulk, liquid, gas, etc.). The system is then asking the user to indicate which ITUs can be considered for the shipment (e.g. a standard 40' or a 45' container, a semitrailer or a bulk or tank container, etc.), and the user can indicate just one ITU for the service or multiple ITUs for the price comparison. Once selected the ITUs, the system will compare, considering road, sea and rail routes available on the market, several routing options, and sort them by three main criteria: Transit Times, Prices and Emissions.

The second phase of the DELPLAN specs, is related to the re-routing functions, where a confirmed shipment can be monitored and, in case of non-compliances on the selected route, replan it using the re-routing options.

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	- Lack of information on available intermodal routes; - Difficulties in determine the route compatibility with available ITUs; - Operational problems in re-routing an intermodal shipment in due course.
2. Goal(s) of the pilot project	- Map some of the key routes in rail and sea freight transport; - Map some of the key intermodal hubs in Italy and Croatia; - Offer a direct tool for shipment planning, with indications of prices, transit times and emissions; - Follow up the shipments in each step of the multimodal chain, adding the re-routing tool as an option for shipments' non-compliance.
3. Technology to pilot	- A web based, user-friendly interface which interconnects all the aspects, ITUs, hubs, routes, conditions, and groups them into an algorithm capable of giving the routing options.
4. Pilot project description	- Multimodal route planner on 3 modalities, rail, sea, road; - Comparison of routes based on ITUs and ranking available on price, transit times and emissions; - Rerouting option, based on the journey non-compliance, and re-route from that point onwards, with rankings on price, transit times and emissions.
5. Resources needed	- System algorithm; - Web based interface; - Simulated data info about traffic and weather; - Simulated data info about multimodal routes with detailed service conditions.

6. Cost/benefits analysis (if any)	- The pilot benefits are well beyond any costs, as the digitalization process would be based on a web-based user interface, easy to create and not expensive, while the benefits would be potentially huge, as they would impact almost any multimodal shipment interesting Italy and Croatia.

2.3. Pilot 3 description - Mobile Safety/Security

Passengers are currently trained for emergencies and emergency signaling is installed onboard, but in a real emergency, some escape routes might not be available anymore (especially in case of fire). In such a case, passengers could be obliged to turn back and search for alternative escape routes, wasting time. Moreover, evacuation can be hindered by panic occurrence especially if passengers are lost, which might again increase the time required to evacuate the ship. In this context, the usage of mobile technology can enable a reduction of evacuation time, preventing passengers to take the wrong direction and increasing their situational awareness to limit panic occurrence. The availability of clear guidance information, considering the current status of escape routes, has been already found useful, but a test adopting mobile devices have not been carried out yet.

During the UNITS pilot project, the technical feasibility of a system based on Bluetooth beacons has been investigated. Besides, the effect on the evacuation time due to the usage of mobile technology has been also studied to prove the benefit of such a system. The test on a small test population has been considered first advisable to compare the standard evacuation time with the one related to the adoption of mobile technology. This is the main objective of the pilot action carried out by UNITS within the framework of the DigLogs project. The test environment included an area covering 2 decks connected by multiple staircases on a the GNV Bridge Ro-pax ship. The pilot system is composed of a mobile application to be installed on mobile wearable devices (smartbands) and a backend application to configure and monitor the system from the ship bridge. The APP exploits a Bluetooth beacon net to enable mobile devices 11nauthorized. The pilot system has been developed in collaboration with ETEC Minds S.r.l. (UNITS subcontractor). The system has been designed to prove its main functionalities while being easily scalable in future developments.

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	- The complex internal layout of passenger ship can hinder the ship evacuation - Fire, floodwater or structural damages might block one or more escape routes - In case of accidents, the fixed 12nauthori might guide the passengers towards blocked escape routes - Passengers might be lost during the ship evacuation
2. Goal(s) of the pilot project	- Prove the feasibility of a system based on mobile technology in a real environment (steel-made) - Measure the evacuation time reduction due to the application of mobile technology - Foster the application of mobile technology to enhance ship safety/security
3. Technology to pilot	- Wearable smartbands (LILYGO TTGO T-Wristband) - Sending/Receiving Bluetooth beacons (WEMS TTGO OLED ESP-32) - Server (Raspberry PI 4) - WiFi connection (HTTP and MQTT protocols) - MySQL database
4. Pilot project description	- Provide guidance during ship evacuation - Adapt guidance to the current status of escape routes - Adoption of wearable devices to 12nauthor/guide passengers towards the right direction - Provide 12nauthorized data to the crew in case of emergency
5. Resources needed	- Suitable hardware (smartbands, Bluetooth beacons, WiFi Network, Server)

	- APP running on smartbands - Backend application running on server - Adequate expertise to set-up the beacon net - Adequate training of the crew using the Backend application
6. Cost/benefits analysis (if any)	- Previous works showed the benefit coming from dynamic signalling onboard to deal with blocked routes - Bluetooth technology has been already applied to design onshore localization services and on passenger ships for commercial purposes

2.4. Pilot 4 description - Application for Data Flows Management

Main pilot function is provision of additional visibility layer to VTS system operators, increasing boat resolution and visibility, showing port basin situation to end stakeholders and passengers and enhancing safety in the area.

Scope of the pilot is requisitioning and purchase of the envisaged equipment, its installation and functional integration with the existing VTS system already in use in the Port control center of the Port of Rijeka Authority, and the visualization of the port panoramic presentation for the end user group of passengers using already existing visualization using Web page presentation.

Exact technical requirements, connectivity and input-output possibilities are subject to further determination during pilot development and component identification up to its end, as some components might change even during pilot execution. While main components are already identified as a part of analysis and requirements specification, it is possible that some smaller components will be identified later in the pilot execution, so flexibility will be required during later stages.

A required optical system must possess **adequate technical qualities to support envisaged role**. Among **initial and required parameters** that were discussed and considered are:

1. Vehicle (boat/maritime object) detection equal to or larger than length of Rijeka breakwater or other selected installation micro location (for example, passenger yachts quay),
2. Respect of industry Johnson criteria: vehicle size defined as 2,3 m2, detection at 2 pixels,

3. 50% probability subject to environmental conditions,
4. Lens F number equal to 1.2 or better, in order to provide optimal sharpness of the image,
5. Resolution, at least 640x480,
6. Adequate camera controls and presentation mode,
7. FLIR capability, and
8. Pan–Tilt–Zoom controls, adding capability of remote directional and zoom controls.

Also, **connection with the system** using *Rijeka Traffic* application (business information system) already used in Rijeka Port Traffic Control center towering over passenger terminal is a prerequisite for successful pilot execution.

Video camera serving separate visual feed for display with Rijeka traffic business information system needs to have adequate quality, IP protection and to be weather and elements proof.

Pilot project limitations are primarily in form of focus on only passenger area, and not other port areas. Port of Rijeka has a quite diverse port structure, and full coverage would greatly exceed the budget and scope of the proposed pilot project.

The pilot project goal is to establish a monitoring system using a highly modular, ready to go, compact surveillance solution, consisting of video and fixed lens thermal cameras, which is ideal for short to medium range surveillance applications, capable to exactly pinpoint every small vessel or other vehicle present or approaching the passenger terminal. This underlines the passenger pilot category, where Port of Rijeka Authority's project neatly fits.

Video sensing device, serving output data to a dedicated, custom made Web client application will be connected via a pilot-developed module to existing traffic system and display in real time the inflow of small and large vessels and vehicles moving at the passenger terminal. *All Silent Sentinel Pan* and *Tilt* systems will be designed with absolute positioning feedback as standard. Also, the system will add more resolution by means of an additional informational layer to already existing VTS radar and connected sensing technology, in order to timely identify any threat detected and remain focused on the target as the threat moves, providing live, real-time update, and enabling both better information and decision making.

Gathered visual and numerical data can be displayed in different venues and forms, for example, in the Port control center (Rijeka traffic system), Port of Rijeka Authority main building, or, in a

limited scope, publicly available at the passenger terminal or yacht quay or other suitable venue, and the operators could make changes and record the vessels currently covered by the existing maritime surveillance system. The idea behind the pilot is to extend visual representation to end users (passengers), using already existing mapping facilities provided by Rijeka traffic system and appropriate graphic elements.

This way, additional benefits will be reaped both by control authorities overseeing traffic via VTS and end user stakeholders – passengers.

Long term goal of the project is to broaden the technological base of the Port of Rijeka, and create a technological mesh of solutions, adding a new layer of visibility and constantly increasing the security of passenger maritime traffic in the port basin.

Decision on the pilot content was made because existing VTS solution has a pre-set resolution and industry and compliance standard resolution, while Port of Rijeka Authority is aiming to increase minimal requirements and meet stakeholders' expectations. Furthermore, it wishes to open its operative data towards stakeholders, primarily **passengers.**

The pilot already contains integration with more complex solutions, namely, port VTS/VTMIS system, adding a new visibility layer in poor conditions, depicting vessels of smaller dimensions.

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	• inability of the passengers to get information of the situational overview in the port • lack of thermal layer in local VTS
2. Goal(s) of the pilot project	• increase resolution of the VTS by addition of the thermal layer • expand existing Rijeka Traffic solution with publicly available information on moored vessels • provide situational overview to interested stakeholders

	• enhance passenger port security
3. Technology to pilot	• thermal camera with VTS connection • dual CCTV cameras as video feed input • enhancing maps technology with Augmented Reality information feed derived from CCTV cameras • SOA architecture and 3-tier architecture used to enhance Rijeka Traffic software
4. Pilot project description	• envisage, deploy and put into production an innovative solution providing additional visibility layer to VTS system operators, increasing boat resolution and visibility, showing port basin situation to end stakeholders and passengers and enhancing safety in the area, all accessible through web • scope of the pilot is requisitioning and purchase of the envisaged equipment, its installation and functional integration with existing VTS system, development of the web application aimed towards passengers
5. Resources needed	• suitable hardware including thermal camera and dual CCTV cameras for video feed • development and integration services • adequate training and professional guidance • project management and reporting
6. Cost/benefits analysis (if any)	• N/A

2.5. Pilot 5 description - Innovative solution for Access Control

Ongoing building of the national PCS will have a significant impact on all port of Šibenik stakeholders and their IT systems, and they have been involved in the process from the very beginning, even before than CEF funding was secured. PCS will have several dedicated modules for various concessionaires, and they will have to adjust their systems a part of regular planned internal growth and maintenance activities.

Immediately, it came to one's attention that there is a room for implementation of an innovation within scope of the DigLogs project, in its essence a sustaining incremental innovation, that digitalizes a process that is currently executed manually and presents a large obstacle in modernization of processes inside port of Šibenik, but also is not addressed within the scope of the new to-be PCS system that will also be deployed in the port of Šibenik. This is a new ***digital access control system, fully aligned with current business needs, whose full scope is to be defined within this pilot work plan,*** and that encompasses stakeholders whose activities are aimed towards processes underlying passengers disembarking and boarding cruisers and passenger ships, port concessionaires, business personnel, vehicles, drivers, containers and other stakeholders within identified target groups. Presently, access control to the Port of Šibenik area is governed by the subject Regulation about identification cards of the Port of Šibenik Authority from 11th September 2015. ID cards used for ingress and egress control and access to information, cargo, premises and operative port spaces are used to identify persons and vehicles and they are particular to a certain person or vehicle and non transferrable. There is also a quite detailed pricing list for permit issuing, as it presents a source of revenue for the Port of Šibenik Authority, in force as of 6th January 2017.

At the beginning of the project, enforcement was still implemented in physical form, using manual labour and plastic cards, causing delays, excessive consumption of time and other resources, and diminishing integration and analytics, contrary to the ISPS requirements and modern business process execution inside ports.

This is especially prevalent when processing large number of passengers from cruisers whose access permits need to be processed sometimes even overnight, using manual process. For

example, passenger terminal Vrulje with a cumulative quay length of 510 meters, has a projected capacity of 1.000.000 passengers annually and with the ongoing capacity expansion to 2.000.000 passengers annually, an inherent need for a new digital system of permits issuing based on innovative digital solution becomes even more clear.

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	• obsolescence of currently used technological process • inability to process large volume of permits • inexistent automatic reporting and data retrieval • low data and process reliability, especially when considering that police is involved in the process
2. Goal(s) of the pilot project	• eliminate the use of manual procedure in permit issuing • creating a dependable technical base for the process that can be expanded in the future • simplify procedure issuing with better user experience for the end user • enhance port security by data and permit transparency and searchability
3. Technology to pilot	• QR code readers • mobile application • Web shop and payment gateway • SOA architecture and 3-tier architecture
4. Pilot project description	• envisage, deploy and put into production an innovative solution for passenger flow control in covered Port of Šibenik terminals, and achieve automated solution for enhancement of security and safety in the port area including payment, tracking, oversight and analysis solutions. Its function is to serve as an input solution for

	further connection with the national PCS system whose implementation is ongoing in parallel with this pilot project • scope of the pilot is requisitioning and purchase of the envisaged equipment, its installation and functional integration, development of the web and mobile applications aimed towards administration, passengers and the police, and implementation of analytic capabilities for the system
5. Resources needed	• suitable hardware including reader • development and integration services • adequate training and professional guidance • project management and reporting
6. Cost/benefits analysis (if any)	- previous research and experience from other ports has shown that introduction of a digital solution for permit issuing has increased the number of issued permits significantly. This analysis is to be performed in the post-project period

2.6. Pilot 6 description - M2M Dialogue

As a part of DigLogs project, the Port of Rovinj Authority decided to upgrade the existing maritime traffic control system to improve information system functionalities related to vessel traffic monitoring while also including all the related activities which enhance the port's performance. This undertake referred to upgrade of the traditional PCS system which will serve its purpose as an intermediator between the given software and the National Single Window's – CIMIS.

The advantage of having this kind of solution greatly exceed its nominal value and it offers the best experience to all of its stakeholders. The project pilot's goal was to establish an alternative to the traditional PCS which can be interconnected with all of the port's stakeholders thus contribute to improve the quality of the system functionality on all levels.

Rovinj Port Authority implemented the application that integrates the operational and accounting system of the Port Authority's operations and it will serve as a local PCS. The application software enables mooring reservation system, graphic mooring occupancy management, billing via mobile application, creating daily, monthly and annual reports, generating mooring contracts, automatic invoicing, CRM-Integrated Email System, accounting, paying invoices and automated importing of bank statements. The system is designed with feature capable of generating feedback in a form of statistical data as well as graphical representation of port's measurable parameters.

Long term goal of the project pilot was to broaden the technological base of the Port of Rovinj, and create a technological mesh of solutions, which in turn increases efficiency and productivity by helping users navigate complex processes, preventing data re-entry, and improving functions in all of the business segments.

Pilot definition

	Information	Description
1.	**Problem to be addressed or improvement desired**	- obsolescence of currently used technological solutions - incompatibility due to multitude of programs needed - unification of technological solutions
2.	**Goal(s) of the pilot project**	- eliminating the need for use of several different programs - bridging the gap towards complete integration with NSW - modernization and digitalization of existing business processes
3.	**Technology to pilot**	- highly modular cloud-based system - possibility of total control over port's operations - all-in-one tool, customizable/upgradeable, stable, transparent, easy transition and result-oriented solution
4.	**Pilot project description**	- upgrade of the existing maritime traffic control system - need for integration of operational and accounting systems - establishment of an alternative to traditional PCS - modernization and digitalization
5.	**Resources needed**	- suitable software and hardware solutions - adequate training and professional guidance - existing database
6.	**Cost/benefits analysis (if any)**	- n/a

2.7. Pilot 7 description - Spatial Data Management System

The pilot action is to be implemented in the context of the North Adriatic Sea Port Authority and it regards the adoption of a **centralized and interoperable spatial data repository** aimed at giving a robust structure to the information and data used within the internal processes and to provide services to external operators and institutions.

The pilot belongs to the innovation named “Maritime Big Data / Data management” aimed at obtaining the best results from integrating different data sources in terms of added value in knowledge and management capability.

The pilot action envisaged by the DigLogs project for the Venice port community concerns the creation of a so-called **"Spatial Data Infrastructure" (SDI) at the Port Authority**. A Spatial Data Infrastructure is an integrated data system that allows centralizing the information and digital maps used by different Port Authority offices and also external actors, allowing both, efficiency in management and maintenance of each dataset, and shared access by multiple operators.

The current situation at the Venice Port Authority is such that the use of the available dataset generates several copies and reprocess data within many different and inhomogeneous systems. This kind of management reduces performance and the overall quality in usage and updating of data among various operators makes decision making process significantly inefficient. The Spatial Data Infrastructure (SDI) performs both, data storage and processing functions, making copies no longer necessary and allowing processing to be archived, both in the form of new data archives and as algorithms that provide results in real time, allowing operators to maintain the known methods and tools thanks to the interoperability protocols.

The pilot action envisaged by DigLogs project for the Venice context will include both the **technological implementation** and a **special training program** for the personnel of the Port System Authority.

Pilot definition

Information	Description
1. Problem to be addressed or improvement desired	- Ease the communication and sharing of information - Improve processes control and decision-making - Eliminate data duplication and redundancy - Allow the creation of new generation location-based services for companies, institutions and citizens
2. Goal(s) of the pilot project	- Increase in processes efficiency - Time reduction in getting information for planning - Great improvement in information sharing between departments - Increase real-time data availability - Improve resource utilization and the reduction of paper documents - Improvement in collaboration between employees and stakeholders - New types of data analytics documents and interfaces to access data from various internal and external sources - Get fast and map-based data processing and aggregation
3. Technology to pilot	- PostgreSQL/PostGIS spatial database - Geoserver OGC Compliant web mapping server - QGIS Desktop Geographical Information System - Openlayers web-oriented mapping library
4. Pilot project description	- Data collection, optimization, and migration into a centralized and interoperable spatial data repository - Creation of the Venice Port Authority "Spatial Data Infrastructure" (SDI) - Implementation of a special training program for the Port Authority employees on spatial data management and visualization techniques

5. Resources needed	- Dedicated physical/virtual server able to host the Spatial Database, the mappping server and to store spatial datasets - External experts to support data optimization and migration - Teachers to carry on the training activities
6. Cost/benefits analysis (if any)	- N/A

3. SWOT Analysis

SWOT matrix is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning.

The use of the SWOT matrix regarding this project is visual summarization of individual project pilots along with their associated activities, which in turn makes this plan a valuable input for transferring knowledge and experience.

By filling up this SWOT analysis, simple “ask and answer questions” generate meaningful information for each category which helps with identification of the competitive advantage and provide valuable information which can be used for improvement purposes.

The purpose of this SWOT analysis is to facilitate the identification and classification of data in the following chapter (Pilot outputs – benefits and disadvantages).

3.1. Pilot 1 SWOT analysis - WMS 4.0 – Dry Port Case Study

STRENGTHS	WEAKNESSES
- Real time decision making provided by DSS - Decision Support System and centralized data system - Data synchronization offered by TAS – Track Appointment System - Digitization information of flow management	- Initial assessment for personnel training by using digital information - Providing of personnel with computer, tablet, smatphone or another device connected to Internet
OPPORTUNITIES	THREATS
- Predective data analysis based on historical data. Using statistical algorithms and machine learning techniques to identify the likelihood of future outcomes - Large scale installation of WMS 4.0 will increase the efficiency of intermodal fright transport in national and international scale	- Not qualified personnel - "Acts of God" - also known as force majeure events - are natural disasters (or other destructive events) which are utterly outside of human control

3.2. Pilot 2 SWOT analysis - Deliveries Planning

STRENGTHS	WEAKNESSES
- Strong information about the multimodal dynamics, ITUs requirements and terminals' conditions; - Solid algorithm that takes into account all the potential expenses, transit times conditions and emissions.	- Lab simulated data, as there aren't many direct sea routes between Italy and Croatia, making the algorithm less effective; - Lab simulated traffic and weather conditions, due to the impossibility to compare real services.
OPPORTUNITIES	THREATS
- Opportunity to expand the coverage area, making the pilot more effective; - Opportunity to use the same algorithm over the project area, using it also for transit routes passing by Croatia and Italy, and not only with origin and destination in Italy or Croatia; - Opportunity to link the system algorithm to real time traffic and weather conditions as well as to further service indicators, that may improve the end results of the system.	- Potential mismatch between services info, as well as not having up-to-date information about services and routes; - Potential mistrust of the users in using the platform, preferring traditional route calculation methods (eg pen and paper, or single-modality planners like the road planners in haulers planning systems).

The Pilot SWOT analysis has highlighted the main points that are coming out of the pilot application process.

Pilot strengths are related to the background research conducted during the DigLogs project. In particular, all the materials obtained in connection with ITUs, terminals, routes and market dynamics in general, allow the pilot to have a solid calculation background. On the same point, the system algorithm takes into account all the potential expenses, transit times conditions and emissions that may arise in each option chosen by the user, during the multimodal planning task.

The pilot weaknesses are related to the necessity of simulating some of the sea and rail connections, in particular sea routes in mid-Adriatic, in order to make the pilot calculations more effective. Considering that the main point of strength of the pilot is connected with its capacity of comparing different routing options, not having many routes to compare in certain areas, forced the pilot team to simulate routes in order to add them as options in the multimodal route calculator. At the same time, having direct access to real-time data related to traffic and weather conditions, as well as additional metrics, could improve the system predictions capabilities.

The pilot opportunities are related to the current status of the pilot, as at the moment the system is limited to comparing routing options for services with point of start or arrival in Italy or Croatia and mainly focusing on the Mid-Adriatic area. By expanding both the focus area to the whole Adriatic and considering routes that do not start or arrive in Italy or Croatia, but that transit over these areas, or even considering routes that are not solely linked to Italy or Croatia, making the system pan-European, the pilot would have a bigger impact on the market.

The pilot threats are connected with the quality of information provided and the level of trust user has in the system. Clearly, pieces of information not updated or not correct, may cause the algorithm not to provide reliable results. At the same time, an user mistrust in the system reliability, whether proving to be right or wrong in actual terms, may still prevent the correct and complete usage of the platform, leaving the user to continue with the traditional planning methods, from the outdated pen and paper way, to the more modern but incomplete road-based route planners, usually included in larger ERP systems. These road-based planners, even if very useful on practical terms to establish the routes and to avoid useless km in the journey, do not consider the multimodal routes, in particular they do not have or consider any rail or sea route, causing the multimodal options to be discarded.

3.3. Pilot 3 SWOT analysis - Mobile Safety/Security

STRENGTHS	WEAKNESSES
- Significant reduction of evacuation time in case of blocked escape routes - Passenger authorized data can help to better manage ship evacuation - Chosen system architecture and hardware assure guidance even in case of WiFi connection failure - The system can be easily scaled	- Steel-made environment impede the use of the compass and causes reflection of Bluetooth signals - The current solution is WiFi based (hence, WiFi shall be available at least at the beginning of an emergency) - Developed for specific hardware (smartbands) - Smartbands battery capacity
OPPORTUNITIES	**THREATS**
- Improved safety of passenger vessels (image return for shipping companies) - Localisation data can be used for commercial purposes too - Additional information/services for passengers	- Possible privacy issues related to authorized data - Too much reliance on technologies

3.4. Pilot 4 SWOT analysis - Application for Data Flows Management

STRENGTHS	WEAKNESSES
- opening up information towards passengers - enhanced VTS resolution and visibility - integration with already existing systems increases capability of the IT solutions portfolio (VTS and Rijeka Traffic) -	- custom solution built by a smaller vendor and as a consequence, somewhat dependent on the vendor availability - it will require maintenance and upgrades to continue functioning
OPPORTUNITIES	**THREATS**
- exploit established path to further open up available information towards the public, especially traffic and passenger statistics, from PCS to-be system, in live mode - transfer effects to end users (passengers), even when it is not directly visible to them (enhancement of port basin security due to better resolution and visibility of smaller area objects)	- parts of the equipment are installed in open space towards the sea and as such, could be jeopardized by weather elements as the time passes, despite being IP-certified, increasing possibility for equipment failure and maintenance costs

3.5. Pilot 5 SWOT analysis - Innovative solution for Access Control

STRENGTHS	WEAKNESSES
- increased speed of permit processing - various applications suite for suitable and individual needs (police, Web, mobile application) - cost efficiency in comparison to "off the shelf" products - greatly modernized process	- custom solution built by a smaller vendor and as a consequence, highly dependent on the vendor availability - it will require maintenance and upgrades to continue functioning - budgetary project limitations have enabled on premise solution while hybrid or public cloud would be more flexible albeit much more costly
OPPORTUNITIES	THREATS
- increased revenue - better reporting - transfer effects for other stakeholders and immediate positive externalities for the Ministry of Interior	- new technologies might render developed solution as obsolete - tentative adoption of a new maritime management solution might already include similar permit issuance module, that might displace developed solution within pilot project

3.6. Pilot 6 SWOT analysis - M2M Dialogue

STRENGTHS	WEAKNESSES
- business processes integration - less diversity -> elimination of possibilities to make an error - modern and digital appearance advantage over competition	- timely and costly endeavor - need of regular upkeeping and frequent upgrades - partial implementation due to differences between old and new solutions
OPPORTUNITIES	THREATS
- integration with NSW in due time - enriched existing offer - facilitation for all stakeholders to whom it may concern - automation of simple processes	- incompatibility with existing technological solutions - familiarization with new technologies - solution more complex than previous ones

3.7. Pilot 7 SWOT analysis - Spatial Data Management System

STRENGTHS	WEAKNESSES
- System implementation based on the information asset with low infrastructure impact - Internal training program allow long-term structural improvement in efficiency - Existing data optimization and centralization is a long-term improvement action	- Bottom-up approach can slow down the implementation - Voluntary membership to training program can reduce its effectiveness
OPPORTUNITIES	THREATS
- Innovative approaches in spatial planning and programming - Improvement in data sharing between stakeholders - New type of data-driven services development	- Legal framework limitations in data sharing - Cyber security issues - Service disruption caused by changes and updates in technologies, standards and formats

4. Pilot outputs – Benefits, disadvantages and improvements

Benefits and disadvantages serve as a starting point towards the need for potential improvement. This chapter contains summarized notes and valuable information regarding outputs derived from the individual project pilot implementation. The tables below serve as a guideline for summing up the results and their significance to the project, while also providing valuable inputs for improvement.

Explanation of the individual pilot benefits will answer to the following questions (for example):

- What bottlenecks does it solve?
- Which processeses or its parts does it optimize?
- Which KPIs does it improve?

Explanation of the individual pilot disadvantages will answer to the following questions (for example):

- What obstacles were encountered?
- Did the results come at the cost of something? Any sacrifices had to be made?
  Are there any other potentially negative impacts?

Explanation of the individual pilot improvements will be the essence of the Transferability plan. They contain measures and strategies needed to be deployed in order to reach the benefits and minimize disadvantages. They also contain indications and/or brief roadmaps in order to achieve more benefits, as a result of releasing the full potential of the pilot, after reaching its full scope.

4.1 Pilot 1 outputs - Benefits, disadvantages and improvements - WMS 4.0 – Dry Port Case Study

Individual pilot benefits:

- WMS 4.0 will solve last mile transport segments by making use of specific algorithms and coordinated data of the whole intermodal transportation chain

- Data information in the interconnection between MTOs, terminal operators and carriers in one single digital access platform allowing them to be timely informed and synchronize their delivery schedules will optimize the final leg of the intermodal transport chain and eliminate data redundancy

- The main KPIs that WMS 4.0 will improve are:

  - **Warehousing Costs** - *Every freight and shipping company is going to have warehousing costs and the digitized information of WMS 4.0 decreases it.*
  - **Intermodal freight transport** - *Spatial Data Infrastructure (SDI) and on-line electronic database containing all information needed to improve intermodal freight transport operations*
  - **Last mile segment** - *DSS making use of a purposely developed Truck Appointment System (TAS), implemented in the form of an open-source platform providing optimised transport arrangements for last mile transport segments*
  - **DSS - Decision Support System** - *will be linked to SDAG Warehouse Management System (WMS), to enable the interconnection between Multimodal Transport Operators (MTO), terminal operators and carriers*

Individual pilot disadvantages:

- No disadvantages are envisaged

Individual pilot improvements:

- WMS 4.0 aims to reduce the redundancy and the lack of data and data dispersion by executing a common data collection exercise and using a DSS to improve the operational efficiency of the whole intermodal transportation chain. Within this context, the development of the TAS will be critical functionality to avoid congestion issues at inland terminals and reduce waiting times for incoming truck drivers.
- Training and assessment of personnel by using digital information should be the first step to be deployed in order to reach the benefits and minimize disadvantages

Type of Enablers and/or Barriers	Description		
	Benefits	**Disadvantages**	**Improvements**
Financial	- Using digital information data will reduce labour cost - Decrease warehousing and transportation logistic costs	- Initial data digitization cost	- By using historical data information additional revenue may be generated - Installation of WMS 4.0 in all distribution chain can reduce trade

			costs and times substantially
Physical	- Couriers, Inland terminal and MTOs can operate more efficiently resolving warehouse bottlenecks and congestion issues - Will solve last mile transport segments by making use of specific algorithms and coordinated data of the whole intermodal transportation chain	- Initial assessment for personnel training by using digital information - Providing users with computer, tablet, smatphone or another device connected to Internet	- Better connection by SMS or QR code between terminal gates operator and couriers
Technological	- Digitization of data information	- n/a	- n/a

	- Centralized data information system		
Environmental	- It is expected to produce fewer carbon emissions and relief traffic pressure on arterial roads	- n/a	- n/a
Political	- n/a	- n/a	- n/a
Legal	- Electronic documentation availability	- n/a	- Possibility to carry out electronic invoicing operations
Security & risk	- Accurate real-time monitoring and control of incoming and outcoming couriers from terminal	- n/a	- n/a

4.2 Pilot 2 outputs - Benefits, disadvantages and improvements - Deliveries Planning

Benefits of the pilot

Problems the pilot aimed to solve:

- Lack of information on available intermodal routes
- Difficulties in determining the route compatibility with available ITUs
- Operational problems in re-routing an intermodal shipment in due course

Benefits achieved:

- Mapping some of the key routes in rail and sea freight transport
- Encouraging multimodality via choosing rail and short sea shipping alternatives over road options, reducing EO2 emmission
- Mapping some of the key intermodal hubs in Italy and Croatia
- Direct tool for shipment planning, with indications of prices, transit times and emissions
- Following-up the shipments in each step of the multimodal chain, adding the re-routing tool as an option for shipments' non-compliance
- Alerts for route closures affecting the route selection

Constraints and limitations

The main pilot constraints and limitations are related to the usage of lab-based data for the system testing. First of all, due to the limited amount of sea routes connecting the mid-Adriatic area, new potential routes will be simulated, in order to make the algorithm more effective in the route comparison.

The necessity of creating simulated routes within the pilot action represent a limitation to the usability of the platform in the short term. Same simulations have been made for open trains in intermodal routes, as some of the trains that connect the mid-Adriatic terminals are block-trains, used by one or two main operators only.

In order to make the multimodal route planner more effective, existing block-trains have been lab-converted to open trains, in order to represent, at least for the algorithm calculations, an alternative to the main existing routes.

The second main limitation is connected to the necessity of having a checkpoint system for the shipment monitoring and re-routing. In real life, the GPS coordinates of a shipment would allow to establish an actual arrival or departure of an ITU in a specific travel leg, while in the pilot action, due to the simulations specified above, in order to arrange shipments taking simulated travel legs, will be modified, using a user validated checkpoint system, so to have a confirmation of the end of specific travel leg and the start of the next one.

The checkpoint system, while on the testing phase will still be effective for the monitoring and re-routing activities, still represent an obstacle to the full automatization of the system, therefore making it a big constraint.

The last limitation is concerning the number of routes available and the geographical area of coverage. Due to the role of the pilot, only shipments to/from Italy and/or Croatia were considered with point of departure and arrival of shipments in any of Italian and Croatian provinces. Outside the pilot action, for the long term planning of the system, it will be essential to consider not only shipments arriving or departing to/from Italian and Croatian provinces, but also shipment crossing the area, for a longer service (for example, a shipment from Barcellona to Bucharest may be directed by the system to use the multimodal services in Italy and Croatia for part of the service).

As the aim of the pilot is to validate an algorithm capable of comparing routing options, only sample routes have been considered, but in the long run further intermodal nodes and travel legs may be added, in order to make the system more effective.

Improvements envisaged

The PCS Automation - Deliveries Planning pilot has successfully created and tested the DELPLAN application, which could in the future be integreated with and extend Port Community Systems. The Deliveries Planning Technology aims at providing an improved knowledge for operators in

the decision-making process for the shipment routing through comparison of multimodal services in terms of prices, transit times and schedules, matching ITUs requirements/compatibility with the vessel, shipment requirements and Dangerous Goods limitations, while providing re-routing options based on traffic & weather conditions. The full scope of the Deliveries Planning innovation system aims at guiding the operator with an automatic booking process (including Custom Declarations and Dangerous Goods processing), then follows the shipment through a Track&Trace system, giving a real-time updated ETA, and finally provides emission certificates at the end of the journey.

DELPLAN is a standalone application, while in the mid to long term it could be integrated with the existing systems of the Transport Operators and Shipping Companies to provide Realtime services. By doing that, with the help of disseminating the potential of the platform, it will be possible for operators to join the system at a later stage, fully benefiting from the savings provided and starting a process of organizational change, once the automatization of processes will have been given for granted and job roles would have been positively impacted by the system.

The full implementation of the system would allow a radical impact on multimodal deliveries planning, by offering a reliable solution to determine the best route available, at the lowest cost, transit time or emission scale, with the addition of the re-routing part, a key element in the service definition, which in the future would happen in real time with live data updates. The full-scale implementation would mean a wider geographical application of the pilot, with the extension of the coverage from the Adriatic Sea to a wider European environment. The addition of multiple rail routes as well as sea ones, will make possible for shipping companies to use the system for non-accompanied shipments, ITUs based, increasing multimodal ITU shipments across Europe. Extending the number of operators across the multimodal supply chain, terminals, rail operators, MTOs, shipping companies, etc. will grant the increase of the system capabilities and reliability in the routing and re-routing functions, as well as the reporting part.

Another interesting key aspect would be to extend the scope to the last mile planning, i.e. the final leg of the intermodal transport chain, eventually exploring the potential of integration with another pilot action from this project, the WMS4.0.

The table below summarizes key benefits, disadvantages and improvements in various aspects.

Type of Enablers and/or Barriers	Description		
	Benefits	**Disadvantages**	**Improvements**
Financial	- Cost savings to the users, by being able of choosing the cheaper route; - Financial benefit of forecasting in advance the shipment costs, reducing potential losses; - Cost reduction of the emergency service re-planning due to shipment non-compliance.	- Potential disadvantage given by misapplication of special conditions provided by MTOs for usual users; - Different financial conditions, given by several MTOs rather than the usually selected ones.	- Contractualization of the conditions of the MTOs prior to placing their tariffs in the system, may change the system result from "Price Indication" to "Actual Price", with a massive change in the perspective; - Standardization of the financial conditions of the MTOs, by adopting a brokerage approach.
Physical	- Huge reduction of non-productive movements, in	- Potential over-reliance on the system, causing non-productive movements	- Increase of the physical interactions of the system at

	particular at terminals; - Increase of acceptance procedures at terminals, with reduction of queues and boarding times	generated by false or incorrect information; - Potential faults at the terminal gates' systems may disconnect the system operations and generate queues	terminal, with back-up plans; - Increase a block-chain system of approval, in order to reduce false or incorrect information.
Technological	- Potential integration of the algorithm with existing ERP systems; - Massive process reduction, by unifying the booking procedures within a single system.	- The integration with the ERP systems may prove to be difficult and incomplete; - There is the disadvantage of potential system disfunction or down-periods, that may cause delays and non-compliances.	- The ERP integrations should be made on a base of "data exchange" model, rather than a full integration one. This may result in the system to remain stand-alone, giving and receiving a certain set of info from/to the ERP system, while remaining independent. - The potential system disfunctions can be resolved by technical improvements,

			back-ups, cloud based solutions and risk management.
Environmental	- Massive impact on the environment, thanks to emission cutting multimodal routes planning; - Additional benefit given by reduction of the non-productive movements, resulting in lower consumptions of raw materials.	- Emissions' savings may be inaccurate, as the comparison of the actual service is made with potential services that have not been made; - Mistrust on the system may cause the positive impact of the system on the environment to be lower than expected.	- Potential recognition of the system for carbon credits emissions, calculations of the external costs and certification of the emissions savings for corporates' environmental balance.
Political	- Important statistics provided to the government, allowing better long term infrastructural planning; - Better calculation of	- Limits to the usage across Europe in case of partial adoption only by some of the European countries.	- The creation of a statistical dashboard available to some of the key government representatives (es. Ministry of Transport and Infrastructures)

	the bonuses (such as Ferrobonus / Marebonus - European Rail and Sea Incentives) to be given to rail and multimodal users.		will allow a better identification of bottlenecks and infrastructural limitations; - This could be a perfect tool for Rail and Sea incentives calculations across Europe, if the system would be institutionalized; - A pan-European adoption would prove to make the system more effective in long term planning.
Legal	- Contracts can be made directly on the platform, by confirming booking details for multimodal shipments. This would mean contracts to be exchanged at a given price and conditions;	- Contracts exchanges would make the system more like a brokerage platform than a simple information platform, meaning that the system would encounter	- The standardization of the platform could mean both a simplified standard contract for all operators, a standard redistribution of the incentives and more clarity;

	- Legal notices and conditions of service, particularly for sea and rail routes can be better advertised on the platform.	additional competition.	- The system, if institutionalized, can provide all the info required for multimodal services, becoming the ideal base of the multimodal eCMR, a digitalized shipment document, proving that multimodal means of transport have or will be used, an essential function even for police checks at motorways, for weight limits and transit permit of trucks during holidays.
Security & risk	- The system reduces the industry risk, by making compliance checks on	- Safety breach of the system could cause caos and malfunctions across the multimodal	- Multiple checks across the supply chain, as well as a mix of human and computer supported

	weights, gabarits and modules. This way, a case for human mistake can be sensibly lowered, as well as making the compliance checks more effective, increasing the transport safety; - The digitalization of the documents and a system of "hierarchy based" authorization processes, grants more security than the paper-based procedure.	chain. Hackers and viruses are the key enemies on this point; - Over-reliance on the system could also become a risk on the long term, leaving too many calculations only to the algorithm which may prove to be faulty or altered, resulting in accidents.	decision making tools, can avoid the over-reliance on the system; - Blockchain validation process can reduce the risk of safety breaches, while keeping the system on a cloud, reduces the risk of losing data.

4.3 Pilot 3 outputs - Benefits, disadvantages and improvements - Mobile Safety/Security

Explanation of the individual pilot benefits:

The main benefit coming from the pilot system is a significant reduction of evacuation time when one or more escape routes are blocked as observed during the trials onboard the GNV Bridge. The results are briefly described hereinafter.

The sample population during the trials was composed of 37 persons as shown in Figure 1. Most of the sample population was composed of university students since the pandemic situation dramatically reduced the willingness to participate from other stakeholders and private citizens.

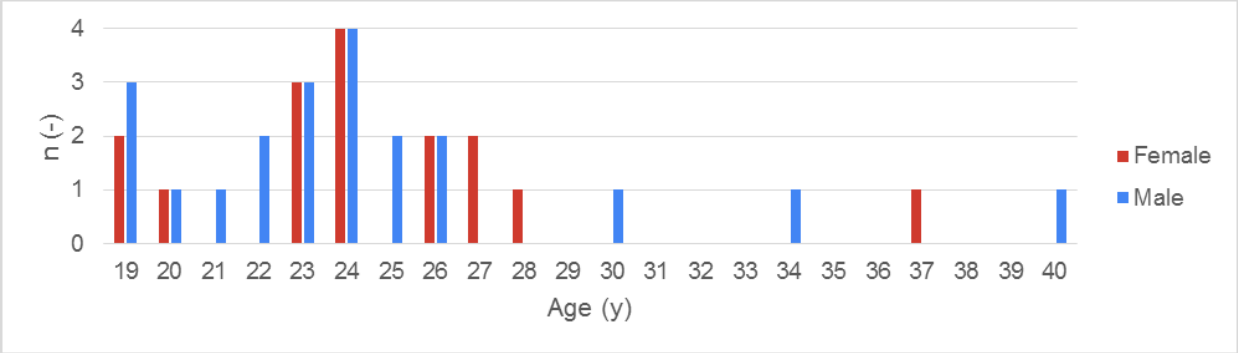


Figure 1 –The area (in red) used during the trials with the doors (FD) that can be closed to simulate the different scenarios

The experimental area has been slightly modified to embrace a wider area compared to the one initially identified in the pilot project plan. Figure 2 shows the updated area equipped with beacons to carry out the experimental campaign. Three possible escape routes were considered using three different staircases.

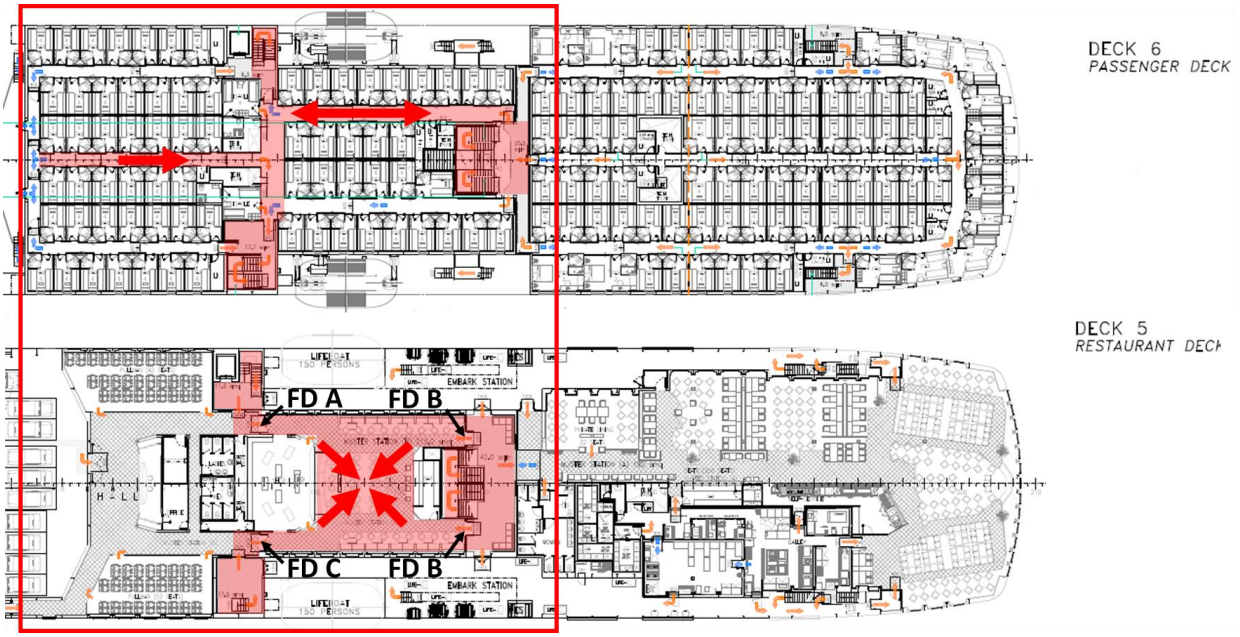


Figure 2 –The area (in red) used during the trials with the doors (FD) that can be closed to simulate the different scenarios

The trials have been carried out in April while the GNV Bridge was under hull maintenance in Trieste. Multiple evacuation runs have been carried out from deck 6 to the assembly station at deck 5. Seven different scenarios were tested to assess the effects of guidance provided by smartbands: one having all the three escape routes available, the others having fire doors blocked at deck 5 to make one or two escape routes no more available. Moreover, the scenarios were tested with and without the active smartband guidance to evaluate the evacuation time reduction due to the developed system. Figure 3 shows all the different signals given by the smartband as presented during the warm up presentation to the sample population. The obtained results are summarized in Table 1. In general, in the scenario where all the escape routes are available (scenario 1) the evacuation time with guidance is slightly higher than the one without guidance. This result was expected, since the population does not know the execution order of the trials and thus consulted the smartbands even in scenario 1. On the other hand, when some escape route is not available, the smartbands guidance had a positive effect being capable to prevent persons to move in the wrong direction and wasting time coming back when a blocked door was reached. An average reduction of 16.9 % was observed. The result is quite

promising, especially considering that some troubles due to the steel-made structure slightly affect the system effectiveness.

Figure 3 – Signals given by the smartband

Table 1 – Results of the experimental campaign

id	FD A	FD B	FD C	duration (s)		diff (s)	diff (%)
				no guide	guide		
01	open	open	open	100.0	105.0	-5.0	-5.00%
02	open	open	blocked	114.5	81.0	33.5	29.26%
03	open	blocked	open	87.0	78.0	9.0	10.34%
04	open	blocked	blocked	124.0	104.0	20.0	16.13%
05	blocked	open	open	96.0	75.0	21.0	21.88%
06	blocked	open	blocked	106.0	103.0	3.0	2.83%
07	blocked	blocked	open	130.0	74.0	56.0	43.08%
mean				**108.2**	**88.6**	**19.6**	**16.93%**

Besides safety, some benefits are connected to the system architecture and the adopted technology. First, all the WEMS TTGO OLED ESP-32 beacons are powered by batteries and thus can assure their functionality during a certain period without any other source of power. Moreover, the adopted beacons are capable to continue providing guidance information even in case of WiFi failure. Hence the system is intrinsically more resilient than one requiring continuous connection to the server through WiFi.

Explanation of the individual pilot disadvantages:

Some technical issues have been encountered during the system installation. Initially, a slightly higher number of beacons was planned to be installed. However, some Bluetooth signal reflection problems were encountered due to the steel-made structure. In general, the installation in the ceiling was not authorised by the shipyard, hence the beacons have been temporarily fixed to handrails. Hence, signal emission was not directed downward but can be reflected by steel bulkheads causing unexpected connections to wrong beacons in some evacuation scenarios, especially in long corridors. Besides, the steel made environment also disturbed the direction indicator which was based on the smartband compass and accelerator.

Moreover, the current system relies on the ship WiFi which is not always available during an emergency. This initial choice was due to the more simple development of the pilot system: relaying on the WiFi limits the need for wiring and makes the system easier to install.

Explanation of the individual pilot improvements:

The reflection related issues have been overcome by keeping the signal strength at a minimum and disabling the sending beacons located in the middle of the fore corridor in some evacuation scenarios. The resulting beacon arrangement is provided in Figure 4. In future system development, it is recommended to install the beacons in the ceiling with a downward primary signal emission direction. To overcome the problems related to the compass, most of the direction indicators have been replaced with fixed location-based instructions. The remaining were tuned case by case. Nevertheless, in future system development compass based indication shall be avoided. Besides, it is advisable to power the main WiFi network hardware with the emergency source of power or alternatively to change beacons type to connect them by wire to the server. Finally, to assure the charging of the beacons' batteries in case of emergency, they should be powered by wires at least during normal operation.

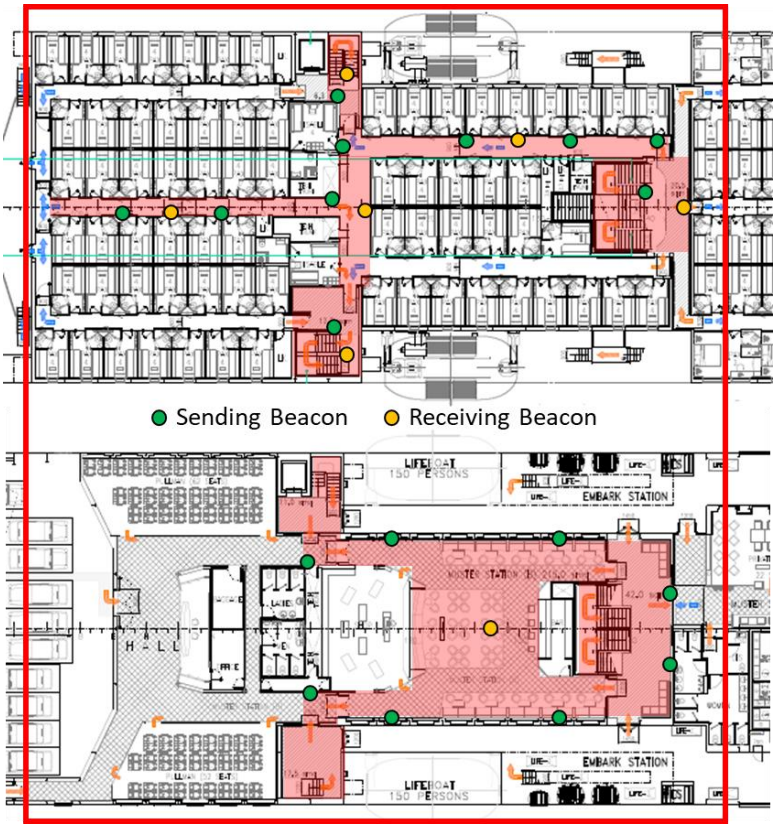


Figure 4 – Signals given by the smartband

Considering the financial point of view, the system requires an initial investment that has no direct return. However, indirect revenues might come from the enhanced corporate image gained with the safety improvement. Besides, other revenues can come from the analysis of the localisation data collected during normal operation or providing additional services to passengers connected to smartbands (e.g. access to cabins, payments, etc.). The integration with commercial features/services is deemed important to assure a financial return as well as to assure the usage of smartbands by the passengers and assure their charging level.

Type of Enablers and/or Barriers	Description		
	Benefits	**Disadvantages**	**Improvements**
Financial	- Possible additional revenues coming from 54nauthorized data analytics - Possible additional revenues coming from additional services based on 54nauthorized	- Additional initial investment costs	- Additional revenues might come from the increased corporate image due to improved passenger safety - To assure financial benefits the system should be integrated with commercial features/services active during normal navigation.
Physical	- All the beacons are provided with batteries that assure their functionality during a limited period without any other source of power.	- Additional hardware and wiring is required - The steel-made environment causes Bluetooth signal reflection problems	- The connection of beacons to a source of power keeping the batteries charged is recommended - To overcome the reflection problems, the

	- The adopted beacons continue providing guidance even in case of WiFi failure	- Compass does not work well in a steel-made environment	number of sending beacons shall be kept as lower as possible - Beacons signal strength shall be kept as low as possible. - Beacons should be installed on the ceiling and emit signals primarily downward - Provide fixed position-based instructions only
Technological	- The adopted system architecture can be easily scaled - The systems can relay on the ship WiFi network	- WiFi network is required also during emergency	- Connect the main hardware of the ship WiFi network to an emergency source of power or assure beacons wire connection to the server
Environmental	- n/a	- n/a	- n/a
Political	- n/a	- n/a	- n/a

Legal	- Ship evacuation can be recorded in the Voyage Data Recorder (VDR)	- Possible privacy issues related to 56nauthorized data	- Maintain 56nauthorized data in anonym form
Security & risk	- The system reduces evacuation time - The system enables lost passenger 56nauthorized - The system might be used to detect 56nauthorized access to restricted areas	- n/a	- Advisable integration with ship access control system (to cabins, restricted areas, etc.)

4.4 Pilot 4 outputs - Benefits, disadvantages and improvements - Application for Data Flows Management

Explanation of the individual pilot benefits

At the moment, traffic oversight in the port area is achieved using standard VTS service that will be upgraded as a consequence of the project.

The technical feasibility of a system does not present a significant risk, as the hardware part of the technology should be readily available, while integration will more of a challenge, and especially in the part of activities related to M2M data exchange with Rijeka Traffic system.

VTS is a service implemented by a Competent Authority, and in this case Port of Rijeka Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service has the capability to interact with the traffic and respond to traffic situations developing in the VTS area, as foreseen by the IMO Resolution A.857(20).

According to IALA VTS Recommendations when, considering the development and implementation of VTS, the Competent / VTS Authority need to decide on the type of service to be provided.

In this sense, VTS can be used as an Information Service, Traffic Organization Service and Navigational Assistance Service.

Objectives and benefits of the VTS system are:

- Vessel traffic management and safety provision in Improved quality of port services and resources utilization
- Greater safety of life and property
- Reduced risk associated with marine operations
- Detection of illegal activity
- Environmental protection
- Distribution of the VTS-related information to interested parties
- Storage of the VTS data for administrative purposes and incident analysis
- Provision of assistance in search and rescue operations and to the coastguard.

Current general configuration of the VTS system is shown in Figure 1.

VTS Control Center configuration

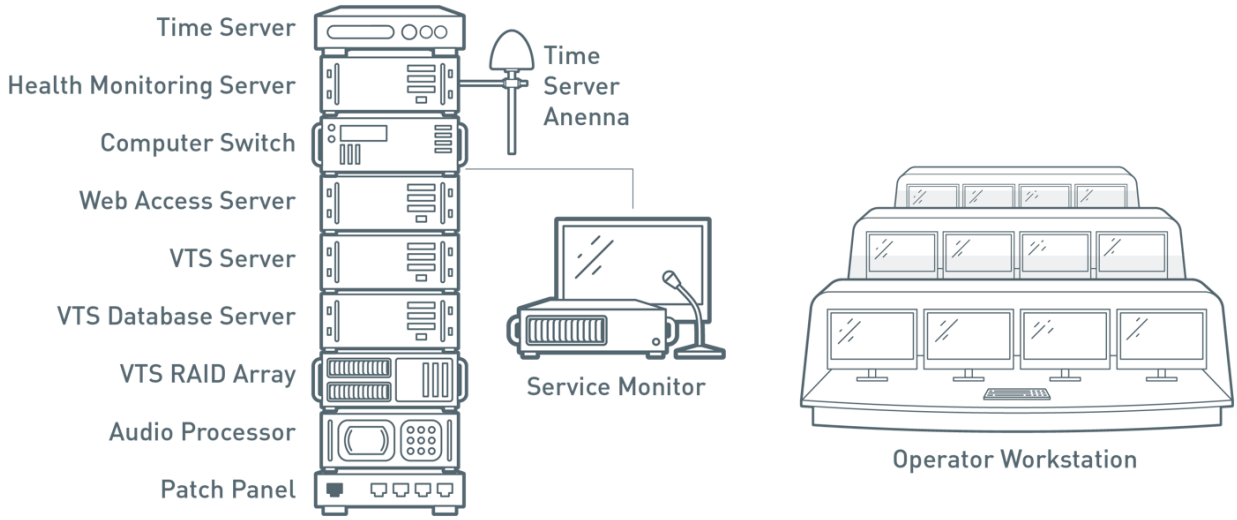


Figure 1: Configuration of the VTS system

VTS system uses the following overlays, or overlay maps, as shown in Figure 2. on the next page.

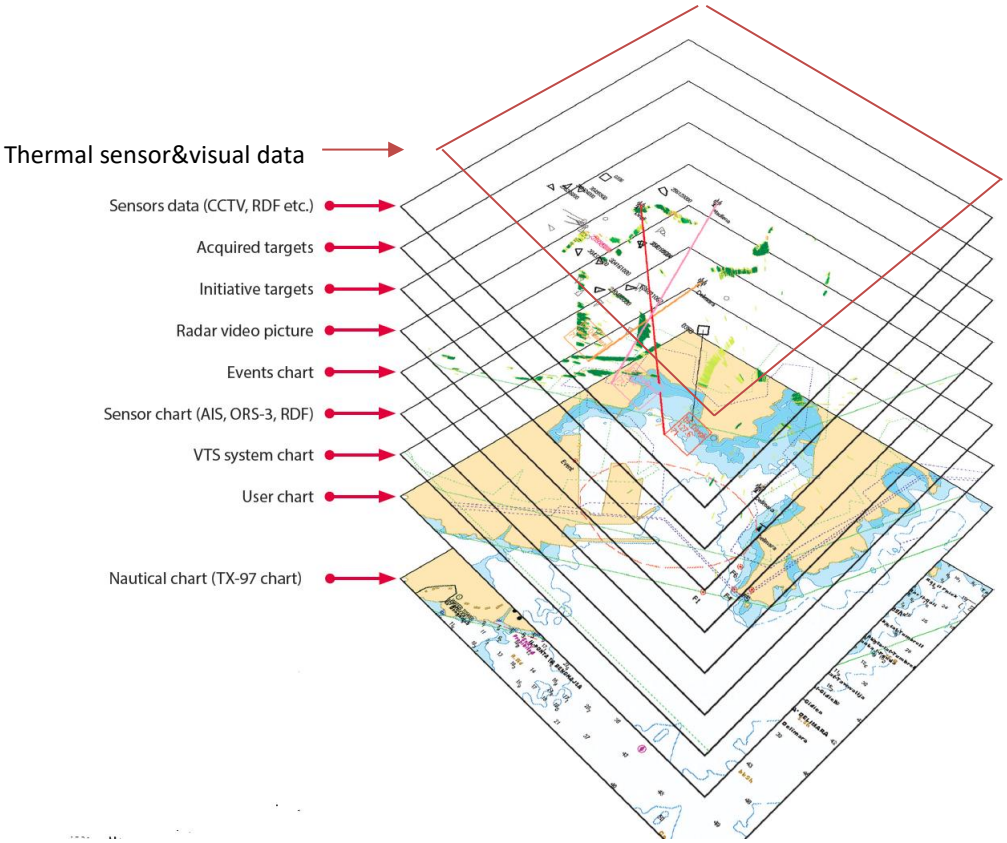


Figure 2: VTS overlays and added-value information

So, as shown in previous Figure 2, execution of the pilot project directly benefits resolution and visibility of objects in the port, by including an additional level of increased resolution, as a direct consequence of the inclusion of new sensing hardware.

Oversight and integration with the Rijeka Traffic system in the segment of the visual feed, is achieved by using a pair of varifocal IP67 IP cameras that will server the data feed using a dedicated switch for further processing and visualisation on the publicly available Web page towards end users (passengers). The benefit is presentation of the maritime traffic information in conjunction with other geospatial data and information to the end passengers, along with timetable, weather information, berths and mooring position and similar. Live production environment of the pilot is placed on the Web page https://pra-diglogs.hr shown in Figure 3.

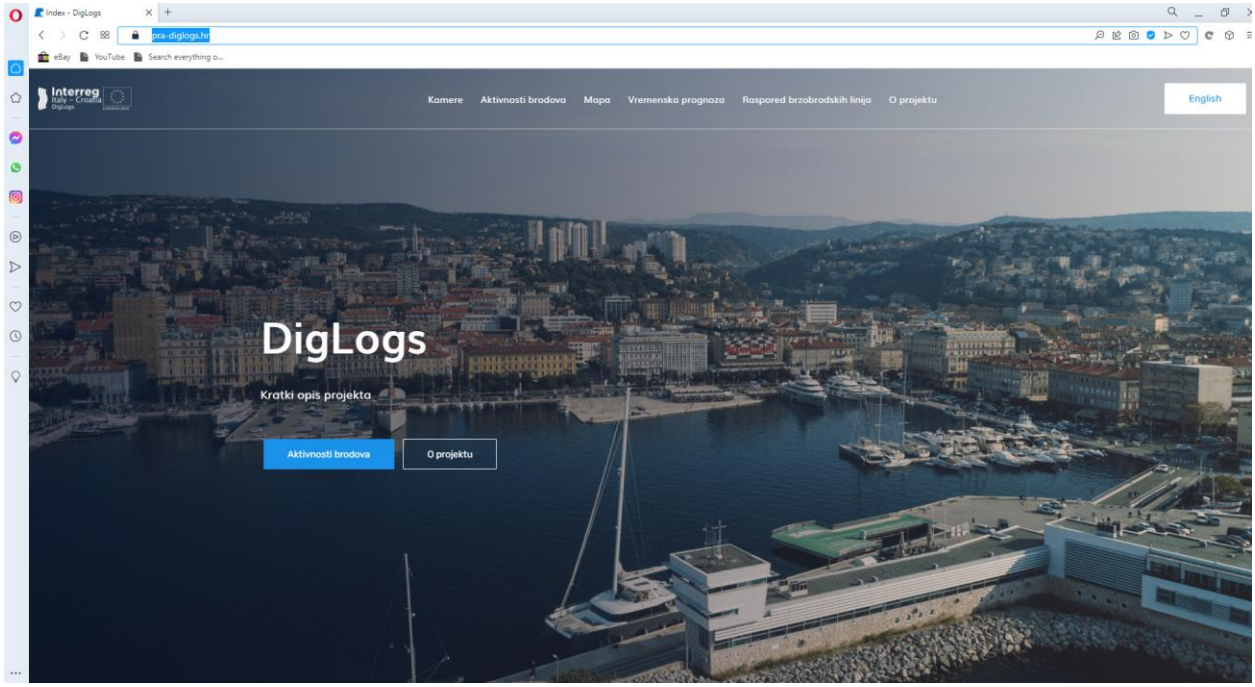


Figure 3: Portal of the DigLogs (passenger part) pilot project

Explanation of the individual pilot disadvantages

There are no particular pilot disadvantages to the pilot project, as it significantly increases passenger security and provides additional information that was not available until the project was completed. However, it is possible to identify certain outflows (not disadvantages) as a consequence of the deployment of new solution. Some time will need to be allocated to maintain the solution, in order to exploit it in the future. This will also require certain financial funds on an annual basis for the ongoing solution maintenance. Furthermore, it is additional solution in the portfolio to be taken care of, increasing overall complexity.

Explanation of the individual pilot improvements

A suitable candidate for the project core selected during preliminary research, and also as a part of previous WP packages, is The Oculus Scout. It is a highly modular, ready to go, compact surveillance solution using video and fixed lens thermal cameras, which is ideal for short to medium range surveillance applications.

The Oculus is a compact, rugged, continuous rotation PTZ camera that has been specifically designed for marine, harsh and challenging environments. With a range of features such as the fixed lens uncooled thermal cameras and low light HD 30:1 zoom day/night video camera make the Oculus Scout a versatile and cost-effective solution.

Improvement upon existing Rijeka Traffic system information, whose data feed is used to present berth and mooring information, is achieved using 8 MP IR Varifocal cameras. As a basis for the development of the end user information panel, internally used Rijeka Traffic software will be used. This business information system utilizes information related to vessels, arrival time, berth, agent and status, and it is used by the Port Control Center to track vessel activity in the area of interest, determine free berths and berth utilization and oversee port control activities.

Camera hardware was installed, tested and calibrated at the designated positions, and the gathered data is stored to a database, feeds are connected, mixed and routed, and displayed using Rijeka Traffic map system data to the end users – passengers on a novel portal dedicated to DigLogs pilot, presenting main pilot project achievement (improvement) visible to end users (passengers).

Similar methodology is expected for integration of the thermal visualization equipment with the existing VTS system. Positive results and improvements in this case are directly exploited by the personnel in charge of Port Traffic Control, and indirectly by all passengers using port traffic services.

Type of Enablers and/or Barriers	Description		
	Benefits	Disadvantages	Improvements
Financial	- transferred financial effects to end users (passengers), avoidance of costs caused by being late due to lack of information - avoidance of cost caused by accidents with smaller area vessels	- additional financial amount will have to be reserved annually for updating and maintenance of the new system	- increased resolution of local VTS system - increased level of information on the side of passengers using port services
Physical	- equipment can be installed in locations that are already used for VTS equipment	- added complexity	- n/a
Technological	- modern and digital solution that is more acceptable for end users and stakeholders	- one more solution to maintain as a part of IT/sensing portfolio	- new process based on digitalization, for both parts of the pilot

Environmental	- avoidance of spills tentatively caused by collisions with smaller vessels	- n/a	- no spill dispersing agents have to be used
Political	- perception of Port of Rijeka Authority as a technological leader adopting latest digital solutions and opening up data to general public	- n/a	- n/a
Legal	- better adherence to ISPS rules	- n/a	- transparency for the PFSO
Security & risk	- increased security enhances ISPS - streamlines PFSO activities - transfer effect to the end users (passengers)	- n/a	- increased security for the passengers - increased security for passenger vessels

4.5 Pilot 5 outputs - Benefits, disadvantages and improvements - Innovative solution for Access Control

Explanation of the individual pilot benefits

Physical cards at the moment can be divided into several categories: (continued on the next page)

1. **Red colour**
   - Employees of Port of Šibenik Authority
   - Internal security personnel
   - External security personnel (vigilance)
   - State employees (police officers, Customs officers, employees of Harbourmaster's office, employees of the State inspectorate)
2. **Blue colour**
   - Concessionaires using port infrastructure and superstructure
   - Concessionaires not using port infrastructure and superstructure
   - Ship agents, with previous permit for work
   - Shipping agencies in the area of port of Šibenik
   - Cargo agents
   - Subcontractors of the concessionaires
3. **Light grey colour** – temporary vendors and contractors
4. **Green colour**
   - Visitors
   - Commercial activity parties (recording of marketing materials, documentaries or TV shows)

ID cards according to the applicable Regulation are furthermore divided into three top-level categories:

1. Permanent
2. Temporary Daily
3. Predetermined duration

The process is not presently digitalized and there is no connection whatsoever with other IT systems. Issuing and tracking relies on manual procedures. Also, no systematic analysis is possible, including statistics, cross-referencing and data import or export for categories of users other than those accessing port areas using cargo vehicles.

This lack of complete informatization of access control process can be identified as an evident bottleneck, and especially in relation to ISPS requirements and port security procedures.

Entry and exit terminals, are to be designated as positions where the ID cards are checked in order to allow entry that are identified. Initially and within DigLogs scope, they include locations (entry to quays and terminals) that are mostly affected by the flow of the passenger traffic.

Analysis shows that **deployment of a modern, innovative digital access control and preparation** for full integration of access control system with the new, future PCS, whose deployment is imminent, as it is steered by the Ministry, is critical at the moment of pilot action analysis and proposal, especially considering lack of funding and no funds anticipated at the PCS side to cover aforementioned functionalities.

Direct project advantages are represented in increased levels of security, data transparency for all stakeholders and especially PFSO and the Ministry of Interior, enables timely mass processing of permit issuance, increased financial revenue stream from faster permit processing, better representation of Port of Šibenik Authority as a leader in digital transformation and increased user experience for the stakeholders from project target groups.

Explanation of the individual pilot disadvantages

There are no particular pilot disadvantages as it digitalizes a process that was previously manually processed and incurs savings in time and money while attracting additional revenue. However, it is possible to identify certain outflows (not disadvantages) as a consequence of the deployment of new solution. Some time will need to be allocated to maintain the solution, in order to exploit it in the future. This will also require certain financial funds on an annual basis for the ongoing

solution maintenance. The solution is developed as on-premises solution, which diminishes its scalability and to a degree, level of business continuity. Furthermore, it is additional solution in the portfolio to be taken care of, increasing overall complexity.

Explanation of the individual pilot improvements

Basic motivation to build the system is digitalization of the demand request and access permits for the passenger side of Port of Šibenik. Permits therefore become digital products whose status can be checked from any physical place using tools embedded in the system. In order to make the system automatic, every access permit will have a unique identification code (for example, QR code) that will be embedded and enable cross-checking with other data from the permit. Content of the QR code is hash string derived using ID-number encrypting by SHA-x methodology. Full digitalization should ensure traceability and follow up to every request for permit issuing. Digitalization will enable additional functions for better traffic management and tracing port resources and increase general level of security. End users will gain higher service levels and lowered levels of stress, as they will be able to perform all these actions in advance and remotely.

Basic improvement of the system is on-line work. It included dislocated, centralized and unique database with remote access in real time. Database is the only location for data storage and interexchange in the system.

Communication with the database is achieved using web services that are a part of a broader application layer. Local applications, portable applications and the Web communication with the database using only web services.

This type of solution enables good **overview of the system operations**, protects data and raises level of system availability. It ensures required SLA (Service Level Agreement) levels. This solution requires a quality local IT infrastructure (LAN and web access with low latency levels).

The system includes the following **elements**:

1. *E-mail and SMS notification* subsystems following the highest standards and guaranteeing

user reach inland and abroad,

2. *Payment gateway* for credit card payment on the web for domestic and foreign users,
3. *Interface* towards *ingress and egress equipment* (terminals); data acceptance and transfer *towards equipment at the control points and other defined or random locations inside the area of remit of the Port of Šibenik. Basic records are "ingress/egress" and "check"*

Basic envisaged way to issue permit cards for the port access will be achieved using **Web client**. This is going to be a public and permanently accessible multi-language web page (anticipated languages are Croatian and English languages) based on a web-shop principle.

PC application is used as a stationary register and back-end reporting and oversight component. Central PC application is used to sell all products envisaged as a part of the project, fulfil all requirements of all user categories and pay for the product and activate or deactivate them. For those user categories that need more permanent ID pass cards, there is an option to issue RFID cards.

Basic **sale channel** for ID cards is the Web. Advantage of the PC application is ability of the person in charge to intervene in case of need, there is no need to create user account (this activity is transferred to the user) and there is oversight of all business processes and phases. Large portion of the application is the reporting part. It is possible to determine roles and access rules to the application server. Laser printing of the reports and bills and ID cards is supported.

PC application for the police is a derivative of the base PC application that has a single basic function which is overview and processing of the created requests for access to the port area. Police employee or security designated person can deny access without changing the requests. Comment can be entered. There are basic reporting functions envisaged to view requests that have been cancelled ex posts – in order to check the work of the police and security officers. Police officer is a special dedicated class of the user representing him/herself using ID badge number.

The technology of the request acceptance and approval is similar to that used in the communal traffic vigilance.

Type of Enablers and/or Barriers	Description		
	Benefits	Disadvantages	Improvements
Financial	- unified solution - expected increase in revenue from permits	- additional financial amount will have to be reserved annually for updating and maintenance of the new system	- additional revenue can be re-routed towards new digitalization efforts
Physical	- no need for physical equipment for manual permit issuing	- added complexity - one more solution to maintain as a part of IT portfolio	- n/a
Technological	- modern and digital solution that is more acceptable for end users and stakeholders	- the solution is not fully flexible and scalable as it is delivered on-premises	- new process digitalization, previous process was manual
Environmental	- digitalization of existing physical administrational procedure	- n/a	- paper savings, savings of time and consequentially GHG emissions savings

Political	- perception of Port of Šibenik Authority as a technological leader adopting latest digital solution	- n/a	- n/a
Legal	- better adherence to ISPS rules - better overview for the Ministry of the Interior	- n/a	- transparency for the PFSO - faster processing for the Ministry of the Interior
Security & risk	- increased security enhances ISPS - streamlines PFSO activities - transfer effect to the Ministry of Interior that is also involved in the process	- digital systems are inherently less secure than paper-based processes as they can be accessed remotely in unauthorized manner	- increased traceability - better overview - enhanced reporting

4.6 Pilot 6 outputs - Benefits, disadvantages and improvements - M2M Dialogue

Explanation of the individual pilot benefits

As the Marina Master software solution offers a good number of implementable modules covering the whole spectrum of port and marinas business processes, the choice had to be narrowed down to the modules that suit best the Rovinj port's needs. Rovinj, as one of the most perspective ports in the Adriatic region, famous by its attractiveness to yacht and cruise ship clientele. The number of dockings was in general uptrend over the last decade excluding year 2020. which was stigmatized by the still present pandemic scenario, even during which the numbers did not drop significantly except in the field of cruising industry which was halted around the globe.

The application software enables mooring reservation system, graphic mooring occupancy management, billing via mobile application, creating daily, monthly and annual reports, generating mooring contracts, automatic invoicing, CRM-Integrated Email System, accounting, paying invoices and automated importing of bank statements. All these features come with a built-in feedback posting generating timely statements and producing graphic and numeric statistical information.

Modules chosen by the Port of Rovinj Authority encompassed the contract generating feature, graphical and visual representation of berth occupancy, preparation of official notes and complaints as well as facilitated way of reservations and ship announcements entries.

As far as the procured hardware, printers were properly adjusted and set to go, being fully functional since then. Implementation of software solution is currently still in progress as the necessary bugs and tweaks have to be resolved on the fly and as the time progresses and new situations occur. The solution now successfully hosts all the port areas which needed to be entered into the system.

Figure 1. Aerial visualization of port areas under the management of Rovinj Port Authority

Rovinj Port Authority's area encompasses 9 berthing and 4 anchoring locations thus requiring a technological solution capable of handling multitude of scenarios while ensuring margin for error becomes non-existent. The sheer number of possible situations required a technologically advanced and extensively developed program which in turn had to facilitate the existing business processes conducted by Rovinj Port Authority.

Usual nautical port's performance indicators revolve around number of "served" vessels, which in this case and in this global scenario is not relevant or admissible.

Real use-case performance indicators refer to the level of system automation, shorter time needed to perform simple tasks such as invoicing or billing, simplification and facilitation of mooring reservation procedures, accommodation to digital era requirements. All the above mentioned parameters must be listed into the equation before concluding and judging if a technological solution brought ease to the existing processes or was it unnecessary and impractical.

Explanation of the individual pilot disadvantages

Speaking of disadvantages, few parameters have to be taken into consideration. Acquisition of the hardware equipment and software solutions were brought in and implemented without any kind of major inconveniences mostly due to the fact that Marina Master is a turn-key solution whose features must be adapted to the existing system in the port.

Database of the existing system served as a collection of necessary inputs needed for successful start of the implementation and no difficulties were presented there, however, integration and transition from the existing PCS required functionality of all the segments in order for business to continue flawlessly. Cash transactions as a major part of the business conduct in any institution turned out to be in perfect working order where the only inconveniences occurred with display features, but the system developers are working on resolving the issue.

The billing process is also fully functional with only minor changes made to the appearance of the account. However, the problem is the steps required to issue an invoice. It is necessary to enter the customer (name, surname, address, OIB (personal identification number) and the vessel specifications (name, length, flag) in different interfaces for each vessel at berth (transit), which in the field conditions (sea, waves, sun) presents a slight problem for employees. So far, the process of billing required entering only the basic information such as name of the vessel, length and length of stay... The developers together with Port of Rovinj Authority's employees are working on simplification of the procedure.

One of the key issues beforehand entering this pilot testing was regarding the complexity of not having an integrated accounting service within the existing Port community system. Absence of a general ledger currently presents an obstruction in the way of system deployment in full. The purpose of general ledger has to be capable of accepting the exports of journal entries from the system.

Cash register and invoicing are fully functional with minor work underway for the connection to the e-invoice system where the difficulties occur when exporting the aggregate orders for payment of invoices through the bank.

Explanation of the individual pilot improvements:

In order to gain possession of a fully working compatible product, expectations have to be real and shouldn't be sought after in turn-key solution due to the fact that each (port in this case) has a unique way of business conduct and each externally implemented solution has to be able to fully customize its performance to meet the existing requirements.

As none of the systems are completely the same, it is not realistic to expect that the acquired solution is capable of integrating within the system and take the workload of the systems that were currently carrying the port's business process. Customization and modularity are a prerequisite for any solutions that seeks to be a new backbone of any system. Here we have a situation where the operational and accounting parts of the business where not unified under one solution which made a situation slightly more difficult for Marina Master. Lot of customization, tweaks and further developing is required to arrive in a position where the working product can be fully deployed. It is common knowledge that this process can be really time-extensive and often costly.

Each disadvantage listed above this paragraph that was encountered during the project pilot implementation has been resolved in a way that it behaves in a way that is sufficient for further use, but as stated before, updates and tweaks have to be regularly performed throughout the trial basis so any kind of unexpected situation can be adequately taken care off.

Marina Master is a great umbrella solution which offers a variety of features that elevate the port's performance levels in all of the business aspects, but it is unrealistic to expect that in a such short period every segment of port's business has been adjusted into the system's performance capabilities.

Type of Enablers and/or Barriers	Description		
	Benefits	Disadvantages	Improvements
Financial	- unified solution / no need for multitude of system providing solutions	- regular updateing and maintenance of the system	- /
Physical	- /	- more hardware	- /
Technological	- modern and digitally more acceptable	- /	- /
Environmental	- digitalization of existing physical administrational procedure	- /	- complete transition to paperless community
Political	- n/a	- n/a	- n/a
Legal	- n/a	- n/a	- n/a
Security & risk	- customer support availability 24/7	- /	- /

4.7 Pilot 7 outputs - Benefits, disadvantages and improvements - Spatial Data Management System

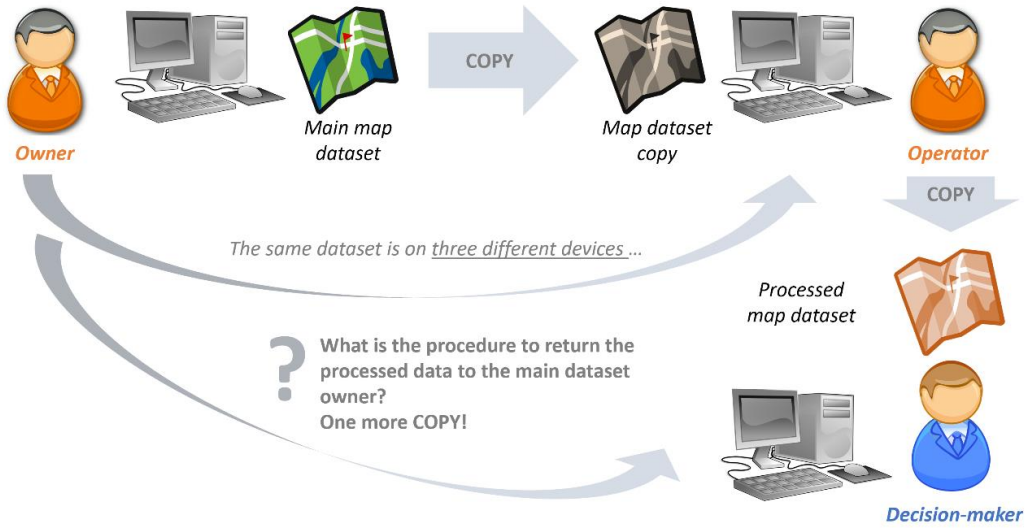
Explanation of the individual pilot benefits

The pilot action is to be implemented in the context of the North Adriatic Sea Port Authority and it regards the adoption of a centralized and interoperable spatial data repository aimed at giving a robust structure to the information and data used within the internal processes and to provide services to external operators and institutions.

The innovation is aimed at obtaining the best results from integrating different data sources in terms of added value in knowledge and management capability. Within this broader context, the specific objective of the pilot action is to enable an integrated management and utilization of standard data, real time data and georeferenced (spatial) data both to support decision making processes and improve Port Authority services overall quality.

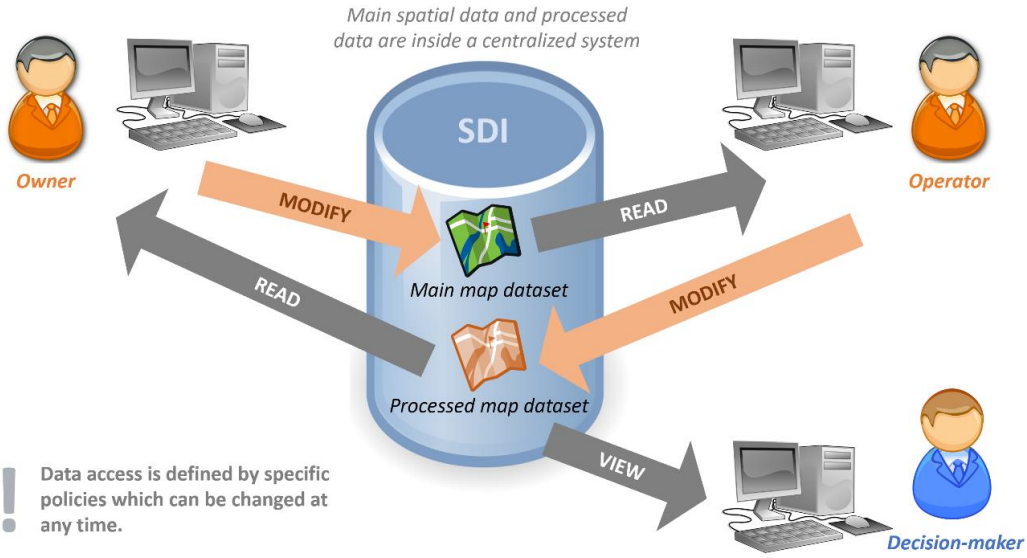
The pilot action is mainly aimed at making a transition from a current situation in which data is ineffectively managed and used to an improved condition in which more different data can be integrated and dynamically accessed by several users according to different policies and objectives without replication and corruption.

In the current situation of the Port Authority, the decision-making support based on the use of spatial data is provided copying several times the main datasets and the processed datasets, due to the utilization of different storage systems and processing techniques within the same organizational context.

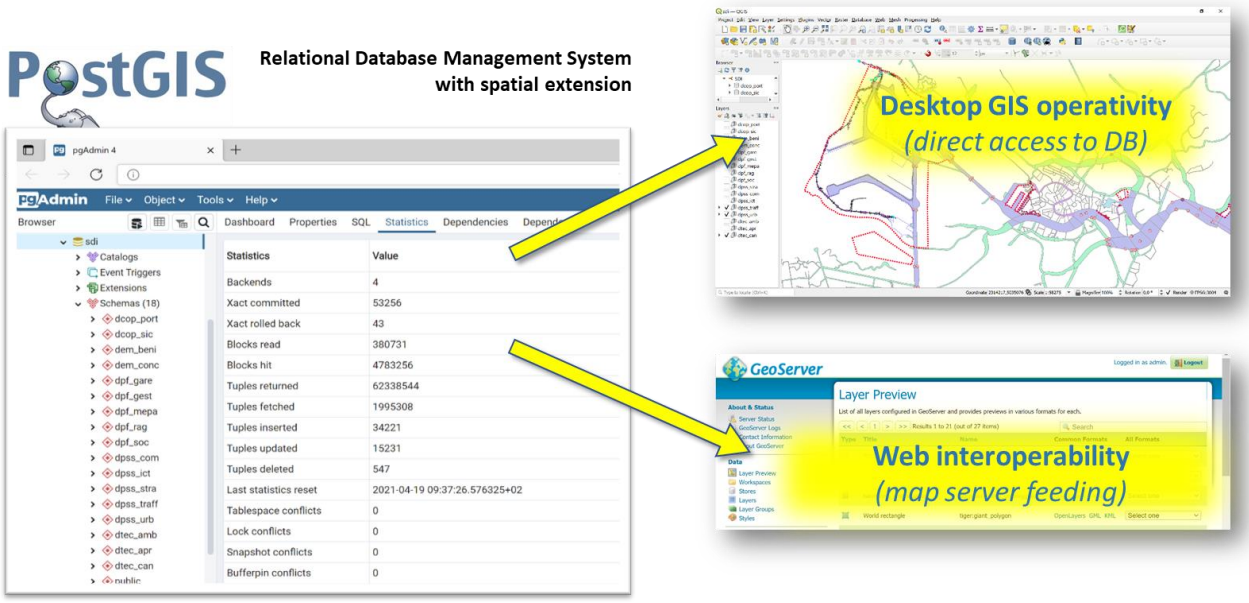


This makes difficult both to keep dataset up-to-date and share it in an effective way, and it significantly reduces processes performance.

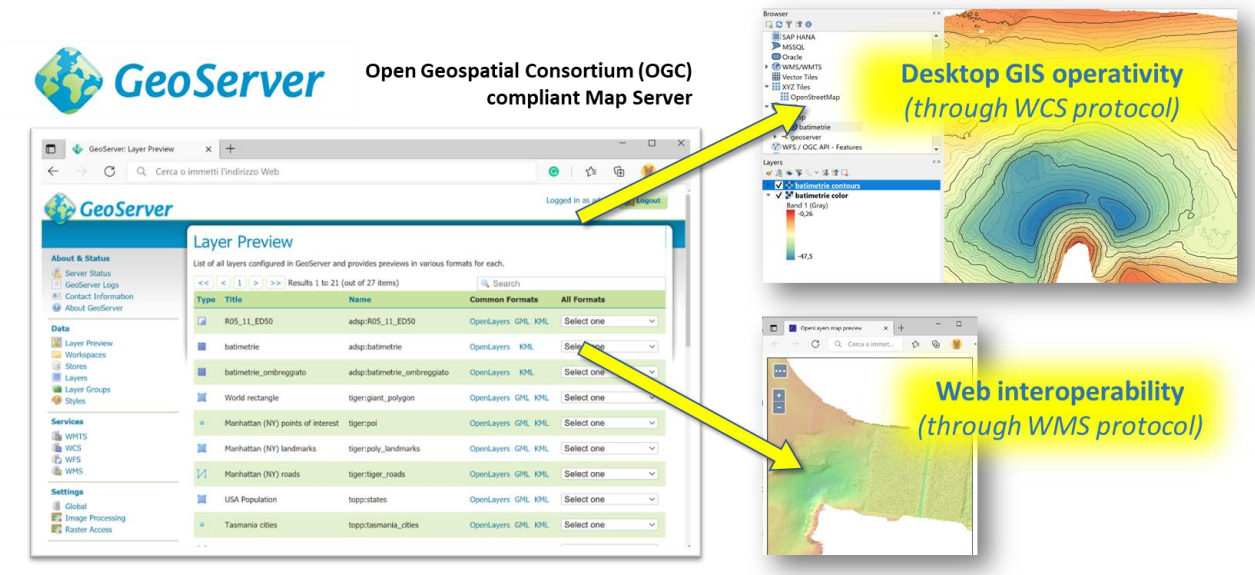
In the improved scenario, a Spatial Data Infrastructure, crafted by integrating existing tools and platforms, will be adopted.



It will perform both the storage and dynamic processing functions, making different users able to directly access data and processing results and visualization according to a special policy management protocol. This Spatial Data Management System will allow to store the processed data and maps either as new datasets or as algorithms that process data in real time, without forcing operators to change the already known working tools.



Spatial Data Infrastructure: vector data sources segment



Spatial Data Infrastructure: raster data sources segment

The SDI uses two open-source server-side interoperable applications and it doesn't need any other software development; indeed, interoperability allows users to keep most of the already used client tools to access and process data. In this scenario, the pilot action is based on a "training-empowered" approach that allow to achieve both organizational and workforce skill improvement, fostering the awareness on how spatial data visualization and dynamic data processing can support decision-making process.

Explanation of the individual pilot disadvantages

The chosen approach is of the bottom-up type, which, unlike the top-down one, significantly reduces the risk of project failure. However, this type of strategy requires longer times to achieve the objectives, therefore, it significantly lengthens the time required to carry out the entire project.

For the creation of a Spatial Data Infrastructure (SDI) within a complex organization, it is mainly necessary to make employees and managers understand that to implement this kind of digital innovation is not recommended purchasing new hardware and software tools; instead, it is more

effective investing in organization improvement, increase of skills and on data quality. To achieve this awareness, it is usually necessary to organize several meetings and seminars for small groups of people, during which to show the methods and the results that can be obtained.

The "training-empowered" approach used in this pilot includes additional activities in which employees and managers of the organization must participate. This is very difficult to carry out as people usually have an agenda already filled by all their routine activities. It is necessary to plan the training activities with great care, inserting them within all the other staff activities, trying to make people understand the benefits that can be obtained from the new tools by applying them directly to the work processes.

The Spatial Data Infrastructure gives users direct access to the Database Management System; therefore, access privileges must be established at database level instead of at the application level. This approach can generate distrust and resistance from the IT operators, which are in most cases used to managing accounts through a special protocol and preventing users to directly access to databases. It is necessary to explain very well to IT technicians that, in the case of SDI, the database system replaces the old data repositories such as network folders and redundant services in order to centralize the information asset.

Explanation of the individual pilot improvements

The individual pilot improvements are the essence of the Transferability plan. This part includes measures and strategies needed to be deployed in order to reach the benefits and minimize disadvantages, as well as operative indications and a basic summarized roadmap that shows the sequence of the tasks to be carred-out in order to better achieve objectives, benefits, and the full potential of the pilot.

The pilot project planning can be more effectively carried out if any documentation relating to in-use data, tools and processes has been recently produced. It is therefore recommended to collect any existing reports about state-of-the-art assessment activities of the data-driven tools and methodologies used within the decision-making processes.

Venice Port Authority 2018 assessment report key values

The pilot action for Venice is based on a strategy centered on raising the level of competence of the staff within the institution; indeed, the know-how and skills owned by both technical staff and managers are very important as a key factor for the optimal use of IT systems. In this regard, one of the main elements of the project are those actions aimed at actively involving staff in data optimization and training activities, since the success of this kind of projects is related to the amount of people that join the proposed activities.

In involving staff in implementation and training activities, you can choose between a top-down approach, based on sharing a large-scale project with the different departments, or else a bottom-up approach in which the initiative is carried on by a department and gradually extended involving others one by one. Most likely the bottom-up approach ensures a greater chance of success, but it significantly extends the lead time.

In the bottom-up approach, the early version of the system can be used as a kind of "demo" application which can be highly useful and effective in engaging the different actors. Indeed, the application is perceived as real and functioning, and helps to overcome situations of distrust and resistance by the operators.

The system, even in its earlyest version, must be used as a real training tool which, especially in the training-on-the-job format, allows to gradually introduce operators to the use of the system and at the same time to optimize existing datasets by reducing errors and redundancies. In this way, the new tools are gradually introduced into the workflow bringing process innovation.

In addition to the training activities for operational staff, planning special training for managers and decision makers is a strong key factor, as they have the strategic vision of those processes that can benefit from data-driven tools and they can more effectively guide technicians in processing data, analyze results and create effective visualization and communication outputs.

The basic implementation roadmap can be summarized as follows:

- Main pilot planning
  - Hardware/Software requirements definition
  - Definition of the dataset package to be optimized ad migrated into the infrastructure
  - Project workgroup definition
  - Work plan and training program definition
- Hardware/Software installation
- Optimization, migration, and training activities start (to carry on in parallel)
- Documentation and user guide drafting (in parallel with migration and training)
- Middle way working test
- Middle way demo to operators, managers and/or other departments (one or more)
- Middle way internal presentation event
- Optimization, migration, and training activities prosecution (to carry on in parallel)
- Documentation and user guide completion
- Mid-term development plan definition
- Final internal and public presentations

Type of Enablers and/or Barriers	Description		
	Benefits	Disadvantages	Improvements
Financial	- Possible reduction of software tools and future consultancy costs	- Project external experts' costs	- Reduced needs of additional technology tools and consultancy
Physical	- n/a	- n/a	- n/a
Technological	- Centralized spatial database - Web oriented standard data publishing system	- Need of a low-level database account management	- Dynamic data processing tools
Environmental	- Increase in use of digital dat visualization tools can reduce paper document production	- n/a	- Possible paper document reduction
Political	- More data sharing opportunities can ease institutional cooperation - Better transparency	- n/a	- Increased efficiency in cooperation between institutions and communication with stakeholders

Legal	- Open Data approaches	- Possible privacy issues related to data sharing	- Increased compliance with data sharing and openness directives
Security & risk	- Planning and programming errors reduction thanks to more reliable data	- Possible cyber security issues	- Increased planning and programming reliability

5. Implementation

The following subchapters contain the current details of individual pilot implementation.

5.1. Pilot 1 implementation - WMS 4.0 – Dry Port Case Study

WMS4.0 is currently in its last stage of development and delivery of the DSS; although some internal delays were generated due to unexpected events, it is foreseen that the delivery of the final pilot project will be at the end of October 2021, which will not comprise or obstruct the regular implementation of tasks in other areas of the Diglogs project.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value
1.	**Completed project work plan**	COMPLETED	Project Partner	Accepted pilot work plan by all PPs	1
2.	**Written draft of the technical-functional specification**	COMPLETED	Project Partner	Written full technical-functional specification	1
3.	**Public procurement (tendering) documentation**	COMPLETED	Project Partner	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	100%
4.	**Received commercial offers**	COMPLETED	External consultant	Received commercial offer(s) / Total number of offer(s) to be received	100%

5.	**Evaluation of offers completed and best offers selected**	COMPLETED	Project Partner	Best offer(s) selected	1
6.	**Awarded equipment purchase contracts (if applicable)**	Not expected	External consultant or Project Partner, Vendor	Awarded purchase equipment contracts	n.a.
7.	**Awarded integration and/or development services contracts**	COMPLETED	Project Partner	Awarded integration and/or development services contracts	1
8.	**Equipment delivered and installed (if applicable)**	IN PROGRESS	External consultant	All equipment installed	1
9.	**Integration and/or development services delivered and completed (if applicable)**	IN PROGRESS	External consultant	All integration and/or development services completed	1
10.	**UAT testing**	IN PROGRESS	External consultant	Number of successful tests / Total number of required tests	100%
11.	**Full system functional (pilot development completed)**	IN PROGRESS	External consultant	One complete pilot project successful	100%
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	IN PROGRESS	Project Partner	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	100%

13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	IN PROGRESS	Project Partner	Percentage of available funds from the budget (Application Form) – only HW, SW and integration	100%
14.	**Number of secondary affected ICT systems as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one secondary ICT system affected as a consequence of the pilot execution	100%
15.	**Number of improved internal processes as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one internal process directly benefitting from the pilot execution	100%
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	100%
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	YES

19.	**Directly or indirectly lowered GHG emissions as a direct result of pilot execution**	IN PROGRESS	Project Partner	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	YES
20.	**Timely submitted pilot action completion/closeout reports**	IN PROGRESS	Project Partner	Timely reporting on pilot action completion/closeout	YES

5.2. Pilot 2 implementation – Deliveries Planning

The DelPlan pilot is under a step-wise implementation process. 4 main steps were identified, the P1 related to Pilot Planning & Control, the P2 related to Technical Development, the P3 related to the Configuration and Testing activities, with P4 as Final Testing.

P1, related to the Pilot Planning & Control Activities has been completed, following a regular schedule:

- The Pilot Concept Drafting activity has been completed by Polo Inoltra by following the research workflow and considering the stakeholders expectations;

- The Pilot Functional Design has been completed with the help of Actual IT, defining the potential software capabilities in relation to the proposed functions;

- The Pilot Work Plan has taken into account the previous two points and it has allowed to define a pilot timescale for the implementation of the various activities.

P1 has respected the estimated deadlines, with the actual completion in Feb 2021.

In relation to **P2**, the Technical Development of the pilot action, starting from a draft Technical Functional Specification, it was possible to define the following pilot parts:

Input Process:

User-data input process has been defined per category, with data-sets based on the shipment and further choices in relation to the ITU. Once the routing process has been set, the system allows further inputs in relation to the re-routing of the shipment.

Output Process

The system output is related to the different multimodal options available for the user and after the routing selection process the system provides the user with the shipment monitoring and the eventual system calculations for re-routing.

Backend Solution

The backend solution allows the system administrator to monitor the status of the system, evaluate the options chosen by the user and to intervene in case of non-conformity.

Track&Trace, Traffic&Weather and RT Modules

In terms of Track&Trace, a checkpoint system based on test-user activation has been applied. For Traffic&Weather a system-admin induced lab-based event system will be used during the pilot testing in order to simulate random event of a real-life implementation scenario. RT modules will be therefore lab-simulated, though the system will react to the unexpected circumstances by offering re-routing options or a new ETA for the shipment, depending on the consequences the unexpected event had on the planned routing.

Re-routing Parameters checklist

Re-routing activities will be based on the user decisions based on the lab-simulated track&trace (checkpoints) and traffic&weather (lab simulated by system-admin) situations. The user will be informed about the shipment non-compliance and will be offered either facultative or compulsory re-routing options (being the compulsory options shown only in case of long-delays making the originally selected routing option unavailable for service prosecution).

Frontend Solution

The frontend solution is related to the main system interface, guiding the user throughout the shipment management & reporting. It has been chosen a user-friendly interface, with clear indications for the routing in terms of transport modality and multivariable ranking options.

P2 has respected the estimated deadlines, with the actual completion in May 2021.

P3, related to the pilot configuration & internal testing activities, is currently ongoing, with tests being currently made on the first pilot prototype on the routing activities, while the re-routing part is under construction.

P3 is following a progressive construction and test method, based on each system variable:

Variables/Set of data checklist

In order for the pilot to function, it was essential to insert some real data in relation to each infrastructure node, travel leg, ITU and transport modality.

In particular, set of potential ITUs were identified, with several lengths (20'-45'), typology (containers, swap bodies, semitrailers), structure (standard, HC, bulk, tank, open top, etc.), EN13044 standards for semitrailers (gabarit profile and wagon compatibility, to be used for intermodal shipments across different transport modalities (road, rail, sea), making use of pre-defined travel legs (a selection of sea and rail routes across Central and Northern Italy, and Croatia, between Italian and Croatian ports for the sea routes while inland routes for the rail part), each with assigned infrastructure node (inland terminals & ports) and mean of transport (actual vessels were assigned to both RoRo and container services between ports, while actual wagons, typology 60', 80', 90', pocket wagons T3000 and MF wagons, were assigned to the rail travel legs).

The set of data was prepared by Polo Inoltra and validated by Actual IT, that included the set of data in the main system algorithm.

Booking & Transport Orders Pilot Function Configuration

User-data input process for the Booking & Transport Order has been defined per category, with the main data source being start and end point of a shipment (on this point for the first and last mile of the intermodal service it has been decided to use a province-based system across Italy and Croatia), ETD and ETA of service with requested Transit Time for the shipment, maximum cost for the shipment and maximum emission category.

ITUs Pilot Function Configuration

Expanding the functionalities of the pilot, it is possible for the user to either select an intermodal shipment routing based on a pre-defined ITUs (e.g. from Split to Milan with a 40' HC container) or to ask the system which ITUs should be used to obtain the best transit time, cost or emission range with an open-selection of the ITUs available. The system will then generate all the routing options per each ITU type, leaving to the user the task to select the preferred routing option.

Travel Sections & Nodes Pilot Function Configuration

A total of 14 nodes were identified in relation to ports and inland terminals, with 16 different travel legs of the rail and sea modality were defined, from a selection of existing and lab-created services.

In addition to what mentioned above, related only to rail and sea routes, there is the possibility for the system to include the road travel legs across any of the 14 nodes and from any province of Italy and Croatia towards any travel node. This way, the road modality is used to fill eventual gaps in the shipment routing and to allow the user to select a first and last mile by road, connecting a factory or a warehouse to the main travel nodes.

Vessels, Ports and Terminal Pilot Function Configuration

A total of 12 actual vessels were included in the system, each with a different assigned travel leg, service type (RoRo, container, bulk etc.), vessel GT, vessel DWT, draught and emission class. The data is actual and it has been obtained by the official registry.

A total of 5 ports and inland terminals were selected, all existing in real-life, and per each infrastructure it has been assigned a working schedule, with DG restrictions, storage and THC fees, reach stacker working hours and terminal opening hours.

Train, Stations and Rail Terminals Pilot Function Configuration

A total of 9 inland terminals and rail stations were selected, all existing in real-life, and per each infrastructure it has been assigned a working schedule, with DG restrictions, storage and THC fees, reach stacker working hours and terminal opening hours.

Re-routing parameters Pilot Function Configuration

Re-routing parameters are currently under construction, as well as the whole re-routing system interface. The construction activity is progressing fine, with the expectation to meet the milestone deadline.

P3 is currently ongoing, with final intervention that are being made on the Travel Section configuration, in order to make sure that the algorithm can provide accurate results, and the Re-Routing Parameters. This part proved to be longer than expected, with predicted completion in Oct 2021.

P4 activities, related to the Final User Testing, have started, actors have been selected, instruction have been passed and users have started the testing of the Deliveries Planning System by making some sample bookings in the system.

Milestone/action	Responsible partner/external resource	Deadline, as defined in PWP	Predicted or achieved completion date	Estimated completion %	Progress status
Milestone 1	Polo Inoltra	Feb 2021	Feb 2021	100%	COMPLETED
Milestone 2	Polo Inoltra	May 2021	May 2021	100%	COMPLETED
Milestone 3	Polo Inoltra	Jul 2021	Oct 2021	80%	ONGOING
Milestone 4	Polo Inoltra	Oct 2021	Oct 2021	30%	ONGOING

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value
1.	**Pilot Concept Drafting**	COMPLETED	PP6	Accepted pilot work plan by all PPs	1
2.	**Pilot Functional Design**	COMPLETED	PP6	Accepted pilot work plan by all PPs	1
3.	**Pilot Work Plan**	COMPLETED	PP6	Accepted pilot work plan by all PPs	1
4.	**Technical Functional Specs**	COMPLETED	PP6	Detailed functional specs agreed with the development partner	1

5.	**Input Process**	COMPLETED	Development Partner	Input interface completed	1
6.	**Output Process**	COMPLETED	Development Partner	Output interface completed	1
7.	**Backend solution**	COMPLETED	Development Partner	System monitoring completed	1
8.	**Track and trace, Traffic&weather, RT modules**	COMPLETED	Development Partner	Non predictive tools completed	1
9.	**Re-routing parameters checklist**	COMPLETED	Development Partner	Re-routing rules and parameters pre-defined and added to the algorithm	1
10.	**Frontend solution**	COMPLETED	Development Partner	Frontend solution defined and implemented	1
11.	**Variables/Set of data checklist**	COMPLETED	PP6	Check of all the variables to be used for the algorithm	1
12.	**Booking&Transport Orders Pilot Function Configuration**	COMPLETED	Development Partner	Booking interface created	100%
13.	**ITUs pilot function configuration**	COMPLETED	Development Partner	ITUs selection list completed	100%
14.	**Travel Section&Nodes Pilot Configuration**	ONGOING 80%	Development Partner	Under completion, still working on the algorithm in relation to the rail services	100%
15.	**Vessels, Ports and Terminals Pilot Configuration**	COMPLETED	Development Partner	HUBs and Vessels added	100%
16.	**Trains, Stations and Rail Terminal Pilot**	COMPLETED	Development Partner	Trains schedule and HUBs added	100%

	Function Configuration				
17.	**Re-Routing parameters pilot function configuration**	ONGOING 70%	Development Partner	Re-routing process still under configuration	100%
18.	**Actors Mapping and Selection**	COMPLETED	PP6	Actors have been selected	100%
19.	**Actors Instructions**	ONGOING 50%	PP6	Actors have been partially trained to use the system and await for final instructions	100%
20.	**Deliveries Planning System Testing**	ONGOING 20%	PP6	Actors have started using the system waiting for the algorithm to be improved to receive precise results	100%
21.	**Integration Development Services Delivered and Completed**	EXPECTED	PP6	Task not yet started	100%
22.	**Data Analysis**	ONGOING 10%	PP6	The first data collected and analyzed suggested more interventions on the pilot algorithm	100%
23.	**Dissemination**	ONGOING 20%	PP6	Dissemination activities have started, by informing stakeholders about the pilot action and the first	100%

				experiments to take place	

5.3. Pilot 3 implementation – Mobile Safety/Security

The pilot project has been already successfully completed and it is not envisaged any delay in the remaining activities of DigLogs project.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Expected value
1.	**Completed project work plan**	COMPLETED	PP4	Accepted pilot work plan by all PPs	1	1
2.	**Written draft of the technical-functional specification**	COMPLETED	PP4	Written full technical-functional specification	1	1
3.	**Public procurement (tendering) documentation**	COMPLETED	PP4	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	1	3
4.	**Received commercial offers**	COMPLETED	PP4	Received commercial offer(s) / Total number of offer(s) to be received	1	1
5.	**Evaluation of offers completed and best offers selected**	COMPLETED	PP4	Best offer(s) selected	1	1
6.	**Awarded equipment purchase contracts (if applicable)**	COMPLETED	Vendor	Awarded purchase equipment contracts	1	1
7.	**Awarded integration and/or development services contracts**	COMPLETED	Vendor	Awarded integration and/or development services contracts	1	1

8.	**Equipment delivered and installed (if applicable)**	COMPLETED	Vendor	All equipment installed	1	1
9.	**Integration and/or development services delivered and completed (if applicable)**	COMPLETED	Vendor	All integration and/or development services completed	1	1
10.	**UAT testing**	COMPLETED	PP4, Vendor	Number of successful tests / Total number of required tests	100%	100%
11.	**Full system functional (pilot development completed)**	COMPLETED	PP4, Vendor, Users	One complete pilot project successful	1	1
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	COMPLETED	Vendor	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1	1
13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	COMPLETED	PP4	Percentage of available funds from the budget (Application Form) – only HW, SW and integration	100%	100%
14.	**Number of secondary affected ICT systems as a consequence of the pilot execution**	COMPLETED	Vendor	At least one secondary ICT system affected as a consequence of the pilot execution	1	1
15.	**Number of improved internal processes as a**	COMPLETED	PP4	At least one internal process directly benefitting from the pilot execution	2	2

	consequence of the pilot execution					
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	PP4	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1	1
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	PP4	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES	YES
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	COMPLETED	PP4	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	NO	NO
19.	**Directly or indirectly lowered GHG emissions as a direct result of pilot execution**	COMPLETED	PP4	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	NO	NO
20.	**Timely submitted pilot action completion/closeout reports**	COMPLETED	PP4	Timely reporting on pilot action completion/closeout	YES	YES
21.	**Trials**	COMPLETED	Users	Number of persons taking part at trials on GNV Bridge	30	37

22.	**Evacuation time reduction**	COMPLETED	PP4, Vendor, Users	Mean percentage of evacuation time reduction due to the introduction of the technology in the test environment	n/a	16.9%

Notes:

Point 4. – The number of quotation requests is 3.

Point 5. – Only one offer has been received and, then, deemed appropriate.

Point 6. – The system is composed of the mobile App and Backend software. The hardware for trials execution was provided by the vendor for the duration of trials.

Point 12. – The pilot system is completely new and aims to improve evacuation execution and monitoring. In the test environment, there are no systems devoted to ease or monitor ship evacuation.

Point 14. – The pilot system is self-standing. There is no integration with other onboard systems except WiFi that is used as supporting infrastructure.

Point 15. – Number of improved internal processes as a consequence of the pilot execution (2 – *ship evacuation process, evacuation monitoring*)

Point 16. – Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution (1 – *GNV Bridge*, then the UNITS facilities where the pilot system will be maintained after onboard trials)

5.4. Pilot 4 implementation – Application for Data Flows Management

The sensing devices are installed in several suitable locations with adequate visibility and connected to power source and data links.

Front-end development for user centric services have run in parallel, and completion was planned mid to end Q1/2021 and achieved with slight delay in Q2/2021., but according to the contract. Output from the camera device is captured and tunneled to the front-end and visualized using map on the Internet, freely available to all interested stakeholders from target groups and passengers.

Information related to the pilot, including QR code leading to the map is placed on information panels installed in easily accessible locations.

Stakeholders within identified target groups are informed about the pilot's go-live by means of e-mail and social networks dedicated to DigLogs project in Q1 and Q2/2021.

With completion of these steps, the pilot has passed from the planning phase through development and execution to the production/exploitation phase of the project.

As a part of post deployment activities, some additional steps will be performed. General public will be informed about the project deliverables using channels already identified as a part of project's WP2. Interested stakeholders are also informed about the pilot using placement on the Port of Rijeka Authority's web page.

End of the pilot action has marked beginning of the operative system exploitation and maintenance and KPI measurement.

Future usage of the system in the second part of the pilot will be measured using web access counter page and regular Web page metric, already used for access to map served by Rijeka Traffic information system. This metric will show utilization of the map by the end users – passengers and stakeholders within identified target groups.

As a summary, successful pilot project execution and deployment marks beginning of additional functionality provided to end users in a simple and easily accessible manner, adding a layer of

visibility in the port area, especially aimed at safety and oversight of the passenger traffic, thus achieving the pre-set project goals.

Table with measured pilot project KPIs is shown below.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Achieved value
1.	**Completed project work plan**	COMPLETED	External consultant	Accepted pilot work plan by all PPs	1	**1**
2.	**Written draft of the technical-functional specification**	COMPLETED	External consultant	Written full technical-functional specification	2	**2**
3.	**Public procurement (tendering) documentation**	COMPLETED	Project Partner	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	6	**6**
4.	**Received commercial offers**	COMPLETED	Project Partner, Vendors	Received commercial offer(s) / Total number of offer(s) to be received	2	**2**
5.	**Evaluation of offers completed and best offers selected**	COMPLETED	Project Partner	Best offer(s) selected: **Maritech Adriatic, Ltd.** **Hexis, Ltd.**	2	**2**
6.	**Awarded equipment purchase contracts (if applicable)**	COMPLETED	Project Partner, Vendor	Awarded purchase equipment contracts	1	**1**

7.	**Awarded integration and/or development services contracts**	IN PROGRESS	Project Partner, Vendor	Awarded integration and/or development services contracts	1	**1**
8.	**Equipment delivered and installed (if applicable)**	COMPLETED	Project Partner, Vendor	All equipment installed	2	**2**
9.	**Integration and/or development services delivered and completed (if applicable)**	IN PROGRESS	Project Partner, Vendor	All integration and/or development services completed	1	**1**
10.	**UAT testing**	COMPLETED	Project Partner, Vendor, Users	Some functions are in everyday use so no number can be specified	100%	**100%**
11.	**Full system functional (pilot development completed)**	IN PROGRESS	Project Partner, Vendor, Users	One complete pilot project successful	1	**1**
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	COMPLETED	Project Partner	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1+	**3**
13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	IN PROGRESS	Project Partner	Percentage of available funds from the budget (Application Form) – only HW, SW and integration	100%	100%
14.	**Number of secondary affected ICT systems as a**	IN PROGRESS	Project Partner	At least one secondary ICT system affected as a	1+	**1**

	consequence of the pilot execution			consequence of the pilot execution		
15.	**Number of improved internal processes as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one internal process directly benefitting from the pilot execution	1+	**2**
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	Project Partner	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1+	**2**
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	Project Partner	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES/NO	**YES**
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	YES/NO	**YES**
19.	**Directly or indirectly lowered GHG emissions as a direct result of pilot execution**	IN PROGRESS	Project Partner	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	YES/NO	**YES**
20.	**Timely submitted pilot action completion/closeout reports**	IN PROGRESS	Project Partner	Timely reporting on pilot action completion/closeout	YES/NO	**YES**

Notes:

Point 12. - Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution (two [2] – VTS system upgraded, passenger port visualisation portal developed, Rijeka Traffic capabilities enhanced-extended)

Point 15. - Number of improved internal processes as a consequence of the pilot execution (two [2]- *ISPS processes, passenger management processes*)

Point 16. - Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution (*two [2] – passenger port Rijeka, passenger port terminal Rijeka)*

5.5. Pilot 5 implementation – Innovative solution for Access Control

Port of Šibenik Authority's pilot consists of the implementation of a separated logical module for access control. At the moment, it did not have automated IT solution for this purpose, and especially not for the passenger traffic segment, hence motivation for the proposed content of the pilot project.

According to the contract that has been stipulated with the vendor of integration and development services with company Disk Ltd. from Šibenik, it has commenced with the development activities.

Envisaged hardware equipment under DigLogs budget has also been procured according to national public procurement rules and installed in identified locations to serve the project purposes.

Contracted development company has completed majority of the applications and is proceeding according to the timeplan. Disk Ltd. is closely cooperating with the Port of Šibenik's DigLogs project manager and PFSO in translating functional specification to deliverables. Since December 2020., a Web server has been set up along with the domain and various functionalities are tested using URL: https://eport-sibenik.hr. Similar activities were ongoing also for the other three applications (PC application, mobile application and the police-oriented application). Mr. Gašperov, representative of the developers has presented all applications and their functionalities. The main meeting on the topic has ben held on the 16th April 2021.

Development services have been completed in its initial pass, for all modules, and the completed applications have been given for testing to the end users Feedback was received during June 2021. from end users, it was incorporated in the final version of the access software and all applications that are deliverables of the pilot project, under supervision of the PFSO and the DigLogs Port of Šibenik Authority project manager were delivered.

Subsequently, project wrap-up and production were done along with documenting the project pilot action. Port of Šibenik Authority has stopped utilizing previous procedure and started with full production as of 1st July 2021.

Most of the KPI-s from the table have been marked “completed” while the only pending phases are the ones that include regular communication with developers and service providers in order to maximize the positive effects done by the project pilot. Regular maintenance has to be scheduled to ensure proper updates and possible bug fixes. Services that were initially planned but are currently not in use (i.e., accounting module) are being worked on.

No delays are foreseen until end of duration of DigLogs project.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Achieved value
1.	**Completed project work plan**	COMPLETED	External consultant	Accepted pilot work plan by all PPs	1	**1**
2.	**Written draft of the technical-functional specification**	COMPLETED	External consultant	Written full technical-functional specification	1	**1**
3.	**Public procurement (tendering) documentation**	COMPLETED	Project Partner	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	3	**3**
4.	**Received commercial offers**	COMPLETED	Project Partner, Vendors	Received commercial offer(s) / Total number of offer(s) to be received	3	**1**
5.	**Evaluation of offers completed and best offers selected**	COMPLETED	Project Partner	Best offer(s) selected: **Disk Ltd.**	1	**1**

6.	**Awarded equipment purchase contracts (if applicable)**	COMPLETED	Project Partner, Vendor	Awarded purchase equipment contracts	1	**1**
7.	**Awarded integration and/or development services contracts**	IN PROGRESS	Project Partner, Vendor	Awarded integration and/or development services contracts	1	**1**
8.	**Equipment delivered and installed (if applicable)**	COMPLETED	Project Partner, Vendor	All equipment installed	1	**1**
9.	**Integration and/or development services delivered and completed (if applicable)**	IN PROGRESS	Project Partner, Vendor	All integration and/or development services completed	1	**1**
10.	**UAT testing**	COMPLETED	Project Partner, Vendor, Users	Some functions are in everyday use so no number can be specified	100%	**90%**
11.	**Full system functional (pilot development completed)**	IN PROGRESS	Project Partner, Vendor, Users	One complete pilot project successful	1	**1**
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	COMPLETED	Project Partner	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1+	**1**
13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds**	IN PROGRESS	Project Partner	Percentage of available funds from the budget (Application Form) –	100%	100%

	allocated for pilot action			only HW, SW and integration		
14.	**Number of secondary affected ICT systems as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one secondary ICT system affected as a consequence of the pilot execution	1+	**1**
15.	**Number of improved internal processes as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one internal process directly benefitting from the pilot execution	1+	**6**
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	Project Partner	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1+	**2**
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	Project Partner	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES/NO	**YES**
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	YES/NO	**YES**
19.	**Directly or indirectly lowered GHG emissions as a direct**	IN PROGRESS	Project Partner	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	YES/NO	**YES**

	result of pilot execution					
20.	**Timely submitted pilot action completion/closeout reports**	IN PROGRESS	Project Partner	Timely reporting on pilot action completion/closeout	YES/NO	**YES**

Notes:

Point 15. - Number of improved internal processes as a consequence of the pilot execution (six [6]- *ISPS processes, financial and accounting processes, permit issuing processes, information security processes, management reporting, revenue process*)

Point 16. - Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution (two [2] - *Vrulje S1, Vrulje E*)

5.6. Pilot 6 implementation – M2M Dialogue

Pilot project underwent a user acceptance testing phase by its personnel together with the developers while adjusting the necessary tweaks and upgrades resulting with a possible easier complete transition to new port community system.

The procurement procedure was done in correct and timely manner thus there were no delays regarding the implementation phases and timely reporting done by the Rovinj Port Authority.

Relative to the Key Performance Indicators listed below, Rovinj port fulfills its obligations in accordance with the Application form and the given timeline which in turn provides a measurable progress done by the project partner.

Most of the KPI-s from the table have been marked "completed" while the only pending phases are the ones that include regular communication with developers and service providers in order to maximize the positive effects done by the project pilot. Regular maintenance has to be scheduled to ensure proper updates and possible bug fixes. Services that were initially planned but are currently not in use (i.e., accounting module) are being worked on.

No delays are foreseen apart from the one with personnel training regarding the new system with COVID-19 measures still in play, thus the need for inferior ways of training – online. The process is underway but difficulties occur with lack of the in-person communication.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Achieved value
1.	**Completed project work plan**	COMPLETED	External consultant	Accepted pilot work plan by all PPs	1	**1**
2.	**Written draft of the technical-functional specification**	COMPLETED	External consultant	Written full technical-functional specification	1	**1**
3.	**Public procurement (tendering) documentation**	COMPLETED	Project Partner	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	3	**3**

4.	**Received commercial offers**	COMPLETED	Project Partner, Vendors	Received commercial offer(s) / Total number of offer(s) to be received	3	**1**
5.	**Evaluation of offers completed and best offers selected**	COMPLETED	Project Partner	Best offer(s) selected: **Marina Master**	1	**1**
6.	**Awarded equipment purchase contracts (if applicable)**	COMPLETED	Project Partner, Vendor	Awarded purchase equipment contracts	1	**1**
7.	**Awarded integration and/or development services contracts**	IN PROGRESS	Project Partner, Vendor	Awarded integration and/or development services contracts	1	**1**
8.	**Equipment delivered and installed (if applicable)**	COMPLETED	Project Partner, Vendor	All equipment installed	1	**1**
9.	**Integration and/or development services delivered and completed (if applicable)**	IN PROGRESS	Project Partner, Vendor	All integration and/or development services completed	1	**1**
10.	**UAT testing**	COMPLETED	Project Partner, Vendor, Users	Some functions are in everyday use so no number can be specified	100%	**90%**
11.	**Full system functional (pilot development completed)**	IN PROGRESS	Project Partner, Vendor, Users	One complete pilot project successful	1	**1**
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	COMPLETED	Project Partner	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1+	**3**

13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	**IN PROGRESS**	**Project Partner**	**Percentage of available funds from the budget (Application Form) – only HW, SW and integration**	100%	**100%**
14.	**Number of secondary affected ICT systems as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one secondary ICT system affected as a consequence of the pilot execution	1+	**1**
15.	**Number of improved internal processes as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one internal process directly benefitting from the pilot execution	1+	**3**
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	Project Partner	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1+	**13**
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	Project Partner	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES/NO	**YES**
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	YES/NO	**YES**
19.	**Directly or indirectly lowered GHG emissions as a direct result of pilot execution**	IN PROGRESS	Project Partner	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	YES/NO	**YES**
20.	**Timely submitted pilot action completion/closeout reports**	IN PROGRESS	Project Partner	Timely reporting on pilot action completion/closeout	YES/NO	**YES**

Point 13. – Explanation: Levels of the current total budget are met at 100%, while the maturity is marked “in progress” because of the ongoing maintenance and upgrade costs which are billed periodically according to the work that needs to be done and will last beyond end of the pilot project. Sufficient maintenance funds will be allocated if necessary to the appropriate category in the next years.

5.7. Pilot 7 implementation – Spatial Data Management System

The pilot action implementation follows the initially defined roadmap, which is componed by 6 different stages. Note that the roadmap tasks are not strictly sequential, as many of them are going to carried out in parallel or to follow different priorities.

The first stage regards the pilot planning, and it has been completed in February 2021.

The second and third stage are about the dataset acquisition and the infrastructure implementation. It has been completed in April 2021, though the data acquisition, analysis, and optimization, have been run in parallel with other stages until the end of August.

Data migration of selected dataset is the fourth stage, and it has been completed at the end of August 2021.

Fifth and sixth stages relates to procedures implementation and services optimization; they are in progress and their completion is scheduled for November 2021.

The training program has been drafted in February 2021; the related activities have been carried out in parallel with data acquisition and optimization activities, and they are scheduled to progress also during fifth and sixth stages until November 2021.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Achieved value
1.	**Completed project work plan**	COMPLETED	PP1	Accepted pilot work plan by all PPs	1	1
2.	**Written draft of the technical-functional specification**	COMPLETED	PP1	Written full technical-functional specification	1	1

3.	**Public procurement (tendering) documentation**	IN PROGRESS	PP1	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	2	2
4.	**Received commercial offers**	N/A	PP1	Received commercial offer(s) / Total number of offer(s) to be received	0	0
5.	**Evaluation of offers completed and best offers selected**	N/A	PP1	Best offer(s) selected	0	0
6.	**Awarded equipment purchase contracts (if applicable)**	N/A	PP1	Awarded purchase equipment contracts	0	0
7.	**Awarded integration and/or development services contracts**	IN PROGRESS	PP1	Awarded integration and/or development services contracts	2	2
8.	**Equipment delivered and installed (if applicable)**	N/A	PP1	All equipment installed	0	0
9.	**Integration and/or development**	N/A	PP1	All integration and/or	0	0

	services delivered and completed (if applicable)			development services completed		
10.	**UAT testing**	IN PROGRESS	PP1	Number of successful tests / Total number of required tests	100%	20%
11.	**Full system functional (pilot development completed)**	COMPLETED	PP1	One complete pilot project successful	1	1
12.	**Number of ICT systems upgraded, enhanced, or introduced as a consequence of project execution**	COMPLETED	PP1	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1+	1
13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	IN PROGRESS	PP1	Percentage of available funds from the budget (Application Form) – only HW, SW and integration	100%	70%
14.	**Number of secondary affected ICT systems as a consequence of the pilot execution**	N/A	PP1	At least one secondary ICT system affected as a consequence of the pilot execution	0	0
15.	**Number of improved internal**	IN PROGRESS	PP1	At least one internal	1+	16

	processes as a consequence of the pilot execution			process directly benefitting from the pilot execution		
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	PP1	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1+	2
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	PP1	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES	YES
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	COMPLETED	PP1	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	NO	NO
19.	**Directly or indirectly lowered**	IN PROGRESS	PP1	Are GHG emissions	YES	YES

	GHG emissions as a direct result of pilot execution			directly or indirectly lowered as a result of pilot execution?		
20.	**Timely submitted pilot action completion/closeout reports**	IN PROGRESS	PP1	Timely reporting on pilot action completion/closeout	YES	YES
21.	**Number of spatial datasets optimized and migrated into the system**	COMPLETED	PP1	At least the number of datasets included into the initial defined list	17+	19
22.	**Number of employees trained**	IN PROGRESS	PP1	At least one employee for each involved department	6+	8

Notes:

Activity 3/KPI3: A public procurement has been published in August 2021 in order to hire 2 experts in spatial data processing and training activities.

Activity 4/KPI4: No commercial offer of the solution is foreseen

Activity 5/KPI5: No commercial offer of the solution is foreseen

Activity 6/KPI6: No awarded equipment needs are foreseen

Activity 7/KPI7: No awarded integration or development services are foreseen

Activity 8/KPI8: Hardware and software equipment have been provided and configured by Venice Port Authority. In fact, no project resources were used for their purchase.

Activity 9/KPI9: No awarded integration or development services are foreseen

Activity 10/KPI10: UAT will be fully completed at the end of training activities which is scheduled for November 2021.

Activity 11/KPI11: System functional development is completed, though data migration and training is still in progress.

Activity 12/KPI12: Spatial Data Management System

Activity 14/KPI14: No secondary ICT systems is expected to be affected by the pilot execution

Activity 15/KPI15: Accessibility and trade flows analysis; Port Master Plan (PRP); VIA, VAS, VINCA procedures; Economic studies, statistics, assessment and reporting; Environmental technical support; Building and infrastructures works management; Green spaces management; Waste management; Water supply and sewage service management; Three-year program and annual list of public works management; Canals and basins maintenance; State concession management; Urban planning and building permits granting; Strategic System and Master Plan; Three-year Operational Plan; One-Stop Administrative Desk.

Activity 16/KPI16: Venezia and Chioggia Port terminals

Activity 18/KPI18: Cyber security of logistics and transport ICT system is not included in the pilot project objectives.

Activity 19/KPI19: GHG emissions reduction is expected as indirect effect of a less paper document usage.

Activity 20/KPI20: Last activities are still in progress.

Activity 22/KPI22: Training activities are still in progress.

6. Pilot stakeholders

The following tables contain the information about all pilot actions and their respective stakeholders whose interests are directly or indirectly affected by the development and the execution of the individual pilot.

Brief information inputs regarding each pilot are provided structured in the tables below.

6.1. Pilot 1 stakeholders - WMS 4.0 – Dry Port Case Study

Stakeholder	Linked partner	Type of organisation	Description	Stakeholder's needs	Level of involvement
SDAG	PP2	Transport operators	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Enhanced speed in document processing Timely document issuing	UAT – User Acceptance Testing
Emmeci a socio unico	Transport operators	Carrier	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
E.spe.go Srl	PP2	Carrier	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
COVEME	PP2	Manifacturer	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development

ENERCO SRL	PP2	Carrier	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
Fenix International Srl	PP2	Carrier	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
G.L.O.	PP2	Manifacturer	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
Latan doo	PP2	Transport operators	MTO	Enhanced speed in document processing Timely document issuing	Informed about project development
Parisi Francesco Spa	PP2	Transport operators	MTO	Enhanced speed in document processing Timely document issuing	Informed about project development
Società Tipografica	PP2	Printmaker	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development

Spedimec Srl	PP2	Carrier	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
Tridex	PP2	Manifacturer	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
Arco Spedizioni Srl	P2	Transport operators	MTO	Enhanced speed in document processing Timely document issuing	Informed about project development
Bevidrink di Dochita Ionel	P2	Transport operators	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
GB Service di Grilj Bogdan	P2	Transport operators	MTO	Enhanced speed in document processing Timely document issuing	Informed about project development
Logika Servizi Srl	P2	Transport operators	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development

Optimus Doo	P2	Transport operators	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development
Righetto Autotrasporti SaS	P2	Transport operators	MTO	Enhanced speed in document processing Timely document issuing	Informed about project development
Spedimec Srl	P2	Carrier	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Wine & Beer di Luka Bresciani	P2	Trader	Enterprises	Enhanced speed in document processing Timely document issuing	Informed about project development

6.2. Pilot 2 stakeholders - Deliveries Planning

Stakeholder	Linked partner	Type of organisation	Description	Stakeholder's needs	Level of involvement
Sangritana SpA	PP6	Rail Transport operator, terminal (Saletti) and MTO	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	As Rail Operator and MTO: Improved management of the booking process, better traffic forecasts, delays calculations and improved customer communications; As terminal: Enhanced speed in document processing; Timely document issuing; More information about arrivals and departures; Marketing of available routes to and from terminal.	UAT – User Acceptance Testing
Tauro Trasporti Srl	PP6	Transport operator	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Improved management of the booking process Better multimodal routes planning, including improved traffic and weather forecasts, service delays, ITUs comparison on price and transit times, rerouting options with automatic redefinition of costs and transit times.	UAT – User Acceptance Testing

Fas Trasporti Srl	PP6	Transport operator	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Improved management of the booking process Better multimodal routes planning, including improved traffic and weather forecasts, service delays, ITUs comparison on price and transit times, rerouting options with automatic redefinition of costs and transit times.	UAT – User Acceptance Testing
Stante Logistics Srl	PP6	Transport operator	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Improved management of the booking process Better multimodal routes planning, including improved traffic and weather forecasts, service delays, ITUs comparison on price and transit times, rerouting options with automatic redefinition of costs and transit times.	UAT – User Acceptance Testing
Angelucci Trasporti Srl	PP6	Transport operator	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Improved management of the booking process Better multimodal routes planning, including improved traffic and weather forecasts, service delays, ITUs comparison on price and transit times, rerouting options with automatic redefinition of costs and transit times.	UAT – User Acceptance Testing

Interporto Val Pescara Spa	PP6	Terminal	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Enhanced speed in document processing; Timely document issuing; More information about arrivals and departures; Marketing of available routes to and from terminal.	Informed about project development
DPA - Interporto Marche	PP6	Terminal	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Enhanced speed in document processing; Timely document issuing; More information about arrivals and departures; Marketing of available routes to and from terminal.	Informed about project development
Porto di Ancona / FMG	PP6	Terminal	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Enhanced speed in document processing; Timely document issuing; More information about arrivals and departures; Marketing of available routes to and from terminal.	Informed about project development

6.3. Pilot 3 stakeholders - Mobile Safety/Security

Stakeholder	Linked partner	Type of organisation	Description	Stakeholder's needs	Level of involvement
Cantiere Navale Visentini S.r.l.	PP4	Shipyard	Shipbuilding company specialised in the design and construction of Ro-pax ships	Offer new safety/security systems on new ships	Informed about project development Provided the test environment (GNV Bridge)
Visemar di Navigazione	PP4	Shipping company	Maritime transport company manning Ro-pax vessels	Improve fleet safety and security	Informed about project development Supported the PP4 and Vendor during trials execution in the test environemnt (GNV Bridge)
Fincantieri S.p.A.	PP4	Shipyard	Shipbuilding company being one of the major constructors of large passenger ships	Offer new safety/security systems on new ships	Informed about project development Trials have been carried out in a Fincantieri drydock (Arsenale San Marco in Trieste, Italy)
ETEC Minds S.r.l.	PP4	Software developer	Company providing tailored solutions for manifacturing, data analysis and communication	Improve the company portfolio in the maritime safety/security sector	developer of the pilot system

Cetena S.p.A.	PP4	Engineering	Marine engineering and naval architecture consultancy and research	Improvement of ship safety/security	Informed about project development Took part in the trials with a volunteer/observer
MSC Cruises	PP4	Shipping Company	Cruise vessel operator	Improve fleet safety and security	Informed about project development
Wärtsilä Italia S.p.A	PP4	Engineering	Maritime engineering company and engine manufacturer	Improvement of ship safety/security	Informed about project development Took part in the trials with a volunteer/observer

6.4. Pilot 4 stakeholders - Application for Data Flows Management

The sensing devices are installed in several suitable locations with adequate visibility and connected to power source and data links.

Front-end development for user centric services have run in parallel, and completion was planned mid to end Q1/2021 and achieved with slight delay in Q2/2021., but according to the contract. Output from the camera device is captured and tunneled to the front-end and visualized using map on the Internet, freely available to all interested stakeholders from target groups and passengers.

Information related to the pilot, including QR code leading to the map is placed on information panels installed in easily accessible locations.

Stakeholders within identified target groups are informed about the pilot's go-live by means of e-mail and social networks dedicated to DigLogs project in Q1 and Q2/2021.

With completion of these steps, the pilot has passed from the planning phase through development and execution to the production/exploitation phase of the project.

As a part of post deployment activities, some additional steps will be performed. General public will be informed about the project deliverables using channels already identified as a part of project's WP2. Interested stakeholders are also informed about the pilot using placement on the Port of Rijeka Authority's web page.

End of the pilot action has marked beginning of the operative system exploitation and maintenance and KPI measurement.

Future usage of the system in the second part of the pilot will be measured using web access counter page and regular Web page metric, already used for access to map served by Rijeka Traffic information system. This metric will show utilization of the map by the end users – passengers and stakeholders within identified target groups.

As a summary, successful pilot project execution and deployment marks beginning of additional functionality provided to end users in a simple and easily accessible manner, adding a layer of

visibility in the port area, especially aimed at safety and oversight of the passenger traffic, thus achieving the pre-set project goals.

Table with measured pilot project KPIs is shown below.

No.	Activity	Maturity	Responsible stakeholder	Key Performance Indicator	Expected value	Achieved value
1.	**Completed project work plan**	COMPLETED	External consultant	Accepted pilot work plan by all PPs	1	**1**
2.	**Written draft of the technical-functional specification**	COMPLETED	External consultant	Written full technical-functional specification	2	**2**
3.	**Public procurement (tendering) documentation**	COMPLETED	Project Partner	Issued request(s) for quotation(s) / Total number of request(s) for quotation(s) needed	6	**6**
4.	**Received commercial offers**	COMPLETED	Project Partner, Vendors	Received commercial offer(s) / Total number of offer(s) to be received	2	**2**
5.	**Evaluation of offers completed and best offers selected**	COMPLETED	Project Partner	Best offer(s) selected: **Maritech Adriatic, Ltd.** **Hexis, Ltd.**	2	**2**
6.	**Awarded equipment purchase contracts (if applicable)**	COMPLETED	Project Partner, Vendor	Awarded purchase equipment contracts	1	**1**

7.	**Awarded integration and/or development services contracts**	IN PROGRESS	Project Partner, Vendor	Awarded integration and/or development services contracts	1	**1**
8.	**Equipment delivered and installed (if applicable)**	COMPLETED	Project Partner, Vendor	All equipment installed	2	**2**
9.	**Integration and/or development services delivered and completed (if applicable)**	IN PROGRESS	Project Partner, Vendor	All integration and/or development services completed	1	**1**
10.	**UAT testing**	COMPLETED	Project Partner, Vendor, Users	Some functions are in everyday use so no number can be specified	100%	**100%**
11.	**Full system functional (pilot development completed)**	IN PROGRESS	Project Partner, Vendor, Users	One complete pilot project successful	1	**1**
12.	**Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution**	COMPLETED	Project Partner	At least one ICT system upgraded, enhanced or introduced as a consequence of pilot execution	1+	**3**
13.	**Amount of funds justifiably spent by the PP for pilot action / Total funds allocated for pilot action**	IN PROGRESS	Project Partner	Percentage of available funds from the budget (Application Form) – only HW, SW and integration	100%	100%
14.	**Number of secondary affected**	IN PROGRESS	Project Partner	At least one secondary ICT	1+	**1**

	ICT systems as a consequence of the pilot execution			system affected as a consequence of the pilot execution		
15.	**Number of improved internal processes as a consequence of the pilot execution**	IN PROGRESS	Project Partner	At least one internal process directly benefitting from the pilot execution	1+	**2**
16.	**Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution**	COMPLETED	Project Partner	At least one port terminal, basin, land terminal, vessel or other location positively affected as a consequence of the pilot execution	1+	**2**
17.	**Increased level of security of port terminal, basin, land terminal, vessel or other location as a direct result of pilot execution**	COMPLETED	Project Partner	Is the security of port terminal, basin, land terminal, vessel or other location increased as a result of pilot execution?	YES/NO	**YES**
18.	**Increased level of cyber security of involved logistics and transport ICT systems as a direct result of pilot execution**	IN PROGRESS	Project Partner	Is the level of cyber security of involved logistics and transport ICT systems increased as a result of pilot execution?	YES/NO	**YES**
19.	**Directly or indirectly lowered GHG emissions as a direct result of pilot execution**	IN PROGRESS	Project Partner	Are GHG emissions directly or indirectly lowered as a result of pilot execution?	YES/NO	**YES**
20.	**Timely submitted pilot action**	IN PROGRESS	Project Partner	Timely reporting on pilot action completion/closeout	YES/NO	**YES**

	completion/closeout reports					

Notes:

Point 12. - Number of ICT systems upgraded, enhanced or introduced as a consequence of project execution (two [2] – VTS system upgraded, passenger port visualisation portal developed, Rijeka Traffic capabilities enhanced-extended)

Point 15. - Number of improved internal processes as a consequence of the pilot execution (two [2]- *ISPS processes, passenger management processes*)

Point 16. - Number of affected port terminals, basins, land terminals, vessels or other locations as a consequence of the pilot execution (*two [2] – passenger port Rijeka, passenger port terminal Rijeka)*

6.5. Pilot 5 stakeholders - Innovative solution for Access Control

Stakeholder	Linked partner	Type of organisation	Description	Stakeholder's needs	Level of involvement
Port authority County of Šibenik-Knin	PP8	Local and regional national public Authorities	Port Authorities	Enhanced speed in document processing Timely document issuing	Informed about project development
Gulliver travel d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Medservis d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development

Rea Dubrovnik d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
G&V Line Iadera	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Applicon tours d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
HŽ PUTNIČKI PRIJEVOZ d.o.o	PP8	Enterprises, transport and multimodal transport	Transport operators	Enhanced speed in document processing	Informed about project development

		operators (MTO) including operators of multimodal logistics hub, Infrastructure providers		Timely document issuing	
Melius promet d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Pražen putovanja d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Stari Velim d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development

		multimodal logistics hub, Infrastructure providers			
MSC krstarenja d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Autotransport d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Adriatic DMC d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub,	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development

		Infrastructure providers			
Grand Circle Corporation, Dubrovnik office	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Catamaran line d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Transport operators	Enhanced speed in document processing Timely document issuing	Informed about project development
Trast otpremništvo d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	MTO	Transfer of knowledge about digitalization and digital initiatives	Informed about project development

Marinetek Adriatic d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Shippers	Transfer of knowledge about digitalization and digital initiatives	Informed about project development
Petrokemija d.d.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Shippers	Transfer of knowledge about digitalization and digital initiatives	Informed about project development
Luka Šibenik d.o.o.	PP8	Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Passengers and freight terminals	Enhanced speed in document processing Timely document issuing Transfer of knowledge about digitalization and digital initiatives	Informed about project development Involved in UAT

Bandić Maritime d.o.o.		Enterprises, transport and multimodal transport operators (MTO) including operators of multimodal logistics hub, Infrastructure providers	Shipping companies	Transfer of knowledge about digitalization and digital initiatives	Informed about project development
Intermodal Transport Cluster - KIP		Transport associations	Sector associations	Transfer of knowledge about digitalization and digital initiatives	Informed about project development

6.6. Pilot 6 stakeholders - M2M Dialogue

Stakeholder	Linked partner	Type of organization	Description	Stakeholder's needs	Level of involvement
Liberty lines Srl.	PP9	Transport operators	Transport operator who maintains regular line with Trieste	Easier port clearance hence faster document production to ease the process	Directly and indirectly participating in user acceptance testing
BWA Yachting	PP9	Transport operator	Yachting agent who benefits of the timely coordination with Port Authority	Easier documents issuance Less time-consuming administrative follow up after services	Directly and indirectly participating in user acceptance testing
Venezia lines Srl.	PP9	Shipping company	Company seasonally stationed in Rovinj port – maintaining a daily connection with Venice, Italy	Easier port clearance hence faster document production to ease the process	Directly and indirectly participating in user acceptance testing
Eldmarc Ltd.	PP9	MTO	As a multimodal transport operator ease on administration would be beneficial to both parties	Maritime agency, transport of passengers and goods by inland waterways, occasional transport of passengers in coastal maritime transport	Directly and indirectly participating in user acceptance testing

6.7. Pilot 7 stakeholders - Spatial Data Management System

Stakeholder	Linked partner	Type of organisation	Description	Stakeholder's needs	Level of involvement
Shipping Agents Association	PP1 - CFLI	Private association	Associatiron that groups together port of Venice Shipping Agents	Higher efficiency, collaboration among stakeholders	Interested to be informed about results
Rhenus Logistics spa	PP1 - CFLI	Logistics operator	Worldwide logistics and multimodal transport operator	Higher efficiency, information sharing, collaboration	Interested to be informed about results
Mazzoleni & Facori Srl	PP1 - CFLI	Freight forwarder	Worldwide operating company	collaboration among stakeholders	Interested to be informed about results
S.D.C. Servizio Doganale Containers Srl	PP1 - CFLI	Customs operator	Compay specialized on customs procedures both in marine (mainly containers) and air trades	Higher efficiency, resources optimization	Interested to be informed about results
E.A.A.M.S. Srl	PP1 - CFLI	Freight forwarder	Company specialized in freight forwarding and customs operator	Higher efficiency, resources optimization	Interested to be informed about results
MULTI LEVEL Chain srl	PP1 - CFLI	Counselling firm	Company that offers counselling services in the logistics field	Higher efficiency, also in real time	Interested to be informed about results
Venice Freight Forwarders Association	PP1 - CFLI	Private association	Associatiron that groups together port of Venice Freight Forwarders	Higher collaborations among players, hgher data sources	Interested to be informed about results

				and availability, higher efficiency	
Chamber of Commerce of Venice Rovigo	PP1 - CFLI	Local public Authority	Public body that groups local enterpises that promotes their needs and creates new opportunities	Availability and sharing of information	Interested to be informed about results
North Adriatic Sea Port Authority	PP1 - CFLI	Local public Authority	Public body whose aim is managing one or more ports	Availability and sharing of information	Interested to be informed about results
Autotrasporti De Girolami S.p.A.	PP1 - CFLI	Transport operator	Enterprise involved in across Europe road transport	Reach higher eficiency through better data management	Interested to be involved during WIP phase
Cab Log s.r.l.	PP1 - CFLI	Transport operator	Enterprise involved in across Europe road transport	Availability and sharing of information	Interested to be informed about results
Codognotto Italia S.p.A.	PP1 - CFLI	Transport operator	Enterprise involved in across Europe road transport	Availability and sharing of information	Interested to be informed about results
DB Group S.p.A.	PP1 - CFLI	Transport operator	Enterprise involved in global forwarding	Availability and sharing of information	Interested to be informed about results
AZ Trasporti s.r.l.	PP1 - CFLI	Transport operator	Enterprise involved in across Europe road transport	Availability and sharing of information	Interested to be informed about results
Phoenix s.r.l.	PP1 - CFLI	Transport operator	Company working on regional/international trucking and Logistics Portual sector	Availability and sharing of information	Interested to be informed about results

Gruppo TCE Trasporti e Logistica	PP1 - CFLI	Transport operator	Company involved in refrigerated road transport at Italian and UE level	Availability and sharing of information	Interested to be informed about results
Hupac Intermodal S.p.A.	PP1 - CFLI	Transport operator	Leader Ccmpany as network operator in intermodal transport across Europe	Availability and sharing of information	Interested to be informed about results
Tx Logisitik AG	PP1 - CFLI	Transport operator	Rail logistics company wholly owned by the Mercitalia Group	Availability and sharing of information	Interested to be informed about results
In Rail S.p.A.	PP1 - CFLI	Transport operator	Railway company headquartered in Genoa with operational offices in Udine (North Eastern Italy) and Nova Gorica (Slovenia)	Availability and sharing of information	Interested to be informed about results
SBB Cargo Italia s.r.l.	PP1 - CFLI	Transport operator	Switzerland railway company	Availability and sharing of information	Interested to be informed about results
DB cargo Italia s.r.l.	PP1 - CFLI	Transport operator	Italian branch of the DB Cargo company	Availability and sharing of information	Interested to be informed about results
Baggio S.p.A Trasporti Combinati	PP1 - CFLI	Transport operator	Combined transport operator ivolved in handling complex logistics cargoes	Reach higher eficiency through better data management	Interested to be informed about results
DMI Trans s.r.l.	PP1 - CFLI	Transport operator	Road transport operator that offers a wide range type of services	Availability and sharing of information	Interested to be informed about results
Donelli Group s.r.l.	PP1 - CFLI	MTO	Custom agent that attends to all the formalities in name	Reach higher eficiency through	Interested to be informed about results

			and on behalf of the owner of the goods	better data management	
Acqua Mineale San Benedetto S.p.A.	PP1 - CFLI	Shipper	Company that produses bottled water and soft drinks	Availability and sharing of information	Interested to be informed about results
ILTA Alimentare S.p.A.	PP1 - CFLI	Shipper	Company operating a brand new processing and packaging in the food sector	Availability and sharing of information	Interested to be informed about results
Vecon S.p.A.	PP1 - CFLI	Freight terminal	Port of Venice main container terminal	Reach higher eficiency through better data management	Interested to be informed about results
MSC - Le Navi Veneto s.r.l.	PP1 - CFLI	Shipping company	Shipping agency that represent MSC within Venice port	Reach higher eficiency through better data management	Interested to be informed about results
Venice Intenational University	PP1 - CFLI	Univ. & Research institute	Consortium of 20 universities from all over the world	Availability and sharing of information	Interested to be informed about results
Università Iuav di Venezia - Master Global Supply Chain Management and Logistics	PP1 - CFLI	Univ. & Research institute	University that offers a Supply chain 1st level Maser Course	Availability and sharing of information	Interested to be informed about results

7. Pilot timelines

The actual timelines for the durations of the entire pilot projects are individually shown in tables below, along with the most important milestones.

7.1. Pilot 1 timeline - WMS 4.0 – Dry Port Case Study

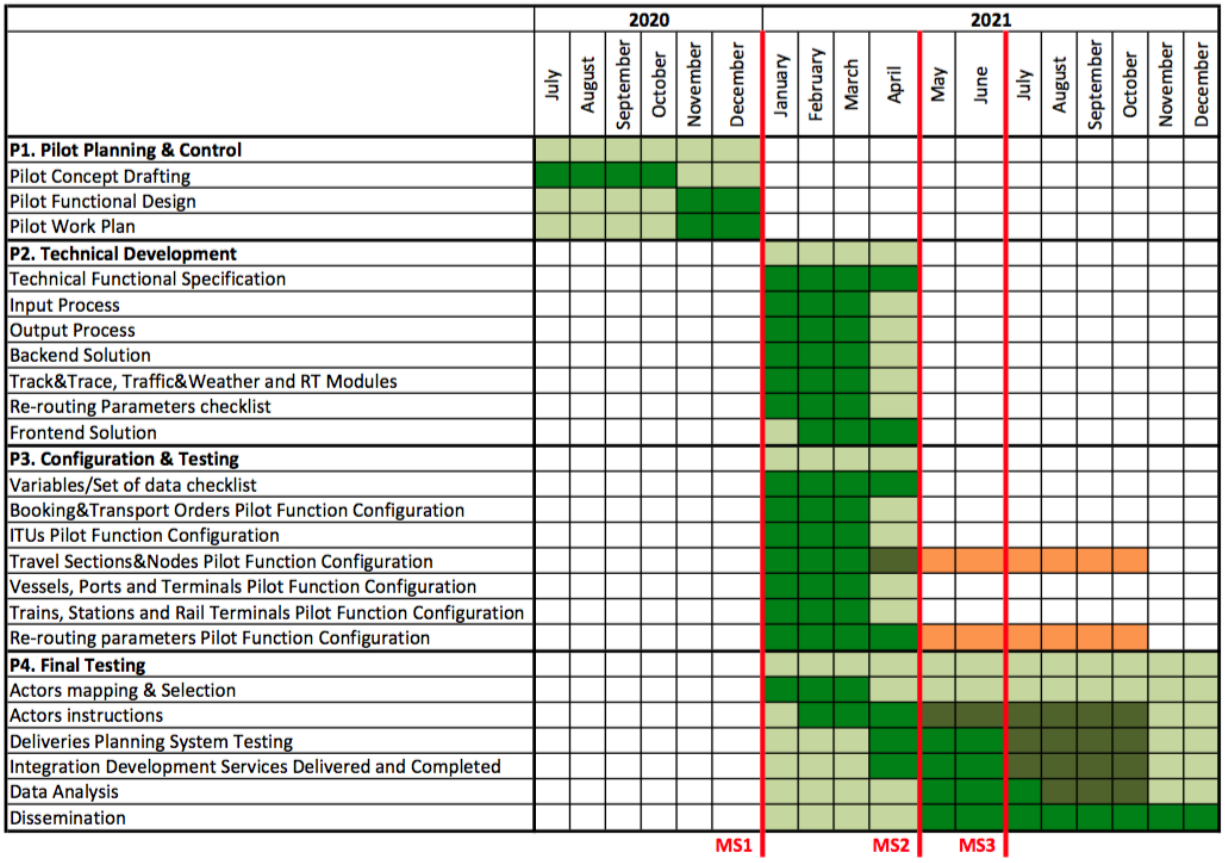
The actual timeline for the durations of the whole pilot project is shown in the following Table**Error! Reference source not found.**, along with the most important milestones.

Herewith is the list of the planned project tasks alongside the milestones achieved within critical project phases. As mentioned earlier, all pilot activities will be carried out until the end of October 2021, hence the last remaining milestone, namely M3 and M4, will be achieved by that date.

1. Compiled draft of the Project Work Plan – by PP2
2. Revised and validated Project Work Plan – by PP5, the package leader
3. Completed Project Work Plan, validated by the project partnership ← **MILESTONE 1 (M1)**
4. A written draft of the Technical-functional specification – by PP2
5. Completed Technical-functional specification ← **MILESTONE 2 (M2)**
6. Completed procurement documentation and award – by PP2
7. DSS delivered and completed by appointed Supplier ← **MILESTONE 3 (M3)**
8. DSS testing by appointed Supplier
9. DSS deployment by appointed Supplier and sign off (pilot development completed) ← **MILESTONE 4 (M4)**

Activity number	Activity title	Year and month														
		2020							2021							
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1	Creation of the pilot work plan draft															
2	Creation of the pilot work plan								M1							
	Creation of the technical-functional specification draft															
3	Creation of the technical-functional specification								M2							
4	Completed public procurement documentation															
5	Awarded equipment purchase and system integration contracts															
6	Development and system integration															
7	Fully integrated system UAT testing												M3 (initially planned)			M3 (new delivery date)
8	Full system deployment in production														M4 (initially planned)	M4 (new delivery date)

7.2. Pilot 2 timeline - Deliveries Planning



7.3. Pilot 3 timeline - Mobile Safety/Security

Year and month																
Activity number	**Activity title**	2020					2021									
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1	**Creation of the pilot work plan draft**															
2	**Creation of the pilot work plan**															
3	**Creation of the technical-functional specification**															
4	**Completed public procurement documentation**															
5	**Awarded equipment purchase and system integration contracts**															
6	**Development and system integration**															
7	**Fully integrated system UAT testing**															
8	**Full system deployment in production**														*	

7.4. Pilot 4 timeline - Application for Data Flows Management

Port of Rijeka Authority's pilot consists of two major activities:

- Upgrade of the Rijeka Traffic Web application visualization with enhanced images
- Upgrade of Port of Rijeka Authority's VTMIS system with additional layer enabling identification of smaller vessels

Port of Rijeka Authority has since inception of the pilot work plan created technical specification for both activities (delivery and integration of hardware equipment for VTMIS and development and integration services for Rijeka Traffic software).

According to the created technical specification, RFQ (request for quotations) was issued as a part of the public procurement process.

On the 2nd of February 2021. A contract has been stipulated with the vendor for VTMIS upgrade and defined contract term until 1st July 2021.

On the 18th of February 2021. A contract has been stipulated with the vendor for application upgrade and development services for Rijeka Traffic software.

Development and integration services were completed until end of June 2021. when the system was set to production mode in both aspects.

Since the first milestone, DigLogs project has received contract extension that is reflected in the subsequent table. The actual timeline for the durations of the entire pilot project is shown in table on the next page, along with the most important milestones.

Activity number	Activity title	Year and month							
		2020					2021		
		8	9	10	11	12	1	2	3
1	Creation of the pilot work plan draft								
2	Creation of the pilot work plan		*						
3	Creation of the technical-functional specification								
4	Completed public procurement documentation								
5	Awarded equipment purchase and system integration contracts							*	
6	Delivery and installation of equipment								
7	Equipment UAT testing								
8	Development and system integration								
9	Fully integrated system UAT testing								
10	Full system deployment in production								

Activity number	Activity title	Year and month								
		2021								
		4	5	6	7	8	9	10	11	12
1	Creation of the pilot work plan draft									
2	Creation of the pilot work plan									
3	Creation of the technical-functional specification									
4	Completed public procurement documentation									
5	Awarded equipment purchase and system integration contracts									
6	Delivery and installation of equipment									
7	Equipment UAT testing									
8	Development and system integration									
9	Fully integrated system UAT testing									
10	Full system deployment in production									*

7.5. Pilot 5 timeline - Innovative solution for Access Control

As the project has been prolonged until the December 31st 2021, pilot's activities have also been slightly moved up on the timeline. In general, this has not affected the full implementation and the project might have been completed timely even without extension. The implementation has completed the phase of User Acceptance Testing (UAT) and it is in full production now. Postproduction deployment and information is being gathered constantly and there is high level of satisfaction with the completed product.

		Year and month														
Activity number	**Activity title**	2020					2021									
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10
1	**Creation of the pilot work plan draft**															
2	**Creation of the pilot work plan**			*												
3	**Creation of the technical-functional specification**															
4	**Completed public procurement documentation**															
5	**Awarded equipment purchase and system integration contracts**				*											
6	**Development and system integration**															
7	**Fully integrated system UAT testing**															
8	**Full system deployment in production**														*	

7.6. Pilot 6 timeline - M2M Dialogue

As the project has been prolonged until the December 31st 2021, pilot's activities have also been slightly moved up on the timeline. Specific scenario slightly delayed but in general haven't affected the full implementation. The implementation is currently in the phase of User Acceptance Testing (UAT) which basically represents one of the last stages of any software development cycle. UAT phase comes after the majority of hardware and software components have been thoroughly tested in order to generate a final "product approval" before being fully deployed.

Year and months																	
Activity number	**Activity title**	2020					2021										
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	**Creation of the pilot work plan draft**																	
2	**Creation of the pilot work plan**																	
3	**Creation of the technical-functional specification**																	
4	**Completed public procurement documentation**																	
5	**Awarded equipment purchase and system integration contracts**																	
6	**Development and system integration**																	
7	**Fully integrated system UAT testing**																	
8	**Full system deployment in production**																	

7.7. Pilot 7 timeline - Spatial Data Management System

		Year and month															
Activity number	**Activity title**	2020						2021									
		8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
1	**Pilot planning**							*									
2	**Spatial dataset acquisition**																
3	**Spatial Data Infrastructure implementation**									*							
4	**Data migration**													*			
5	**Procedures implementation**																
6	**Process and services optimization analysis**																
7	**Final test and documentation**																*

8. Risks and risk mitigation

Risk management assured that the majority of problems were discovered early enough so that there was time to recover from them without missing schedules or overspending the budget

Project risk management - the **risk management plan** from the individual Pilot project plans defined what activities should be done to deal with project risks:

- The risk identification allowed identifying and documenting risks that may have affected the project objectives.
- The qualitative analysis evaluated the possible consequences of the risks as well as their likelihood of occurrence, in subjective terms, in order to prioritize the risk.
- The quantitative analysis was recommended to be conducted for the most important project risks, considering their probability and impact resultant from the qualitative analysis. It was conducted with rigor in quantitative terms to assess the probability and impact of the high priority risks.
- The risk response planning helped to develop actions to enhance opportunities and to reduce threats on project objectives.
- Monitoring and controlling risks enabled the project manager to keep track of the defined risks and identify new risks during the project and during the implementation of the risk response plans.
- The risk management plan also included the definition of the tools and techniques suitable and available for each risk process, for a particular project or type of project.

In the following subchapters, individual project pilot risks that have occured are stated, along with the measures which were implemented in order to prevent and/or minimize their overall impact on the individual pilots, and the project overall. This will help during the transferability of the project outputs, because similar risks may occur when replicating the project results.

Common risk register methodology was developed by in earlier stages of the project, and was used to identify and mitigate risks that might arise from the pilot execution.

8.1. Pilot 1 risks and risk mitigation - WMS 4.0 – Dry Port Case Study

Goal of the risk management of the pilot project is to address all foreseen risks from various aspects:

- Use preventive measures and risk avoidance, where possible, to avoid risk occurrence (most favourable),
- Use mitigation measures, where possible, to lessen the risk impact (less favourable),
- Use risk transfer (to third parties), to lessen the risk impact, and
- Establish a clear list of actions and contingencies including escalation path towards WP5 leader and LP and have informed opinion on residual risk.

However, the project will be relatively short in duration (pilot execution), so it is logical that this fact will help significantly in its successful completion.

No higher levels of technical risks are anticipated, so mostly common project risks may reasonably be expected.

8.2. Pilot 2 risks and risk mitigation - Deliveries Planning

The main risk that occurred during DelPlan pilot implementation was connected with the Pilot Configuration & Testing phase, which was one of the most difficult task to complete.

During this phase, the algorithm, after a serie of samples testings, proved not to be accurate and needed further adjustment. In order to mitigate this risk, PP6 have maintained a direct contact with the system developer, constantly evaluating the pilot progresses made.

After the identification of the issue, a new deadline has been agreed for the task and further activities are taking place to solve the problem.

8.3. Pilot 3 risks and risk mitigation - Mobile Safety/Security

No significant risks or delays have been encountered during the implementation phase. Regular reporting on ongoing actions regarding the pilot advancement were documented in Pilot progress reports along with the alignment with the project timeline and Gantt diagram. Only some minor risks have been experienced as detailed hereinafter.

In the beginning, all the activities have been slightly shifted compared to the initial planning due to a delay in the tendering procedure. Three requests for quotations were issued while a single offer has been presented, judged eligible according to UNITS procedures and accepted. No problems with subcontractors occurred, and no delays regarding the delivery and installation of procured services.

The most critical risk encountered was a lack of communication between PP4 and the shipyard providing the test environment (GNV Bridge). The pilot system was planned to be installed and tested during the hull maintenance carried out at Arsenale San Marco in Trieste. At the beginning of the implementation phase, the hull maintenance was planned for May/June 2021. Then it has been anticipated to April. As a consequence, UNITS and the vendor of the system reschedule the activities anticipating the development of the system, its installation/testing and the planning of the trials with a sample population. The change does not cause significant effects since a sufficient safety margin was still available in the project schedule.

The SARS-CoV-2 pandemic had also an impact on trials. The organisation of trials and the recruitment of the sample population has been difficult since multiple authorisation and safety protocols were required and the pandemic situation dramatically reduced the willingness to participate from other stakeholders and make it difficult to involve private citizens (Italy was in lockdown at the time). To overcome this issue, registration has been extended to university students, which mainly constituted the sample population during trials.

8.4. Pilot 4 risks and risk mitigation - Application for Data Flows Management

No significant risks or delays have presented themselves during the implementation phase. Regular reporting on ongoing actions regarding the pilot advancement were documented in Pilot progress reports along with the alignment with the project timeline and Gantt diagram.

There were no complications regarding the public procurement procedure, two requests for quotations were issued while valid offers came back resulting in simplification of evaluation process. No problems with subcontractors occurred, and no delays regarding the delivery and installation of procured objects. If any problems were risen, results would have been sought after in the table below to protect the everyone's best interests.

Implementation phase was slightly delayed related to the global pandemic scenario and cross-border interactions with neighboring states. Lack of communication also stands as a major factor when dealing with project management. Technological aspect of the project was duly enabled, and issues fixed on-the-go respecting the overall project timelines.

8.5. Pilot 5 risks and risk mitigation - Innovative solution for Access Control

No significant risks or delays have presented themselves during the implementation phase. Regular reporting on ongoing actions regarding the pilot advancement were documented in Pilot progress reports along with the alignment with the project timeline and Gantt diagram.

There were no complications regarding the public procurement procedure, three requests for quotations were issued while single offer came back resulting in simplification of evaluation process. No problems with subcontractors occurred, and no delays regarding the delivery and installation of procured objects. If any problems were risen, results would have been sought after in the table below to protect the everyone's best interests.

Implementation phase was slightly delayed related to the global pandemic scenario and cross-border interactions with neighboring states. Lack of communication also stands as a major factor when dealing with project management. Everything was duly enabled and fixed respecting the overall project timelines.

8.6. Pilot 6 risks and risk mitigation - M2M Dialogue

No significant risks or delays have presented themselves during the implementation phase. Regular reporting on ongoing actions regarding the pilot advancement were documented in Pilot progress reports along with the alignment with the project timeline and Gantt diagram. Following list includes variety of risks which can occur, their occurrence likelihood and severity impact, as well as mitigation measures to level out the unforeseen events.

Current issues and disadvantages with Rovinj Port Authority's pilot were listed in the paragraph number 4. together with the explanations and mitigation measures related to the issue.

There weren't any kind of complications regarding the public procurement procedure, three requests for quotations were issued while single offer came back resulting in simplification of evaluation process. No problems with subcontractors occurred, and no delays regarding the delivery and installation of procured objects. If any problems were risen, results should be sought after in the table below to protect the everyone's best interests.

Implementation phase was slightly delayed related to the Act of God clause referring to the global pandemic scenario and cross-border interactions with neighboring states. Lack of communication also stands as a major factor when dealing with project management, but solution regarding the training of the personnel was fixed immediately resulting in slower but not non-existing necessary communication. Everything was duly enabled and fixed respecting the overall project timelines.

8.7. Pilot 7 risks and risk mitigation - Spatial Data Management System

#	Risk description	likelihood	impact	severity
1	Pilot project purpose and need is not well-defined	Medium	High	High
2	Project design and deliverable definition is incomplete	Low	High	High
3	Project schedule is not clearly defined or understood	Low	Medium	Medium
4	No control over staff priorities	Medium	Medium	Medium
5	Consultant or subcontractor delays	Medium	High	High
6	Estimating and/or scheduling errors	Medium	High	High
7	Unplanned work that must be accommodated	Low	High	Medium
8	Lack of communication, causing lack of clarity and confusion	Medium	Medium	Medium
9	Pressure to arbitrarily reduce task durations and or run tasks in parallel	Low	High	Medium
10	Scope creep	Medium	High	High
11	Unresolved project conflicts not escalated in a timely manner	Low	Medium	Medium
12	Proposed pilot action becomes obsolete or is undermined	Low	High	High
13	Delay in earlier project phases jeopardizes ability to meet fixed date	Medium	High	High
14	Added workload/time requirements due to new direction, policy, other changes	Low	Medium	Medium
15	Inadequate testing leads to large post go-live snag list	High	High	**High**
16	Legal action delays or pauses project	Low	Medium	**Medium**
17	Stakeholder or PP refuses to approve deliverables/milestones or delays approval	Medium	Medium	**Medium**
18	Theft of materials, intellectual property, or equipment.	Low	High	**High**
19	Acts of God leads to loss of resources, materials, premises etc.	Low	High	**High**
20	Pilot project stakeholder's action (or lack of) delays project	Low	High	**High**

The main risk is related to the unavailability of some data sources that have been identified as optimal for the system implementation. This risk can be related to #13 item of the risk register which suggests to track the stages and schedule slippage early; since this risk has actually occurred, an alternative data source package among the available datasets has been defined.

No risks of delay due to tendering procedures has been envisaged as possible need of additional external resources was initially identified. However, an unscheduled tender has been published in August 2021 to hire two experts in data management and training. The procedures have been carried out without significant delays.

No significant risks or delays have been encountered during the other implementation stages. Regular reporting on ongoing actions regarding the pilot advancement were documented in Pilot progress reports. Only some minor risks have been experienced due the mentioned delays in

data acquisition, some internal re-organization events within the Port System Authority as well as the SARS-CoV-2 pandemic situation.

The pandemic had a significant impact on traing activities. The organisation of training courses and training-on-the-job activities has been difficult since safety limitations dramatically reduced the willingness to participate from employees. To carry out the training, the program has been delayed and protracted until the end of 2021, with some activities scheduled after the project completion.