# DigLogs

# Transferability plan

## Activity title: 5.4 Transferability plan

## 5.4.4 Transferability plan

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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. Transferability and replicability

Transferability is often defined as the ability to transfer and adopt successful measures previously adopted elsewhere, and to achieve comparable results. There is no “universal recipe” to transferability, due to the large number of variables to deal with. Numerous experiences have provided a wide range of concepts for transferability, depending on goals, contexts of application, measures/solutions to transfer, stakeholders involved, etc. Theoretical principles and standard procedures can be used and adjusted to the issue at hand, with special attention to methods to identify general perspectives and goals which usually support the transferability process.

The transferability of project results is a basic requirement of most projects that obliges to share experiences and to transfer the project results achieved within the project. The attention must be given to the process of development of the project, the main steps of the project, main questions that were raised and solved during the development, etc. All the above has to be widely diffused towards the future stakeholders. The main objective of transferability should be to gain the commitment of other stakeholders and target groups in replicating the project results, having in mind that they will probably not have the financial support of EU funds as the Diglogs project partners and their pilot actions have had.

Transferability plan is an important component of any organized activity, Diglogs project included. Transferability activities define the transferring methodology, identify outputs to be transferred, actors and other issues to be addressed by transferring actions. In other words, the Transferability plan defines the activities aiming at transferring and promoting the project results to the decision makers, stakeholders and wide public. Transferability plan should (at least) identify the outputs to be transferred, specify project results, specify target or audience groups (direct and indirect), specify authorities, analyze relevant environment factors and determine the cooperation scope with above mentioned stakeholders, before transferring the actual results. The majority of the above mentioned has already been put into words in previous Deliverables published witin Activity 5.4 of the Diglogs project.

The purpose of the Transferability plan is to transfer the results of the project to the different stakeholders, and to make the best practices developed in the project replicable. Transferability

plan's principal objective is the transfer of technical knowledge, results obtained in the project, problems encountered, and lessons learned during (and after) the end of the project. The transferability and replicability of the project results should be supported by clearly defined activities.

The aim of this document is to analyse the potential of the Diglogs project to be transferred and replicated by other stakeholders after project closure, following up on Deliverables 5.4.1 – Template for assessment, 5.4.2 – Data collection and 5.4.3 – Performance Assessment Results. The strategy of project replicability and transferability should include both the activities aimed at ensuring the project continuation after its closure, and specific tools for replicability and transferability. The DigLogs project recognizes the need of replication and/or transfer of project results to other contexts/entities/regions for the same, similar, or even different purpose. This will contribute to project efforts by utilizing practices, methodologies and actions already successfully implemented as a part of this project.

"Replication" means that the same methods, techniques, or practices developed and/or used in the project are used again in the same way and for the same purposes by other entities, while "transfer" means that methods, techniques, or practices developed and/or used in the project are used in a different way or for a different purpose. However, replication is not merely a repeated application of a new business model or the exploitation of a good idea. The replication strategy involves investments in discovering and learning about what those complex, interdependent processes, and customer-valued aspects of the business model that are replicable and worth replicating actually are.

The transferability measures planned within the Diglogs project are interconnected with implementation, monitoring and dissemination actions. Communication and dissemination activities will have an important role in facilitating the replicability and transferability by reaching a broader audience. The strategy of dissemination and use of results depends on the project objectives and its main activities. The needs of identified target groups (potential future users of project results) should be recognized and verified. This is facilitated by consultations and the inclusion of target companies through information or participation in pilot testing.

The purpose of disseminating Diglogs project results is not only to spread the knowledge, but also to contribute to the shaping of both national and European policies. The dissemination goals

should definitely focus on ensuring the maximum durability and sustainability of the results. Diglogs project partners should choose relevant tools (for example social media, website, press releases, conferences) to disseminate results according to the interests and needs of the defined targeted audiences. In this context, for example, oral presentations, posters, publications encouraging the exchange of ideas etc. should be prepared. Diglogs project partners should arrange meetings with national, regional or local authorities and other stakeholders in order to enhance the transferring of project results, knowledge and experience earned. Project website and social media accounts should be further managed after the project closure. Further scientific papers should be published in peer-reviewed journals, and the results presented at international conferences. Information and education materials should be disseminated further. Dissemination events should be organized both at national and international level by project partners, in order to provide the necessary expertise to extend the results of Diglogs project. Attention should also be given to networking activities to ensure the transferability and replicability of the project results, for example events addressed to different stakeholders to facilitate cooperation, to share data and to transfer knowledge. The objective should be to transfer the results of the pilot actions beyond the territorial and administrative limits of the pilots.

Project results will outlive the lifetime of the project itself and have a long-term impact on the cross-border area. The project outcomes and deliverables will spread throughout the entire programme area and will become valuable tools for further measures in the region. The establishment of similar pilots should be a part of a long-term strategy to foster the joint opportunities after the end of the project, which can lead to increased knowledge and competitiveness in the region, and increase of added value created in the region, going far beyond the project itself. Experiences can be exchanged, and job opportunities can come into the market.

The availability of the materials developed during the project and adapted to the needs of the region is a prerequisite for their incorporation in the future. The partners will carefully observe the project results and estimate what other projects or activities can be developed in the cross-border area. After the end of the project, they will continue their efforts for supporting similar actions in the region and will search for further opportunities. The established connections with

local communities, business representatives and authorities, and other stakeholders will provide opportunities to deepen the relations in benefit of the cross-border region.

In conclusion, the replicability and transferability strategy of the project is based on specific replicability tools, but also intertwined with several actions of the project that ensure networking and future cooperation opportunity throughout the whole project lifecycle and beyond it. The implementation of the Transferability plan is expected to promote the development of future joint action and cooperation opportunities and to extend the results of the project. In order to obtain successful transferability, the most important factors to ensure the durability and the sustainability of the Diglogs project need to be understood:

- **Maintaining a strong network** is a key element, to establish relationships with other stakeholders, considering the possibility of participating in future projects with a partnership that shares the common objectives.
- **Integrating Diglogs pilot results in a local or regional system,** in a way to ensure the durability of the model.
- **Advertising results and outcomes ready to be capitalized,** offering the methodology and the tools ready to be adapted and implemented.
- **Finding new funding,** through private or public funding sources (EU or national funding).

# 3. Brief pilot descriptions

In the following subchapters, a brief 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)

A more detailed description can be found in Deliverable 5.4.2 - Data Collection, and in the respective Pilot Work Plans.

## 3.1. 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.

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.

## 3.2. 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.

## 3.3. 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 localisation. 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.

## 3.4. 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.

## 3.5. 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.

## 3.6. 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.

## 3.7. 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.

# 4. Benefits, disadvantages and improvements of Diglogs pilots

In order to achieve successful transferability and replicability of Diglogs project results, benefits, disadvantages and improvements of Diglogs pilots should be studied. Benefits and disadvantages serve as a starting point towards the need for potential improvement. This chapter contains summarized notes and aggregated information regarding the outputs derived from the individual Diglogs 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, transferability and replicability.

Explanation of the individual pilot benefits will answer 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 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 are 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 pilots, after reaching their 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:

- Initial data digitization **cost** (*digitization is the conversion process applied to the current system into a digital information*)
- Initial assessment for personnel training by using digital information. It is necessary to prepare and share simple and easily understandable (video/PDF) instructions and guidelines
- Providing users with computers, tablets, smatphones or similar devices with good and stable Internet connection
- To have a fully functioning working service of WMS 4.0, digitization should be fully completed
- The transition of data transfer from the current system to WMS 4.0 represent a crucial step to be carried out quickly without generating bottlenecks to (other) logistics and data processes
- It is necessary to make periodic backups of the data to avoid their loss at any time. Backups must be performed periodically every few days so as not to block the operation of the system

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.
- Data completely synchronized between all the operators involved. This means avoiding database update delays by having an optimized RESTful service
- By obtaining of historical data, will be possible to increase the efficiency of intermodal transport, achieving better environmental protection. In this way it will also be possible to make predictions based on the data collected in the previous months / years

- Possibility to carry out electronic invoicing operations and purchasing services securely with credit card (Visa, Visa Electron and MasterCard) and prepaid card
- Data storing completely in cloud by respecting all the security policies makeing sure the cloud system uses strong data security features

| Type of Enablers and/or Barriers | Description | | |
|---|---|---|---|
| | **Benefits** | **Disadvantages** | **Improvements** |
| **Financial** | - Using digital information data will reduce labour cost<br>- Decrease warehousing and transportation logistic costs | - Initial data digitization cost | - By using historical data information additional revenue may be generated<br>- 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 | - Initial assessment for personnel training by using digital information<br>- Providing users with computer, tablet, smatphone or another device | - Better connection by SMS or QR code between terminal gates operator and couriers |

| | | | |
|---|---|---|---|
| | - Will solve last mile transport segments by making use of specific algorithms and coordinated data of the whole intermodal transportation chain | connected to Internet | |
| **Technological** | - Digitization of data information<br>- Centralized data information system | - Digitization should be fully completed to have a full working service of WMS 4.0 | - Data completely synchronized between all the operators involved |
| **Environmental** | - It is expected to produce fewer carbon emissions and relief traffic pressure on arterial roads | - n/a | - By way of gathering hutorical and real-time data from multiple stakeholder, it will be possible to increase the efficiency of intermodal transport, achieving better environmental protection |

| | | | |
|---|---|---|---|
| **Political** | - n/a | - n/a | - n/a |
| **Legal** | - Electronic documentation availability | - The transition of data transfer from the current system to WMS 4.0 | - Possibility to carry out electronic invoicing operations |
| **Security & risk** | - Accurate real-time monitoring and control of incoming and outcoming couriers from terminal | - It is necessary to make periodic backups of the data to avoid data losses at any time of the logistic process | - Data storing completely in cloud by respecting all the security policies |

## 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;<br>- Financial benefit of forecasting in advance the shipment costs, reducing potential losses;<br>- 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;<br>- 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;<br>- Standardization of the financial conditions of the MTOs, by adopting a brokerage approach. |
| **Physical** | - Huge reduction of non-productive movements, in particular at terminals; | - Potential over-reliance on the system, causing non-productive movements generated by | - Increase of the physical interactions of the system at terminal, with back-up plans; |

| | | | |
|---|---|---|---|
| | - Increase of acceptance procedures at terminals, with reduction of queues and boarding times | false or incorrect information;<br>- Potential faults at the terminal gates' systems may disconnect the system operations and generate queues | - 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;<br>- 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;<br>- 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.<br>- The potential system disfunctions can be resolved by technical improvements, back-ups, cloud |

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| | | | based solutions and risk management. |
| **Environmental** | - Massive impact on the environment, thanks to emission cutting multimodal routes planning;<br>- 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;<br>- 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;<br>- Better calculation of the bonuses | - 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) will allow a better |

| | | | |
|---|---|---|---|
| | (such as Ferrobonus / Marebonus - European Rail and Sea Incentives) to be given to rail and multimodal users. | | identification of bottlenecks and infrastructural limitations;<br>- This could be a perfect tool for Rail and Sea incentives calculations across Europe, if the system would be institutionalized;<br>- 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;<br>- The system, if institutionalized, |

| | | | |
|---|---|---|---|
| | - Legal notices and conditions of service, particularly for sea and rail routes can be better advertised on the platform. | additional competition. | 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 weights, gabarits and | - Safety breach of the system could cause caos and malfunctions across the multimodal chain. Hackers and viruses are | - Multiple checks across the supply chain, as well as a mix of human and computer supported decision making tools, can avoid |

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| | 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;<br>- The digitalization of the documents and a system of "hierarchy based" authorization processes, grants more security than the paper-based procedure. | the key enemies on this point;<br>- 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. | the over-reliance on the system;<br>- 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.

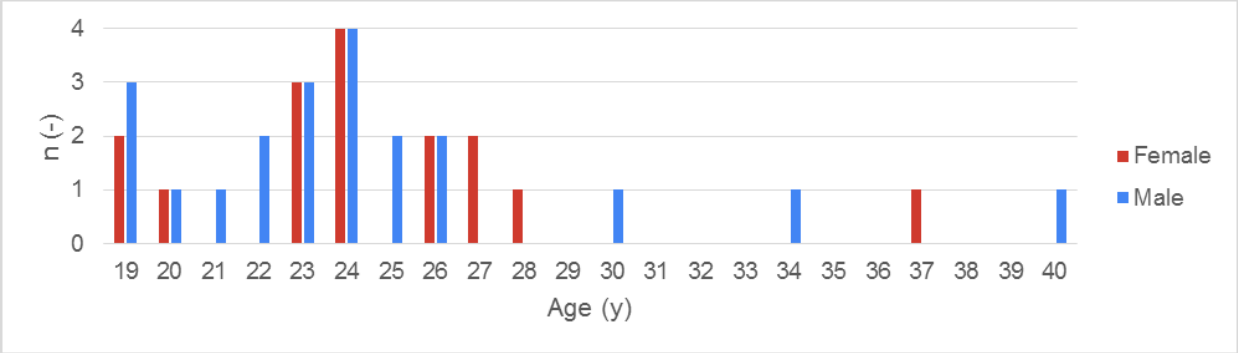



*Figure 1 –The area (in red) used during the trials with the doors (FD) that can be closed to simulate the different scenarios*

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.

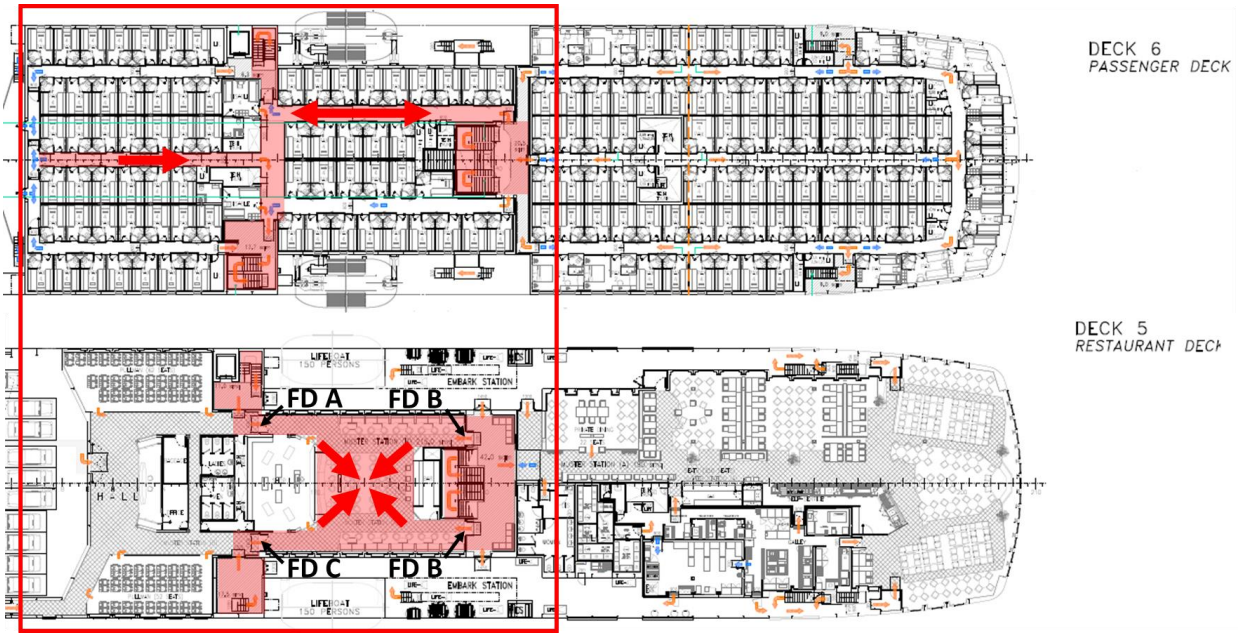



*Figure 2 –The area (in red) used during the trials with the doors (FD) that can be closed to simulate the different scenarios*

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.

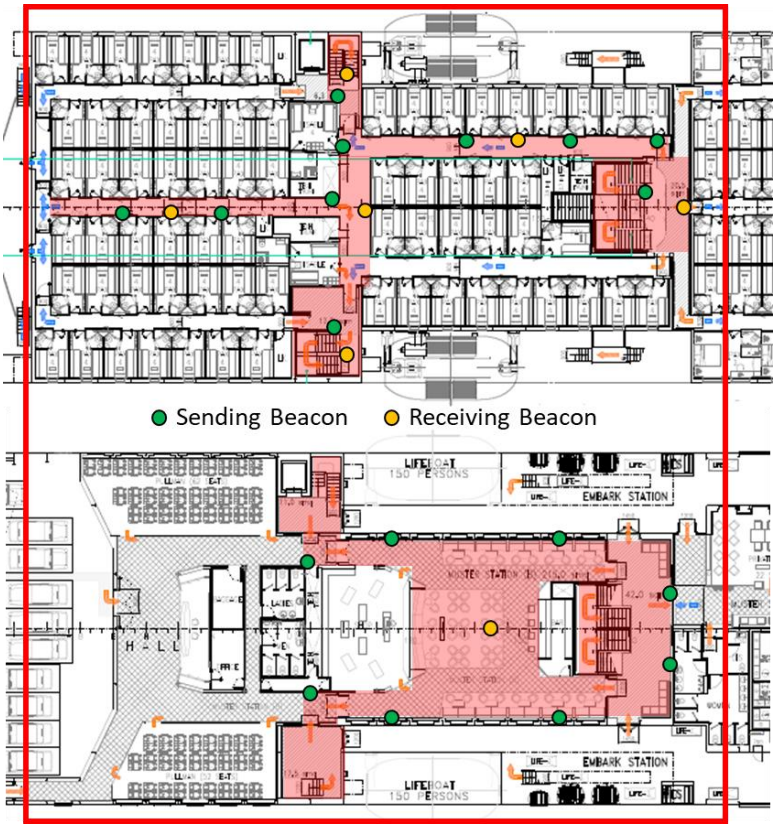



*Figure 4 – Signals given by the smartband*

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 38nauthorized data analytics<br>- Possible additional revenues coming from additional services based on 38nauthorized | - Additional initial investment costs | - Additional revenues might come from the increased corporate image due to improved passenger safety<br>- 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<br>- The steel-made environment causes Bluetooth signal reflection problems | - The connection of beacons to a source of power keeping the batteries charged is recommended<br>- 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<br>- Beacons signal strength shall be kept as low as possible.<br>- Beacons should be installed on the ceiling and emit signals primarily downward<br>- Provide fixed position-based instructions only |
| **Technological** | - The adopted system architecture can be easily scaled<br>- 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 40nauthorized data | - Maintain 40nauthorized data in anonym form |
| **Security & risk** | - The system reduces evacuation time<br>- The system enables lost passenger 40nauthorized<br>- The system might be used to detect 40nauthorized 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

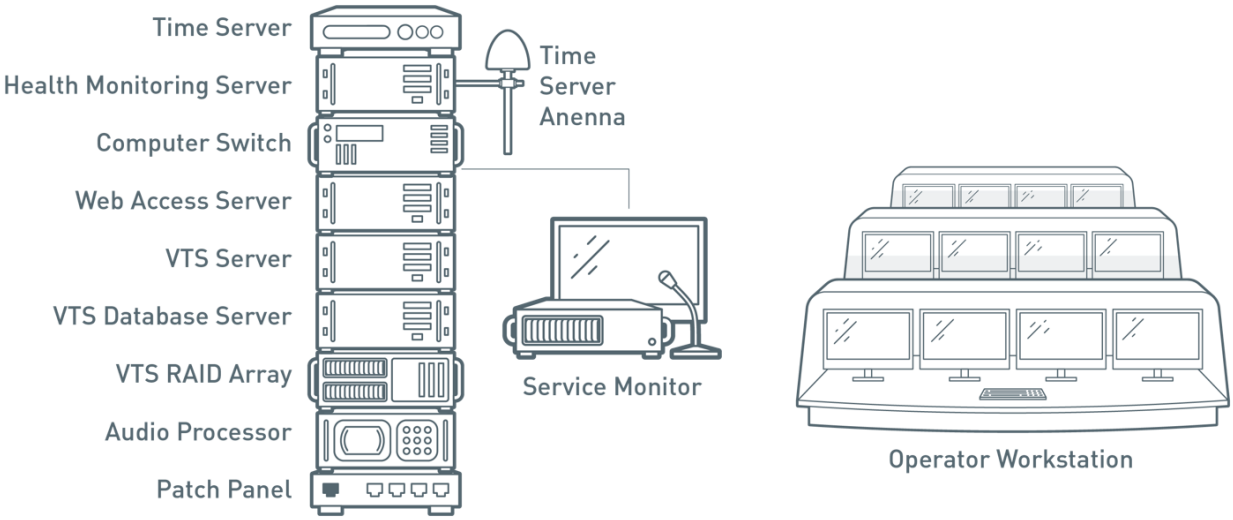



Figure 1: Configuration of the VTS system

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

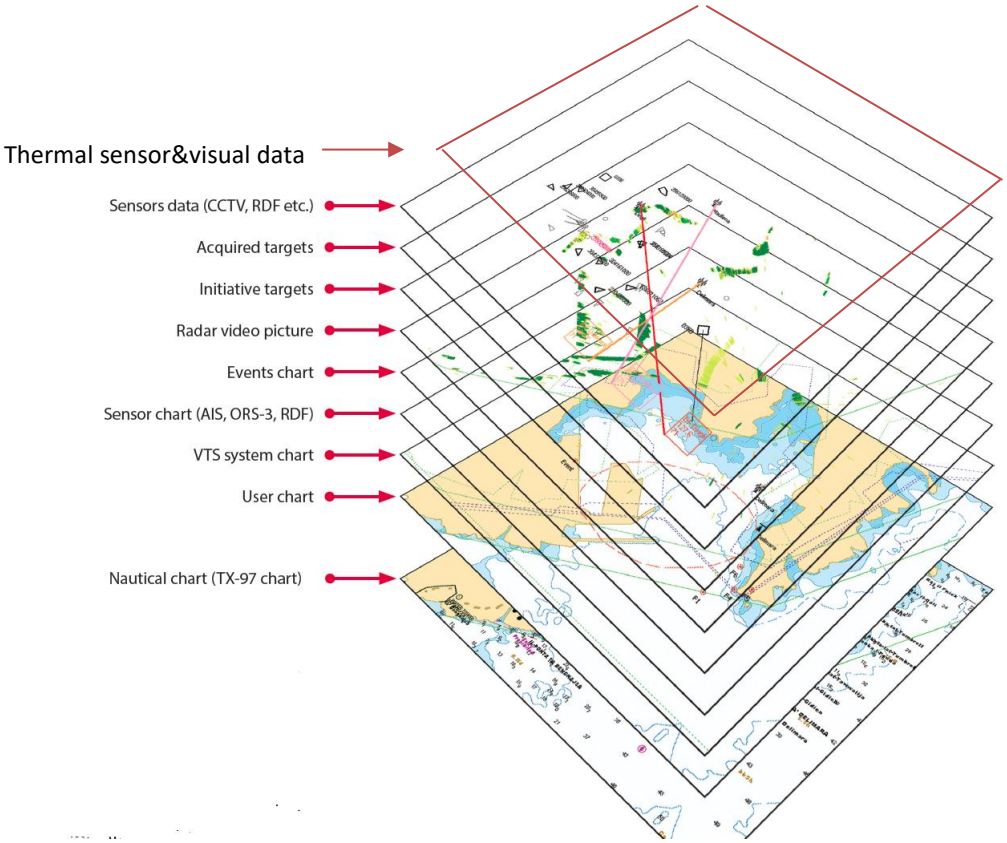



Figure 2: VTS overlays and added-value information

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.

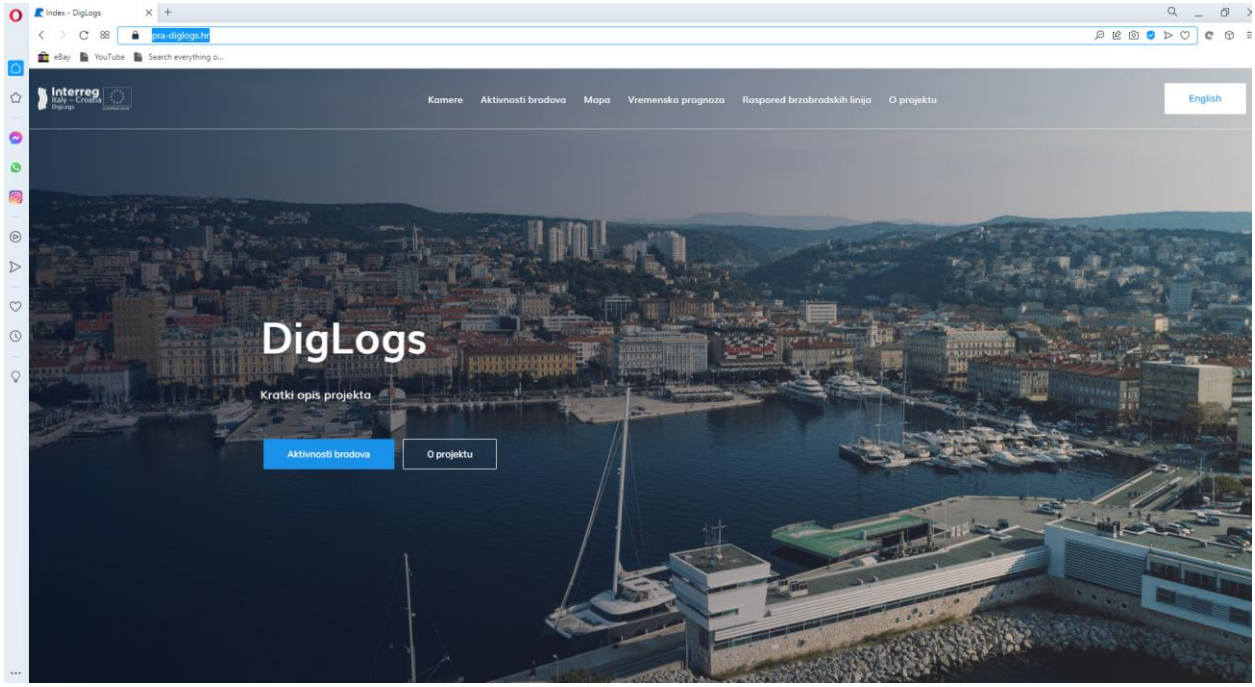



Figure 3: Portal of the DigLogs (passenger part) pilot project

**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<br>- 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<br>- 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<br>- streamlines PFSO activities<br>- transfer effect to the end users (passengers) | - n/a | - increased security for the passengers<br>- 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<br>- 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<br>- 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<br>- better overview for the Ministry of the Interior | - n/a | - transparency for the PFSO<br>- faster processing for the Ministry of the Interior |
| **Security & risk** | - increased security enhances ISPS<br>- streamlines PFSO activities<br>- 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<br>- better overview<br>- 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

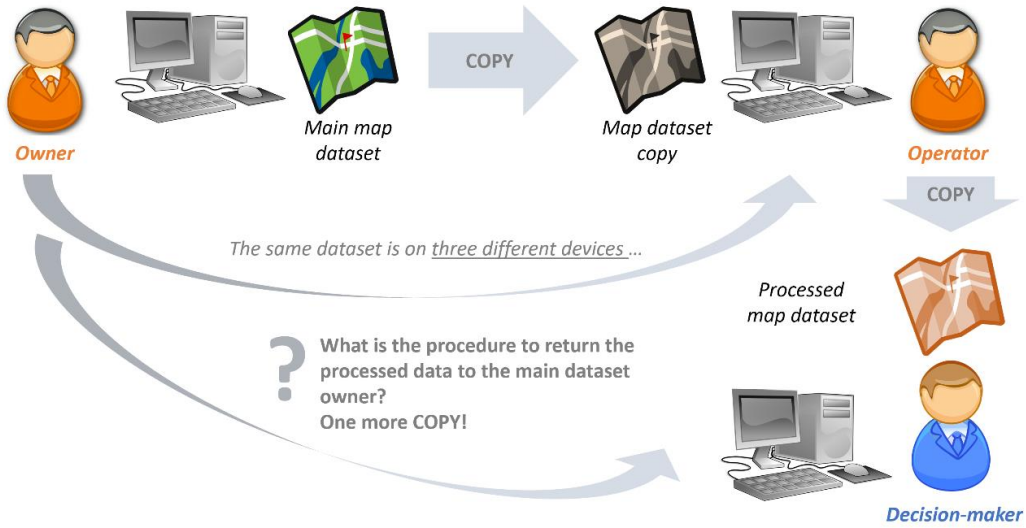
**Explanation of the individual pilot benefits**

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.

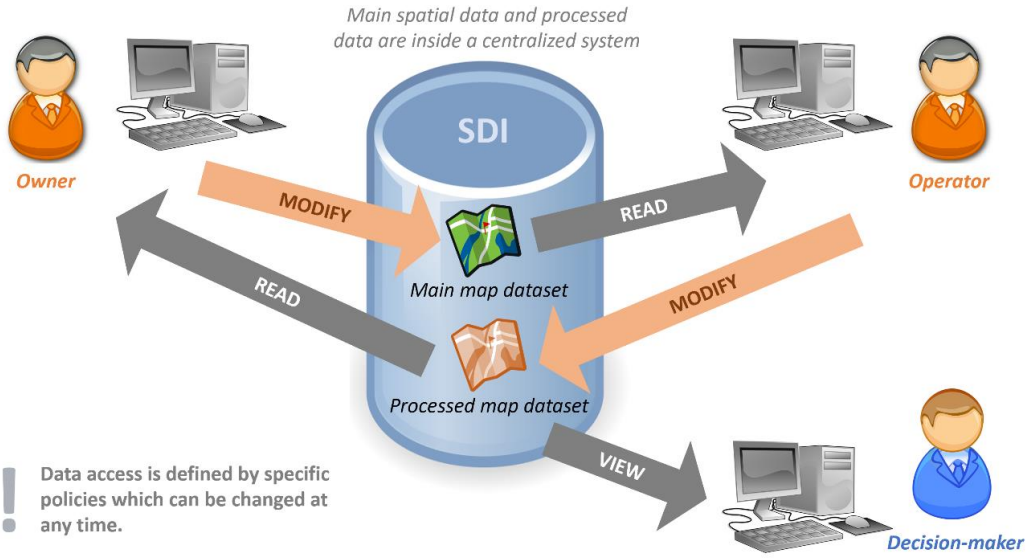
The pilot action is mainly aimed at making a transition from a current situation in which data is ineffectively managed and used to an improved condition in which more different data can be integrated and dynamically accessed by several users according to different policies and objectives without replication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

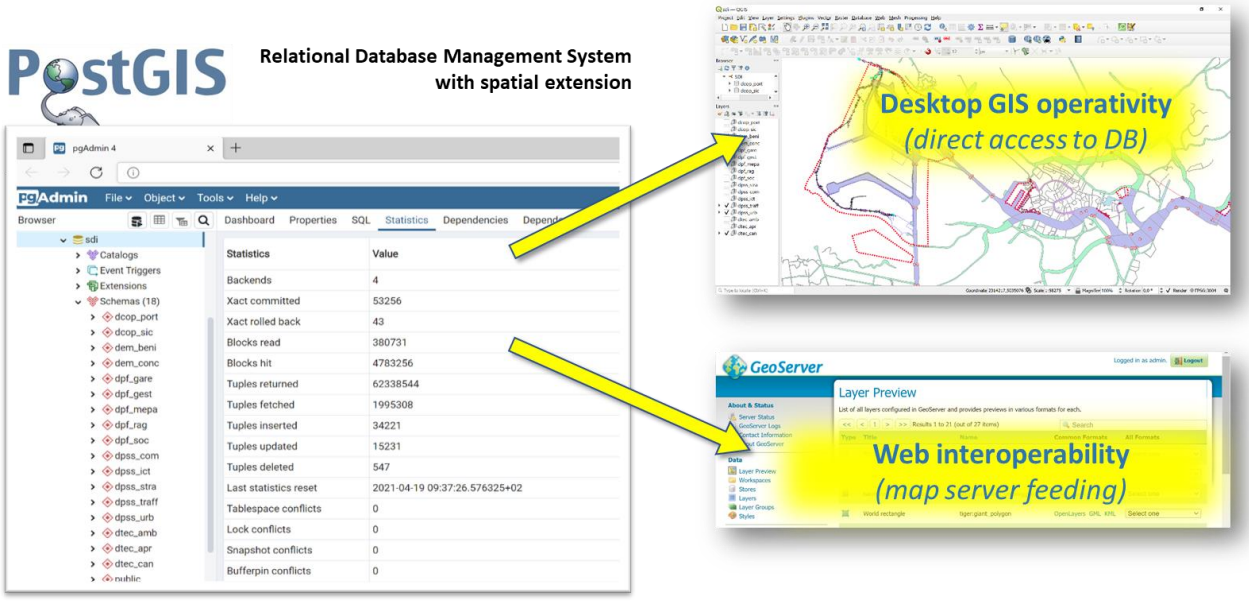



This makes difficult both to keep dataset up-to-date and share it in an effective way, and it significantly reduces processes performance.

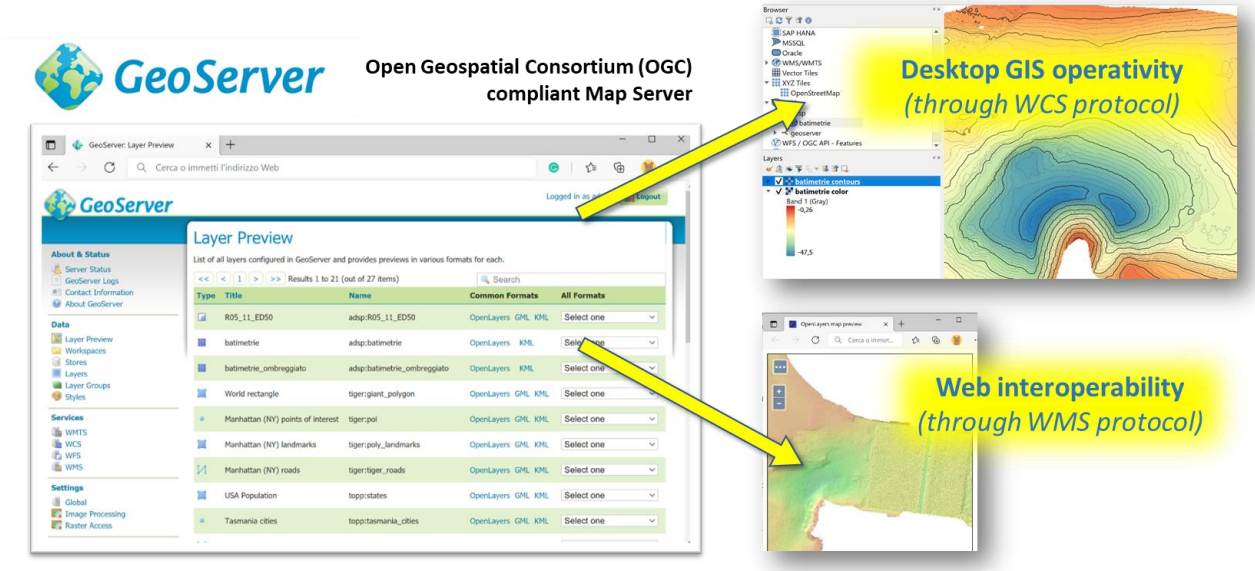
In the improved scenario, a Spatial Data Infrastructure, crafted by integrating existing tools and platforms, will be adopted.



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<br>- 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<br>- 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 |