DigLogs

4.3.3 - Involvement of selected players and delivering of road maps final version

University of Trieste

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Notes: The following partners contributed to the content of the core sections: Port of Rijeka Authority, Port of Rovinj Authority, Port of Šibenik Authority, Aksentijevic Forensics and Consulting, Ltd, CFLI			

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Introduction

In the previous phases of the DIGLOGS project, the passenger mobility harmonization has been studied, selecting 5 innovation dealing with this topic. For each innovation, a dedicated pilot project will be carried out in the next phases of the DIGLOGS project. To assure an effective development of the selected technologies, a roadmap has been drafted for each of them. The road mapping process is divided into three steps:

- Fist version of the roadmap (V1) carried out by the project partner in charge of the pilot project according to a common methodology.
- Stakeholders involvement aimed to revise the roadmap V1 to maximise the contribution of most important stakeholders in the project area
- Final version of the roadmap (V2) incorporating the stakeholder feedback.

Currently, the roadmaps V1 have been already finalised and the stakeholders' involvement completed. Each partner in charge of a pilot-project collected stakeholders opinion about the roadmap V1. Based on the outcomes of the consultation phase each partner in charge of a pilot project shall review the roadmap to finalise the V2, which is the main content of the present document. This second version incorporates the remarks coming from stakeholders, finalising the strategy proposed for innovation deployment. Moreover, provide a recap of the adopted road-mapping technique in order to ease the interpretation of the final results and a list of all the stakeholders involved in the review process.

This document is expected to ease the deployment of the selected innovations, contributing to foster the digitalisation process in the project area. Moreover, the outcomes of the present study might serve as best practices and be useful in other contexts, after a proper re-elaboration based on the different application environment.

1 Objectives of this document

In this document, the final version (V2) of the roadmap is reported, representing the consolidated version of the V1 contained in D4.3.1. it refers to the strategic planning technique of "road mapping" and comes as an overall "what-why-how" list, including both physical and intangible elements that can be changed to achieve the goal of the innovation deployment.

Final roadmap V1 has provided the basic framework for the subdivision of pilot into deployment actions and activities and their first basic arrangement into a timeline.

According to strategic planning literature, the roadmap "what-why-how" list is based on the following questions:

- <u>WHAT element of the context can be changed</u> to achieve the objectives expected from the innovation pilot deployment?
- <u>WHY a context element must be changed</u>? What is the specific objective to achieve changing that element?
- Briefly, <u>HOW to change the context element</u>? What can be tools, methods procedure to change it?

The roadmap answered the above question including, at the moment, the following **11 context elements**:

1. Knowledge and awareness about internal assets and resources
2. Products and services
3. Organisational model
4. Employees' skills and capabilities
5. Processes and procedures
6. Information assets
7. Machinery and equipment
8. IT infrastructure
9. Financial resources
10. Goods and real estate
11. Corporate image

1.1 Deployments roadmaps to increase competitiveness of multimodal transport services

The main objective of the 4.2 activity is to define a road map for innovative solutions deployment in the freight sector segment.

The DigLogs pilot action brief list is the following:

- Action 5.1 Freight pilot implementation
    - 5.1.2 - Warehouse Management System 4.0 (aimed at implementing multimodal transportation solutions)
    - 5.1.3 - PCS Automation (new automation functions to be applied on existing PCSs)

- Action 5.2 Passengers pilot test
    - 5.2.2 - Mobile APP for passenger security (mobile app and beacon WSN implementation) - UNITS
    - 5.2.3 - APP for data flows management of passengers (data integration for the development of new services for passengers) aimed towards Rijeka port
    - 5.2.4 - Digitalization of access control as a prerequisite for integration with the national PCS in Port of Šibenik

- Action 5.3 Combined pilot implementation
    - 5.3.2 - Management solution for passengers and freight transport combination. (Maritime Transport Management by linking PCS and national platform for Croatian ports)
    - 5.3.3 - Big Data / Data management solution for planning (Spatial Data Infrastructure version 1 and skill enhancement for Venice port)

Since this deliverable is focused on the **passengers' sector**, it will include roadmaps for pilot actions 5.2.2, 5.2.3 and 5.2.4. Furthermore, according to agreement from project video meetings held on 7th and 8th April, combined pilots contribution are uploaded to the shared project folder the same way than others and the agreement was that they are included in both deliverables including a brief description of freight/passengers impact, since a dedicated deliverable for them is not foreseen.

2 Roadmap strategic "what-why-how" list

This chapter is divided into 11 paragraphs, one for each context element.

For each context element, a brief description is provided, a list of strategic objectives, forming the "why change" list, and a list of the type of actions that can be carried out to achieve the goals, as well as a short sample list of possible actions useful to better understand the possible changes.

2.1 Knowledge and awareness about internal assets and resources[1]

Internal assets and resources are the core value of an organization and include all physical and intangible resources, from financial, knowledge and organizational resources to machinery, technologies, workforce, and real estate.

This first context element is about the knowledge referring to both intrinsic values of items and their productivity and performances.

It is very important to have the most accurate and detailed report of available resources in order to develop any subsequent planning and design action.

2.1.1 Why change

- Better understand performance and lacks in the organization model
- Better understand skills, capabilities, and productivity of workforce
- Better know the quality, accuracy and completeness of data and information
- Better understand the adequacy of available technologies
- Better know the regulation framework
- Better know the adequacy, performance and lacks in methods, procedures, and protocols
- Better know the amount of financial resources and funding opportunities
- Better know the value and adequacy of machinery and work tools
- Better know the value of owned real estate

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[1] To be defined if it is also external assets should be included (e.g. a market analysis is about something external from the organization)

2.1.2   How to change

- Perform assessments
- Make prototypes
- Run tests and experimentations
- Perform monitoring and benchmarking
- Carry-out make-or-buy analyses
- Make censuses of available resources
- Make needs analyses
- Make requirement analyses

Change actions examples

- o *Production process analysis*
- o *Market scouting*
- o *Data sources census*
- o *Relationship issues assessment*
- o *…*

2.2   Products and services

Products and services are the core business of a company or an institution. Changing a product or a service does not mean changing the production or the provision process (processes are another context element) but changing the specific features of a product or a service. Changing products and services is often a response of some modification of the broader context of the production and provision process.

2.2.1   Why change

- Meet the new needs emerging from customers and users
- Make product or service cheaper and/or more effective
- Make product or service more compliant to the broader context
- Replace non-digital parts with digital or add new digital-based parts
- Make product or service more attractive or usable

- Make products or service more integrated with other products or services

2.2.2   How to change

- Add a new product or service to portfolio
- Redesign a product or a service
- Redesign products packaging
- Use different products or services delivery/provision ways and channels

Change actions examples

- o *New information service development for customers or suppliers*
- o *Design of a new packaging with identification system*
- o *Document dematerialization*
- o *Porting of service to web-oriented systems*
- o *…*

2.3   Organisational model

Organisation model is how responsibilities and activities are assigned to persons or groups of persons referring to specific areas, but it can also include relationships network, materials' sharing, information exchange and communication models.

2.3.1   Why change

- Meet the new needs emerging from employees and decision-makers
- Ease integration of processes
- Motivate employees
- Exploit workforce skills and capabilities
- Improve information exchange

2.3.2   How to change

- Reassign roles
- Reassign activities
- Redefine groups, internal areas, and relationships

- Improve information exchange and reduce redundancy and inconsistence
- Improve internal and external communication

Change actions examples

- o *Centralized information and data access policy plan*
- o *Common protocol for institutional/corporate communication*
- o *New/revised organization chart*
- o *New/revised internal areas subdivision*
- o *…*

2.4 Employees' skills and capabilities

Skills and capabilities refer to human resources and they are one of the primary production factors of a company or an institution.

2.4.1 Why change

- Make employees able to use tools and apply procedures
- Increase employees' cooperation
- Increase workforce productivity
- Increase decision-makers capability to define workgroups and internal areas subdivision
- Increase decision-makers capability to understand/assess inputs, outputs and times of production and service provision processes
- Increase decision-makers capability to forecast skills and capabilities needs

2.4.2 How to change

- Carry on educational and training activities for employees and decision-makers
- Support tools and methods adoption and utilization
- Provide self-training materials
- Hire new professionals

Change actions examples

- o *Refresher courses*

- o *Workshops*
- o *Training on the job / coaching*
- o *E-learning systems development*
- o *Recruiting plan*
- o *…*

2.5 Processes and procedures

Processes, procedures, protocols, and regulations concerning how products and services are provided. Changing processes and procedures does not mean changing assets, infrastructures, materials, workforce which are other factors, but changing the way they are integrated to get to the final product instead.

2.5.1 Why change

- Increase overall productivity
- Make processes faster and/or more effective; eliminate bottlenecks
- Make processes more compliant to the broader context and exploit digital innovations
- Make processes easier for employees
- Make processes more integrated with other processes
- Embed new tools or methods inside existing processes or define new processes based on the use of new tools and methods

2.5.2 How to change

- Redefine the combination of the production factors
- Re-allocating resources or including new resources
- Redefine times and sequence, scheduling, relationships between resources or with other processes
- Make new regulations or review existing ones
- Replace obsolete activities
- Develop integrated procedures to eliminate redundant activities
- Include interoperability

Change actions examples

  o *Production process revision plans*
  o *Time scheduling, GANTT charts and other time-optimization tools*
  o *Replacement of non-digital tools with new generation digital tools*
  o *System Integration projects*
  o *Laws / rule books*
  o *…*

2.6   Information assets

In logistics decision-making processes, the information assets are the main support resource. In this era, it is mostly called "the new oil" with reference to data sources and data streams flowing through the IT networks.

2.6.1   Why change

- Avoid bad decisions caused by bad data
- Better support processes
- Increase product and services quality
- Increase analysis, forecast and estimation capability
- Improve assets management
- Provide new services to customers, users, and suppliers

2.6.2   How to change

- Collect new data
- Optimize available data
- Process and integrate data
- Define extraction, transform, and load algorithms
- Connect to data sources

Change actions examples

  o *Data collection campaigns*

o *Data purchasing*
o *Data geocoding*
o *Data classification*
o *ETL system development*
o *Big Data extraction*
o *…*

2.7 Machinery and equipment

Machinery and other equipment are the set of physical production tools of the organization. Notice that we consider IT hardware tools as another element of the list.

2.7.1 Why change

- Increase productivity
- Allow a new product or service provision
- Increase a product or service quality or intrinsic value
- Ease work procedures
- Increase work safety
- Obtain new working process functions

2.7.2 How to change

- Purchase or rent a new tool or machine
- Modify or integrate an existing tool or machine
- Integrate a tool or machine with another one or with a system

Change actions examples

o *Purchase of box for sensor installation*
o *Machinery stock update plan*
o *Installation of energy distribution slots*
o *…*

2.8 IT infrastructure

The IT infrastructure of an organization usually includes hardware devices, software tools and network connectivity.

2.8.1 Why change

- Obtain or increase digital information storage capacity (increase room)
- Obtain or increase computer processing power (increase speed)
- Obtain new digital information processing functions or update existing (improve results)
- Obtain or increase digital information network exchange capability (improve sharing)

2.8.2 How to change

- Purchase or rent storage devices
- Purchase cloud-based storage services
- Purchase or rent server computers, workstations, client, or personal computers.
- Purchase cloud-based computing solutions
- Purchase and install sensor devices and actuators
- Purchase software licenses
- Update operating systems and applications
- Purchase and install network devices and infrastructures
- Perform systems and applications update, tuning and maintenance

Change actions example

- o *Wireless Sensor Network implementation*
- o *Mobile APP development*
- o *Web hosting service purchasing*
- o *Server computer empowerment*
- o *Wireless network devices installation*
- o *…*

2.9 Financial resources

Available financial resources, in terms of budget and financing funds.

2.9.1 WHY CHANGE

- Allocate resources for the needed actions
- Re-allocate resources according to new available funds and resources
- Re-allocate resources according to actions progress and results

2.9.2 HOW TO CHANGE

- Define budgets
- Make an economic and financial plan
- Make purchases, contracts, and payments
- Make economic and financial progress reports and plans
- Make in-progress and final economic and financial balances

Change actions example

- *Project budget plan*
- *Purchase orders*
- *Public procurements*
- *Budget revision report*
- *…*

2.10 Goods and real estate

Excluding machinery and equipment, goods and real estate are tangible assets that have intrinsic or operational value which can be considered part of production or service provision processes.

2.10.1 Why change

- Meet the needs of assets of production or service provision processes
- Redefine the use of assets according to production or service provision process
- Increase assets value

- Improve asset features

2.10.2 How to change

- Obtain real estate
- Add functions or equipment to real estate asset
- Increase needed assets and movable properties quantity
- Improve needed assets and movable properties quality, usability, durability

Change actions example

- o *Purchase a warehouse*
- o *Make a rooms or office barrier-free*
- o *Electrify a dock*
- o *Purchase a stock of warning signs*
- o *…*

2.11 Corporate image

Corporate image is how a company or institution is evaluated and considered by others. Corporate image is known to have an intrinsic value related to several factors like communication strategy, marketing strategy, identity design, customer relationship, social responsibility, products and services portfolio and others.

2.11.1 Why change

- Make improvements, new products, services, and features known to the public
- Increase competitiveness and attractiveness
- Improving relationships with partners, customers, and suppliers
- Entering new market sectors
- Entering new market segments

2.11.2 How to change

- Design / re-design brands
- Modify products and services portfolio

- Promote products and services through the media
- Use social media
- Make advertising
- Make social events
- Disseminate research results
- Involve people, companies, institutions, and professionals in activities
- Promote social initiatives

Change actions example

- *Brochures*
- *Logo design*
- *Virtual games, contests*
- *Digital advertising (web/mobile app)*
- *Newsletters*
- *Public conferences*
- *Websites*
- *…*

3 Passenger sector roadmap V2

Roadmap V1 was intended as the first step of DigLogs WP4 road-mapping pathway. In V2, the aim is to review the V1 including the findings coming from stakeholders' consultion. When possible, a <u>time planning of implementation steps</u> has been carried out, but the resulting roadmap is not intended to be a detailed work plan but a <u>pre-design stage</u> between strategy and implementation instead.

Pre-design planning draft is done by each action pilot responsible PP, starting from the described 11 context elements and trying to select appropriate objectives from the "why change" section, appropriate actions types from "how to change" and then <u>defining a list of needed actions</u> that it will be the main input for the implementation work plan.

3.1 Innovation deployment pathway

Roadmap V2 first draft takes into account the time horizon of at least 5 years implementation pathway according to the application form pilot action description. To meet this requirement, a list of action types to include in roadmap V2 is suggested below:

- Preliminary assessment stages
- Market analyses
- Financial plan
- Pre-design and detailed workplan design stages
- Services and material procurement
- Project review stages
- Development and deployment stages
- Prototyping and testing
- Stakeholder's involvement stages
- Experimentations and results analyses
- System review and tuning stages
- Performance monitoring stages
- System maintenance
- Market monitoring, system review and update assessment stages

- Education and training stages
- Communication stages

It is important to underline that this, **V2 version of roadmap is a "Pre-design planning draft"** so it will be **less detailed** than an implementation project. Indeed, the goal of the final version of roadmap is to cover 5 years, including the steps to be performed to deploy the innovation considering its broader scope; the detailed implementation project will be developed for the narrower scope of the pilot action instead, starting from the roadmap steps deemed feasible in the context of DigLogs project.

At this stage of the project, <u>each action pilot responsible PP has concentrated on trying to identify the needed (macro) actions</u> to achieve the innovation deployment, starting from strategic objectives, instead of technologies, human or financial resources, in order to define a more robust step sequence along the 5 years pathway.

The stages of the next work package <u>will be focused on one or more roadmap actions</u> to deepen in detail in order to implement the pilot action as a subset of the whole innovation.

This version of the document is amended according to the feedback received from the stakeholders within identified target groups by means of the questionnaire.

3.2 Mobile solutions for passenger safety/security V2 roadmap

Reference selected innovation: **Mobile APP - UNITS**

The mobile technology can help in reducing the time required for the ship evacuation and abandonment procedures. During and emergency, escape routes might be blocked due to fire or flooding, forcing people which is following evacuation signs to turn back and search for alternative routes. A mobile application, guiding passengers through the proper direction in the current situation might reduce such problems while avoiding congestions. Such a technology shall be based on the localisation of passengers (mobile phone, smart watch, or other mobile devices) based on an infrastructure sustained by ship emergency grid and/or an independent source of power.

Bluetooth beacons can be adopted, designing a net capable to localise the passenger through the connections to the nearest beacons. Bluetooth beacons can be sustained by batteries, removing the need for cabling, and thus reducing the installation time and costs (especially in case of retrofits of existing vessels). The localisation data can be collected through the net and transmitted to a backend application. The backend application shall be sustained by the emergency grid and possibly receive data from other onboard emergency systems (fire alarms, fire/watertight doors status, flooding sensors, etc.). The crew on the bridge can access localisation data in case of emergency in order to speed up crew reaction and the countermeasures elaboration. The mobile application can also allow the passengers to rise safety and security alerts to the attention of the crew, improving the situational awareness and a fast and effective reaction to safety and security threats.

Localisation data can be useful also during normal operation. They can be used to early detect unauthorised access to restricted areas, allowing a fast reaction of the onboard security team. Moreover, in case of onboard infections, the localisation records, usually not accessible in order to protect passengers' privacy, could be put at disposal of medical officers. The movements of infect passengers can be analysed in order to identify the passengers that came in contact with them. Then, through the adoption of test and quarantine, it will be easier to contain the infection growth onboard. Finally, localisation can be useful also for commercial purposes, such as allowing big data analysis, providing push notifications related to the passenger position and providing guidance onboard to reach desired destinations.

Before the development of this promising technology, the technical feasibility of a system based on Bluetooth beacons on a ship has to be proven. In addition, the effect on the evacuation time due to the usage of mobile technology should be also studied to prove the benefit of the system. Therefore, a test on a real population is required in order to compare the standard evacuation time with the one related to the adoption of mobile technology. These should be the main objectives of a pilot action forerunning the final system development.

3.2.1 Players involved in revision process

Stakeholders involved belong to different fields (academic institutions, private companies having specific expertise in the field etc.). The major contributors are:

- Espereal Technologies S.r.l.s.
- Marinelab d.o.o.
- University of Trieste

The involved stakeholders does not require changings in terms of tasks compared to V1. Anyway they contribute to validate the proposed tasks, subtasks providing a time estimate and pointing out their interest in being involved during the innovation deployment.

3.2.2 Preliminary assessment

During the preliminary assessment phase the basis for the correct innovation deployment are defined. First the current situation shall be studied including regulatory framework, best practices and solutions available on the market or under development. Then, new solutions to enhance the onboard safety and security can be found and the required technologies selected, with the agreement of major stakeholders in the sector. After the analysis of the proposed innovation, the deployment planning can start, again with the involvement of the major stakeholders in order to maximise the impact of the innovation. Most of these activities have been carried out within the Diglogs project. The current version of the roadmap can be considered the overall planning for the deployment of mobile applications to enhance ship safety/security in the project area.

- Current situation analysis (**Estimated duration:** 2/18 months)
    - CE1. Analyses of rules concerning ship evacuation
    - CE1. Analysis of design tools for evacuation simulation
- Overall Design (**Estimated duration:** 3/12 months)

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- o CE11. Workshops with stakeholders
- o CE3. Define a new approach to detect and monitor a safety/security emergency
- o CE2. Select technologies for onboard application
- o CE6. SWOT analyses
- o CE3. Overall planning
- o CE11. Feedback from stakeholders
- o CE2. Define required resources
- o CE9. Overall budget plan

3.2.3   Pilot action

The Pilot action (Figure 1) will represent the next step, devoted to proof the effectiveness of the application of Mobile apps in reducing evacuation time and support crew decisions. In detail, the pilot action shall be planned by fixing the pilot main objectives and defining the pilot system and its technical specifications. The test scenario shall be represented by an area of a passenger ship, where it is expected to run several tests involving a small sample population. A system for onboard applications shall be composed by three main components:

- A Bluetooth beacons net devoted to enable localisation inside the ship (Bluetooth technology has been chosen since it is expected to work properly in steel made environment);
- A backend application running on the ship bridge devoted to control the system (selection evaluation cases, emergency signals launching, monitoring, data collecting, etc.)
- A Mobile application installed on passengers mobile devices (e.g. smart phones, smart watches) providing to passengers their position (thanks to the beacon net) and specific guidance in case of emergency.

All these components shall be designed and developed, and then the system shall be installed and configured in the test environment. The experimental testing should proof the benefit of the innovation opening the possibility to start the following phases. Diglogs project it is expected to cover the roadmap up to this phase.
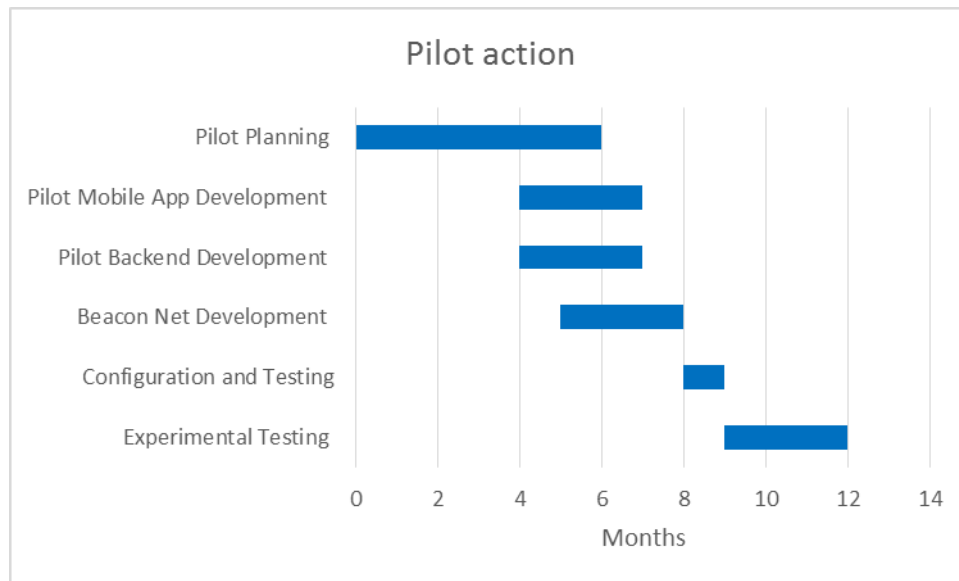
Figure 1. Gantt chart reporting the mean expected duration of the main tasks of the pilot action

- Pilot Planning (**Estimated duration:** 1/12 months)
    - CE2. Define target of Pilot Action
    - CE2. Define Pilot App requirements
    - CE2. Define Pilot Backend requirements
    - CE2. Define Pilot Beacon net requirements
    - CE4. Define Test Population
    - CE1. Identify test scenarios
    - CE1. Acquire test scenarios data
    - CE3. Define development/testing team
    - CE9. Allocate Pilot Budget
    - CE4. Recruiting/resources allocation
- Pilot Mobile App Development (**Estimated duration:** 1/6 months)
    - CE2. Design Graphical User Interface
    - CE8. Software development
    - CE8. Software Testing
- Pilot Backend Development (**Estimated duration:** 1/6 months)
    - CE8. Define (and acquire) Pilot Backend Hardware
    - CE2. Design Backend Graphical User Interface
    - CE5. Define Backend installation and configuration procedure

- o CE8. Software development
- o CE8. Software Testing
- Beacon Net Development (**Estimated duration:** 0.5/6 months)
  - o CE8. Acquire the beacon net components
  - o CE5. Define beacon net installation and testing procedures
  - o CE8. Test connectivity with backend and application
- Configuration and Testing (**Estimated duration:** about 0.5 months)
  - o CE10. Acquire materials required by system configuration and testing
  - o CE8. Pilot system installation on test environment
  - o CE8. Pilot system trial run
- Experimental Testing (**Estimated duration:** about 3 months)
  - o CE2. Acquire evacuation analyses softwares
  - o CE4. Instructions to test population
  - o CE6. Comparison of population behaviour with and without mobile application
  - o CE6. Comparison with evacuation simulations
  - o CE11. Dissemination of pilot results (publications, conferences, events)
  - o CE11. Newsletters
  - o CE11. Direct contacts with shipping companies

3.2.4 System development

Provided that the pilot action succeeded, the mobile applications to increase ship safety/security can start the process to become a mainstream product on the market (Figure 2). To this end, the development of a commercial product shall be planned and carried out. Meanwhile, it is essential to place the product on the market with a promotion campaign. Again the final version of the three main components of the system shall be designed and developed. Special attention shall be given to the flexibility: the system will be customised for each single installation (passenger ship, passenger terminal, etc.) and it is strongly dependant on the installation environment. Hence, in order to assure smooth design, configuration and testing of the beacon net functionality installation and testing procedures shall be defined and special tools might be developed.
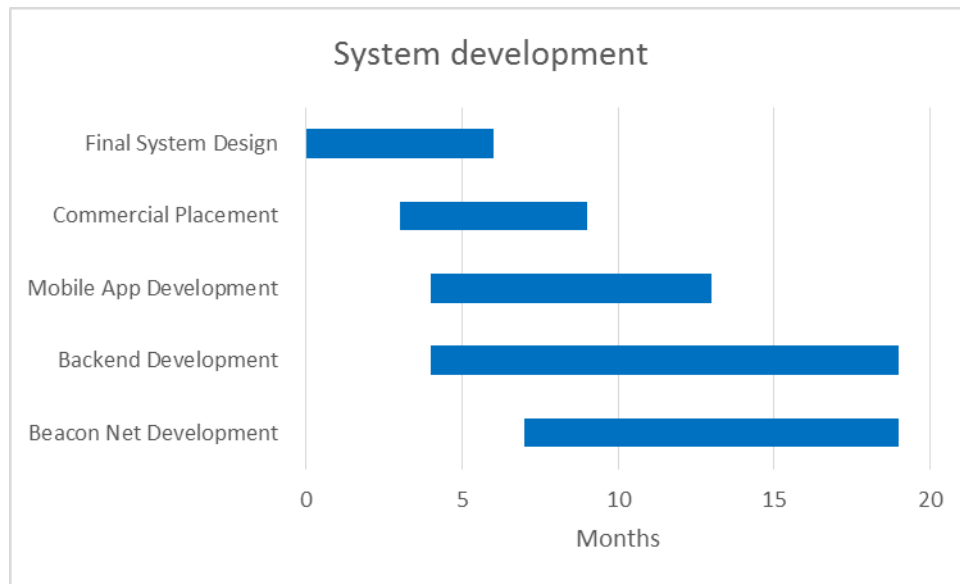
Figure 2. Gantt chart reporting the mean expected duration of the main tasks of the system development

- Final System Design (**Estimated duration:** about 6 months)
    - CE1. Detailed analysis of legal and regulatory issues
    - CE1. Selection of decision algorithms to provide directions to passengers
    - CE1. Selection of interfaces with onboard automation (e.g. fire detection, flooding detection, fire doors status, WTD doors status, etc.)
    - CE2. Definition of Final system architecture
    - CE2. Define Final App requirements
    - CE2. Define Final Backend requirements
    - CE2. Define Final Beacon net requirements
    - CE5. Define a standard proposal for the review of onboard emergency procedures
    - CE3. Define development team
    - CE9. Budget revision
    - CE10. Acquire materials/infrastructures for system development
    - CE4. Recruiting/resources allocation
- Commercial Placement (**Estimated duration:** about 6 months)
    - CE5. Definition of promotion campaign
    - CE11. Brochures
    - CE11. Digital advertising
    - CE11. Website

- o CE11. Contacts with shipping companies
    - o CE11. Expositions
- Mobile App Development (**Estimated duration:** about 9 months)
    - o CE2. Final design of standard GUI
    - o CE8. Software development
    - o CE8. Software testing
- Backend Development (**Estimated duration:** 9/24 months)
    - o CE2. Final design of backend GUI
    - o CE8. Software development
    - o CE8. Software testing
- Beacon Net Development (**Estimated duration:** 5/12 months)
    - o CE5. Define procedures for the design of Beacon Net for each specific installation
    - o CE8. Develop tools for fast Beacon Net design and configuration
    - o CE4. Training of specific installation designers

3.2.5 Placement on the market

In this last phase, the final commercial product will be installed in its final environment (Figure 3). Since each single installation will be unique (if anything, a small number of sister ships), a dedicated project shall be started for one of them. Data acquisition will play an essential role, being the base for the design of the beacon net and the configuration of the system. Moreover, it is expected that shipping companies will require a certain degree of integration with other existing IT systems or applications. For instance, several companies already adopted mobile apps for commercial purposes and might be interested in completing the product with safety and security functionalities. Hence, a certain degree of customisation of the backend and application is essential to enable a widespread diffusion of the innovation on the market. The integration with commercial applications has also the advantage to raise the app adoption over the passengers maximising its effect in case of emergency.
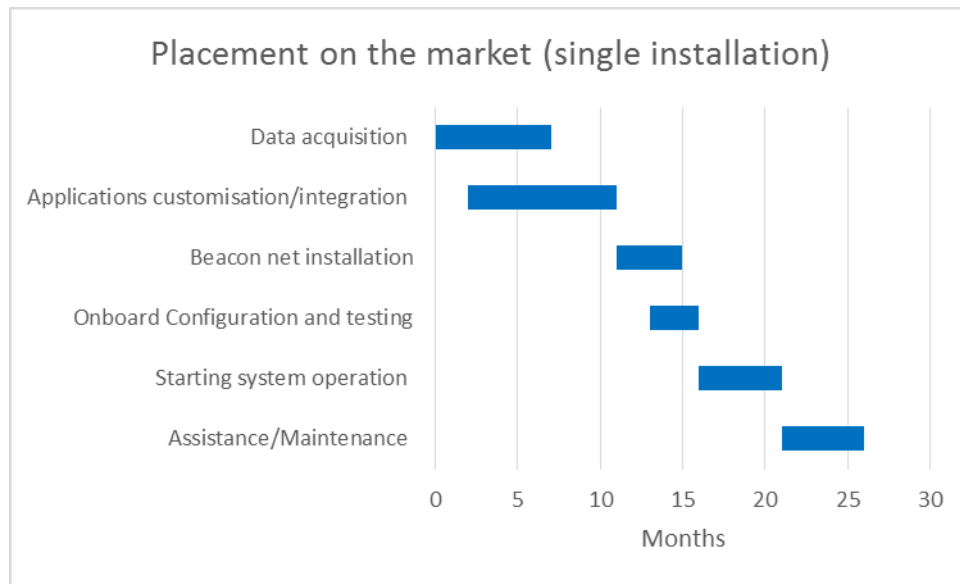
Figure 3. Gantt chart reporting the mean expected duration of the main tasks of the placement on the market of the system in a single installation environment

- Data acquisition (**Estimated duration** for each specific installation**:** 6/9 months)
    - CE1. Study of current onboard organisation and procedures
    - CE1. Acquisition of specific requirements
    - CE1. Study of the integration with existing onboard IT infrastructure
    - CE2. Definition of required system customisations
    - CE3. Specific installation planning
    - CE4. Resources allocation (specific installation)
    - CE9. Budget allocation (specific installation)
- Applications customisation/integration (**Estimated duration:** 5/12 months)
    - CE8. Development of agreed customisations (App, Backend)
    - CE8. Software Testing
    - CE8. Acquisition and onboard installation of the backend (Hardware, Software)
    - CE3. Update onboard organisation model due to system installation
    - CE5. Update of onboard procedures due to system installation
- Beacon net installation (**Estimated duration:** 2/6 months)
    - CE2. Design of Beacon Net for the specific ship
    - CE8. Acquisition and onboard installation of Beacon net
- Onboard Configuration and testing (**Estimated duration:** 1/6 months)

- o CE8. System configuration (interaction between Beacons net, Backend and Apps)
- o CE8. System trial run in real environment
- o CE5. Definition of reset/restore procedures
- o CE5. Definition of onboard maintenance procedures
- o CE3. Identify maintenance responsibilities
- Starting system operation (**Estimated duration:** 1/10 months)
  - o CE4. Crew training
  - o CE4. Onboard maintenance team training
  - o CE11. Digital advertising
  - o CE11. Public conferences
  - o CE8. Mobile application uploaded on app stores
- Assistance/Maintenance (**Estimated duration:** 3/6 months)
  - o CE5. Assistance procedures definition
  - o CE5. System update procedures definition
  - o CE3. Define assistance team
  - o CE9. Budget allocation
  - o CE10. Acquire material/infrastructures required for assistance
  - o CE4. Internal resources allocation
  - o CE4. Internal resources training
  - o CE8. Corrective maintenance

3.3 APP for data flows management of passengers (data integration for the development of new services for passengers) V2 roadmap

Reference selected innovation: **APP for data flows management of passengers – Port of Rijeka Authority**

The Port of Rijeka Authority has decided to upgrade the existing maritime traffic control system to improve information system functionalities related to vessel traffic monitoring.

Core of the project is establishing a monitoring system using a highly modular, ready to go, compact surveillance solution using video and fixed lens thermal cameras, depending on the exact specification to be defined, which is ideal for short to medium range surveillance applications to exactly pinpoint every small vessel or other vehicle present or approaching the passenger terminal. The sensing device, or a dedicated, custom made client application furthermore might 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 positing feedback as standard. The system might be developed in a way to be twinned with radar or any automated control program and driven automatically to 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.

Main idea behind the pilot is provision of enough coverage of the area inside Rijeka port breakwater especially in term of detection, diversification and identification of smaller targets in close proximity to one another. Since area inside of breakwater is designated for commercial cargo vessels including service vessels supporting them (i.e. tugs, pilots, etc.) but also fishing vessels, yachts and leisure boats, end users and operators serving them would benefit from covering the area with camera solution which would provide another possibility of insight into traffic and redundancy to the existing radar system giving the passengers and identified stakeholder inside target groups improved situational awareness.

Gathered visual and numerical data may 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.

Exact technical requirements, connectivity and input-output possibilities are subject to further determination during pilot development and component identification.

Such an optical system must possess adequate technical qualities to support envisaged role. Among those parameters to be discussed and considered are:

1. Vehicle (boat/maritime object) detection equal to or larger than length of Rijeka breakwater or other selected installaction microlocation (for example, passenger yachts quay),
2. Respect of industry Johnson criteria: vehicle size defined as 2,3m2, detection at 2 pixels, 50% probability subject to environmental conditions,
3. Lens F number equal to 1.2 or better, in order to provide optimal sharpness of the image,
4. Resolution, at least 640x480,
5. Adequate camera controls and presentation mode,
6. FLIR capability, and
7. Pan–Tilt–Zoom controls, adding capability of remote directional and zoom controls.

Tentative added value of the project may be further extension of the gathered and processed information towards end users-passengers, thus enabling direct benefits for them. For example, a QR code, or similar interconnectivity technology may be used as a form of notification that would be posted at the passenger terminal, or using digital outlets with similar functionality, which would allow passengers to download and install mobile application via smart mobile devices, and access visual representation and numerical data representing all information related to the vessel traffic in port of Rijeka that is applicable and significant for them.

The application would be useful for passengers arriving at the port of Rijeka as they would have real-time information into the arrival / departure and position of the maritime traffic inside the port of Rijeka.

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 may be more of a challenge, and especially in the part of activities related to M2M data exchange. A test on a real population is required in order to measure adoption of the technology by end users (operators and passengers). These should be the main objectives of a pilot action immediately preceding the final system development.

Figure: Subpage of PP7's pilot action leading to stakeholder survey

3.3.1 Post questionnaire stakeholder assessment - pilot action

1. Pilot Planning
    1. CE3 - Definition of pilot action targets
    2. CE7 - Definition of pilot installation requirements
    3. CE8 - Definition of integrative requirements - development
    4. CE7 - Definition of technical characteristics of deployed solution – hardware BoM
    5. CE3 - Definition of the internal test scenarios
    6. CE3 - Identification of the test scenarios
    7. CE8 - Finding methods to store captured data
    8. CE4 - Define development/testing team
    9. CE9 - Allocation of the pilot budget
    10. CE4 - Recruiting/resources allocation

2. Pilot Technical Equipment Installation
    1. CE7 - Granular definition of technical specifications for the camera
    2. CE7 - Selection of a suitable location for installation
    3. CE10 - Acquisition of the camera hardware
    4. CE10 - Acquisition of the installation services
    5. CE7 - Hardware acceptance testing
    6. CE8 - Acceptance of technical installation documentation

3. Pilot Integrative Development
    1. CE1 - Acquisition of technical documentation for existing traffic management solution
    2. CE1 - Analysis of technical documentation for existing traffic management solution
    3. CE3 - Back to back analysis of legacy systems versus new solution
    4. CE3 - Extraction of common elements
    5. CE6 - Definition of communication between systems
    6. CE2 - Exploitation of tentative synergies for system opening
    7. CE2 - Drafting technical specification for interconnectivity
    8. CE8 - Acquisition of the interconnectivity services
    9. CE8 - Development of the interconnectivity module
    10. CE8 - Deployment of the interconnectivity module
    11. CE1 - Software acceptance testing
    12. CE8 - Acceptance of technical installation documentation

4. Information panel deployment
    1. CE1 - Drafting technical specification for information panels
    2. CE2 - Analysis of criteria for appropriate locations for installation
    3. CE7 - Selection of the appropriate locations
    4. CE1 - Drafting technical specification for interconnectivity
    5. CE7 - Acquisition of the information panel hardware
    6. CE8 - Acquisition of the installation services
    7. CE7 - Hardware acceptance testing
    8. CE8 - Acceptance of the technical installation documentation

5. Deployment of end users (passengers) information tools
    1. CE1 - Granular definition of end user requirement analysi
    2. CE2 - Selection of appropriate development technologies
    3. CE4 - Translation of user requirements into software functional specification
    4. CE6 - Creation of GUI mock-ups
    5. CE6 - Acquisition of application integration services
    6. CE4 - Internal software testing
    7. CE5 - User acceptance testing and experimentation

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8. CE8 - Acceptance of the technical installation documentation

6. Configuration and Testing
    1. CE6 - Full components integration
    2. CE1 - Pilot system installation in test environment
    3. CE6 - Pilot system trial run
    4. CE2 - Drafting of test conclusions and dissemination towards stakeholders

7. Post-project activities
    1. CE2 - Definition of promotion campaign
    2. CE2 - Decision on dissemination of project visibility materials
    3. CE5 - Dissemination of pilot results (publications, conferences, events)
    4. CE2 - Creation of digital newsletters
    5. CE8 - Web information placement
    6. CE2 - Social networks pilot project reach
    7. CE2 - Direct contact with passenger shipping companies
    8. CE2 - Exploration of venues to reach end users (passengers)
    9. CE2 - Decision of expositions participation

8. Commencing with operative system exploitation and maintenance
    1. CE8 - Application placement in distribution channels
    2. CE4 - Assistance/maintenance procedures definition
    3. CE8 - System update and patching procedures definition
    4. CE4 - Definition of the assistance team
    5. CE9 - Budget allocation
    6. CE7 - Acquisition of the material/infrastructures required for assistance
    7. CE4 - Internal resources reallocation
    8. CE1 - Internal resources training
    9. CE2 - Corrective maintenance deployment

3.4 Digitalization of access control as a prerequisite for integration with the national PCS in Port of Sibenik

Reference selected innovation: Implementation of digital access control – Port of Šibenik Authority

There is an ongoing CEF-cofinanced project of a national PCS (Port Community System) implementation, initially as a pilot project in the port of Rijeka that started in April 2018. and will be fully completed by end of 2020. The project is well underway and executed on time under supervision of TA (Technical Assistance) team comprised of subject matter experts.

PCS needs to be connected to the surrounding systems (such as CIMIS) with underlying goal being avoidance of multiple data entry and facilitation of data exchange between stakeholders. Along with all the other systems enabling electronic communication in maritime traffic, PCS forms an

important constituting and participating element of the NSW platform. The "Project of setting up a single national Port Community System" is currently underway, with the Ministry of the Sea, Transport and Infrastructure being the bearer of the project. Cooperating parties in this project are, among others, Port of Rijeka Authority and Port of Ploče Authority. Once the mentioned project is completed in early 2021., all the Croatian port authorities will have a fully functional PCS system at their disposal that will be adaptable to all Croatian cargo ports with minor changes and adaptation dependant on local characteristics of each individual participating port. One of such ports is also port of Šibenik. Layout of operative quays of the port of Šibenik, and main characteristics are shown in figure and table below, and on the next page:

Designation	Name	Length (m)	Depth (m)	Purpose
8-9	Vrulje, W1	114	10,00	Ferryboats
10	Vrulje, W2	50	10,00	Ferryboats
11	Vrulje, S1	133	08,00	Cruise lines
12	Vrulje, S2	29	10,00	Customs
13	Vrulje, E	191	10,00	Cruise lines
Cargo port				
14	Dobrika	228	10,00	Bulk cargo import
15	Connection coast	128	08,00	RO RO, Ferryboats
16	Rogač 1	210	10,00	Bulk and general cargo

17	Rogač 2	240	07,00 - 09,00	Bulk and general cargo
19	TB 1	120	07,00	Timber terminal
20	TB 1	120	05,20	Timber terminal

Ongoing building of 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 comes 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 by the future functional analysis,* and that may encompass 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.

Enforcement is 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.

There are two levels of ID cards, and articles 8-14 of the applicable regulation govern layout, characteristics and use of ID cards. Physical cards at the moment can be divided into several categories:

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

The process is not digitalized and there is no connection whatsoever with other IT systems. 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. Depending on the scope of the project, permitted by the time and budgetary constraints, they should initially include at least locations (quays) that are mostly affected by 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.

Affected stakeholders within targeted groups are all freight agents operating in port of Šibenik, all terrestrial cargo traffic operators (categorized for simplicity as one item) and all other occasional or permanent visitors to port area (police, Customs officers, other state agency officials, vendors, consultants, subcontractors, teams filming in the port area etc.) who need to fill paper documents in order to obtain access to port area. In the current scope of PCS, no module is envisaged to support permit issuing due to time and financial constraints of the ongoing PCS project. It is evident that in order to increase digitization in the area of port of Šibenik for almost all stakeholders, but especially passengers, further steps need to be undertaken in order to upgrade processes and technology by introducing and building a completely new innovative IT system to facilitate permit issuance, storage, monitoring and oversight, further underlining ISPS compliance.

Some useful requirements and suggestions for successful implementation of the ID card and permits issuance can also be identified before prior to commencement of the pilot:

1. *Changes to current Regulation*: They should be relatively minor and include primarily change in description of ID cards (colour and composition), and recognition of virtual ID

cards (especially applicable for "daily" category of usage) that are represented by a valid and properly processed database entry.

2. *Technology*: Affirmative experience gained with implementation of QR codes for entry and exit from container terminals forms a positive guideline also for virtual ID cards – permits for physical person ingress-egress control. QR codes can be created in a way to contain useful information like location, first and last name and vehicle's license plate. IT system should be robust and follow all modern ICT and cybersecurity requirements. Solution should be in line with GDPR and ensure alignment with national Cybersecurity regulation.

3. *Payment possibilities and end-user (stakeholder) satisfaction*: Considering that ID card and permit issuance carries payments for certain categories of private and legal persons and vehicles, integration with payment gateways supporting various means of payment (subscription, credit cards, PayPal, prepaid) would also be highly advisable and trivial for integration, and it would results in high levels of satisfaction for identified stakeholders (end-users).

4. *Integration:* entry and exit gate procedures should be prepared for integration with the future PCS system, in order to use input data. Furthermore, a module for maritime police will have to be included with entry function enabling police officers in charge to deny entry to a particular terminal.

5. *Other:* Access using mobile or Web application with adequate usability for mobile phones or tablets is advised, especially if used by the police, or for field control purposes.

Figure: Subpage of PP8's pilot action leading to stakeholder survey

3.4.1 Post questionnaire stakeholder assessment - pilot action

1. Pilot Planning
    1. CE3 - Definition of pilot action targets
    2. CE7 - Definition of pilot installation requirements
    3. CE8 - Definition of integrative requirements with existing national PCS specifications
    4. CE7 - Definition of technical characteristics of deployed solution – hardware BoM
    5. CE3 - Definition of the internal test scenarios
    6. CE3 - Identification of the test scenarios
    7. CE8 - Finding methods to store captured data
    8. CE4 - Define development/testing team
    9. CE9 - Allocation of the pilot budget
    10. CE4 - Recruiting/resources allocation
    11. CE3 - Identification of need for change in current access Regulation
    12. CE3 - Drafting a new version of the access Regulation, if needed

2. Pilot Technical Equipment Installation
    1. CE7 - Granular definition of technical specifications for the equipment
    2. CE7 - Analysis of criteria for appropriate quay locations for installation in the Port of Šibenik
    3. CE7 - Selection of the appropriate locations

4. CE7 - Drafting technical specification for interconnectivity
5. CE10 - Acquisition of the ID card readers/hardware
6. CE10 - Acquisition of the hardware installation services
7. CE7 - Hardware acceptance testing
8. CE8 - Acceptance of the technical installation documentation

3. Pilot Integrative Development
    1. CE1 - Acquisition of technical documentation for PCS integration
    2. CE1 - Analysis of technical documentation for PCS integration
    3. CE3 - Back to back analysis of legacy solution versus new solution in light of current Permits issuance Regulation in the Port of Šibenik
    4. CE3 - Extraction of common elements
    5. CE6 - Definition of communication between systems
    6. CE4 - Inter-team cooperation in integrative development acceptance
    7. CE8 - Acceptance of technical documentation

4. Deployment of end users (passengers) visual information tools
    1. CE1 - Granular definition of user requirements
    2. CE2 - Selection of appropriate development technologies
    3. CE4 - Inclusion of user requirements into software functional specification
    4. CE6 - Creation of GUI mock-ups
    5. CE6 - Acquisition of application integration services
    6. CE4 - Internal software testing
    7. CE5 - User acceptance testing including stakeholders within identified target groups
    8. CE8 - Acceptance of the technical installation documentation

5. Configuration and Testing
    1. CE6 - Full components integration
    2. CE1 - Pilot system installation in test environment
    3. CE6 - Pilot system trial run including stakeholders within identified target groups
    4. CE2 - Drafting of test conclusions

3.4.2 Post-project activities

1. CE2 - Definition of promotion campaign within stakeholders
2. CE2 - Decision on dissemination of project visibility materials
3. CE5 - Dissemination of pilot results (publications, conferences, events)
4. CE2 - Creation of digital newsletters and innovation branding
5. CE8 - Web information placement
6. CE2 - Social networks pilot project reach
7. CE2 - Direct contact with passenger shipping companies
8. CE2 - Exploration of venues to reach end users (passengers)
9. CE2 - Decision of expositions participation

3.4.3 Commencing with operative system exploitation and maintenance

10. CE8 - Application placement in distribution channels
11. CE4 - Assistance/maintenance procedures definition
12. CE8 - System update and patching procedures definition
13. CE4 - Definition of the assistance team
14. CE9 - Budget allocation
15. CE7 - Acquisition of the material/infrastructures required for assistance
16. CE4 - Internal resources reallocation
17. CE1 - Internal resources training
18. CE2 - Corrective maintenance deployment

3.5 Maritime Transport Management by linking PCS and national platform for Croatian ports V2 roadmap

Reference selected innovation: Management solution for passengers and freight transport combination – Port of Rovinj Authority

The greater part of the port area of the Rovinj Port Authority is intended for passenger traffic and mooring of nautical boats, passenger and excursion boats, yachts, and cruisers, but one part of their operation also pertains to fishing boats and transhipment of fish, which represent freight transport. Regarding this, improving the operations of the Rovinj Port Authority and introducing IT innovation can be considered as a combined pilot activity.

The operation and functioning of the Port Authority are very complex, especially given the need to communicate with a large number of stakeholders. It needs to be balanced between the administrative requirements of the state on the one hand and the private interest of the users on the other. The function of the Port Authority is to manage the port area in such a way that it optimizes the operation of all processes and always strives to maximize commercial results. Of course, taking into consideration the business conditions prescribed by the state government and which all port users must satisfy and fulfil.

In that sense, the Port Authority must strive to improve all processes in order to provide users with the best conditions. This especially concerns functioning and administrative operation. First and foremost, whether concerning the fishing boats (freight) or cruisers/yachts/nautical boats (passengers), their users require information from the Port Authority about the availability of

berths, the possibility of booking berths and, later on, information regarding the water and electricity supply. This operational information must be accurate and prompt, as well as approved in the National Single Window System (CIMIS). Furthermore, in administrative terms, the usage of berths should be formalized by signing a contract and issuing an invoice that must be accurate and transparent. This is just one segment of interaction and communication between the users, the State Administration (NSW - CIMIS), and the Port Authority. Unfortunately, it currently includes several separate and unrelated applications. This results in unnecessary piling up of documents, the longer procedure duration, and, consequently, reduced efficiency of the port and economic competitiveness of the users.

Rovinj Port Authority will implement an application that integrates the operational and accounting system of the Port Authority's operations and it will serve as PCS. The application 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.

Rovinj Port Authority currently uses several different unrelated software systems that make it difficult to operate and monitor all business processes. The implementation of a system that integrates all aspects of the Port Authority's operations will enable optimal control over the operations of the Port Authority in all port areas it manages, and at the same time, enable the control of the mooring capacity occupancy. The application enables better integration of the operational part of business and management. Additionally, it solves the problem of duplicate data entry and possible errors that occur during the input, facilitates access to the data since all the data is digitized and in one place, the software is also available through the mobile application, statistical reports on traffic in the port are generated, significantly reduces the paperwork, radically speeding up processes, digitizing business and enabling better financial control.

The application's output documents are a prerequisite for future automation of the communication process with NSW, which is not technically possible at this time. As soon as NSW - CIMIS enables electronic data to be automatically entered and accepted from an external application/source, this system will be ready to establish M2M dialogue.

Web page presenting PP9's stakeholder questionnaire is shown in Figure on the next page.

Figure: Subpage of PP9's pilot action leading to stakeholder survey

3.5.1 Post questionnaire stakeholder assessment - pilot action

- Current situation analysis
  - CE1. Analysis of DigLogs AF pilot project requirements
  - CE1. Identification of resident technologies for PCS integration
  - CE1. Analysis of fit of the pilot project with IT and project portfolio
  - CE1. Outline of pilot project candidates
  - CE1. Enumeration of pilot project candidates
  - CE1. Selection of the viable pilot project
  - CE1. Listing of initial project considerations

- Overall Design
  0. CE1. Overall planning
  1. CE1. Workshops with stakeholders
  2. CE8. Select technologies for application
  3. CE1. SWOT analyses
  4. CE1. Feedback from stakeholders
  5. CE4. Definition of required resources (time/personnel/quality requirements)

6. CE9. Overall budget planning

3.5.2 Pilot action

- Pilot planning
    7. CE1. Definition of pilot action targets
    8. CE8. Definition of pilot installation requirements
    9. CE3. Analysis of all operation processes
    10. CE3. Analysis of all administrative processes
- Pilot implementation
    11. CE8. Procurement and installing of equipment
    12. CE8. Modification of the application to the needs of the Port Authority
    13. CE5. Definition of the internal test scenarios
    14. CE5. Identification of the test scenarios
    15. CE3. Define development/testing team
    16. CE4. Training of employers
    17. CE4. Training of stakeholders

3.5.3 Post-project activities

- Promotion, dissemination and consultation
    0. CE11. Definition of a promotion campaign towards stakeholders and target groups
    1. CE11. Decision on the dissemination of project visibility materials
    2. CE11. Individual dissemination of pilot results (publications, conferences, events)
    3. CE11. Creation of digital newsletters
    4. CE11. Web information placement
    5. CE11. Social networks pilot project reach
    6. CE11. Direct contact with stakeholders within target groups
    7. CE10. Exploration of venues to reach end-users (passengers and freight)
    8. CE11. Decision of expositions participation

3.5.4 Commencing with operative system exploitation and maintenance

- Exploitation and maintenance planning
    0. CE9. Budget allocation
    1. CE5. Assistance/maintenance procedures definition
    2. CE8 System update definition

3. CE3. Definition of the assistance team
- Exploitation and maintenance execution
    4. CE8. Acquisition of the material/infrastructures required for assistance
    5. CE3. Internal resources reallocation
    6. CE4. Internal resources training
    7. CE8. Corrective maintenance deployment

3.6 Big Data / Data management solution for planning V2 roadmap

Reference selected innovation: **Spatial Data Infrastructure version 1 and skill enhancement for Venice port - CFLI, Intermodal Logistics Training Consortium**

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.

Within the broader context of the innovation, the narrower 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.
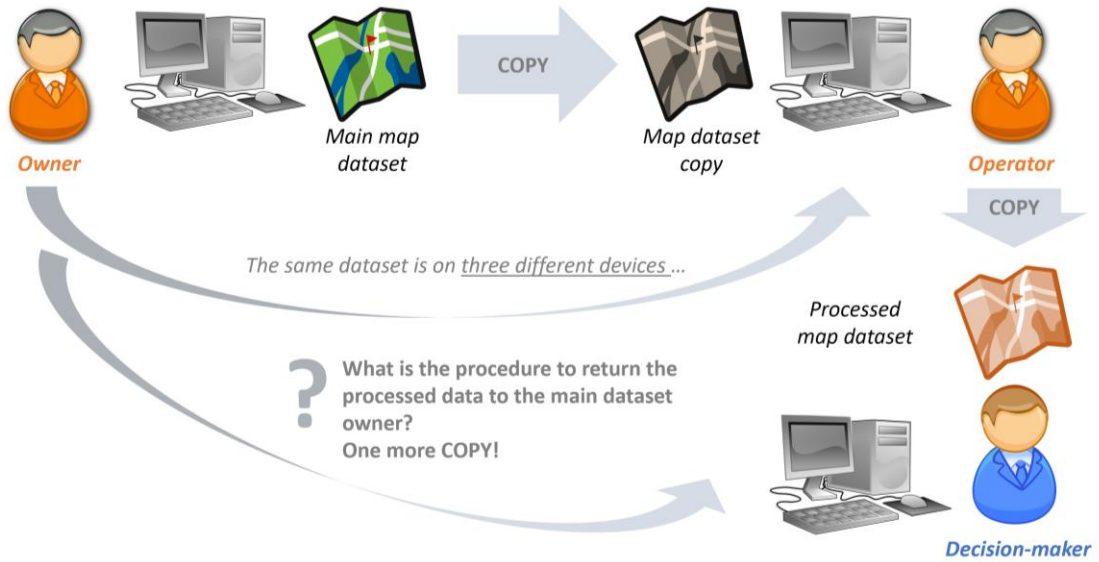
Port Authority data management process current situation
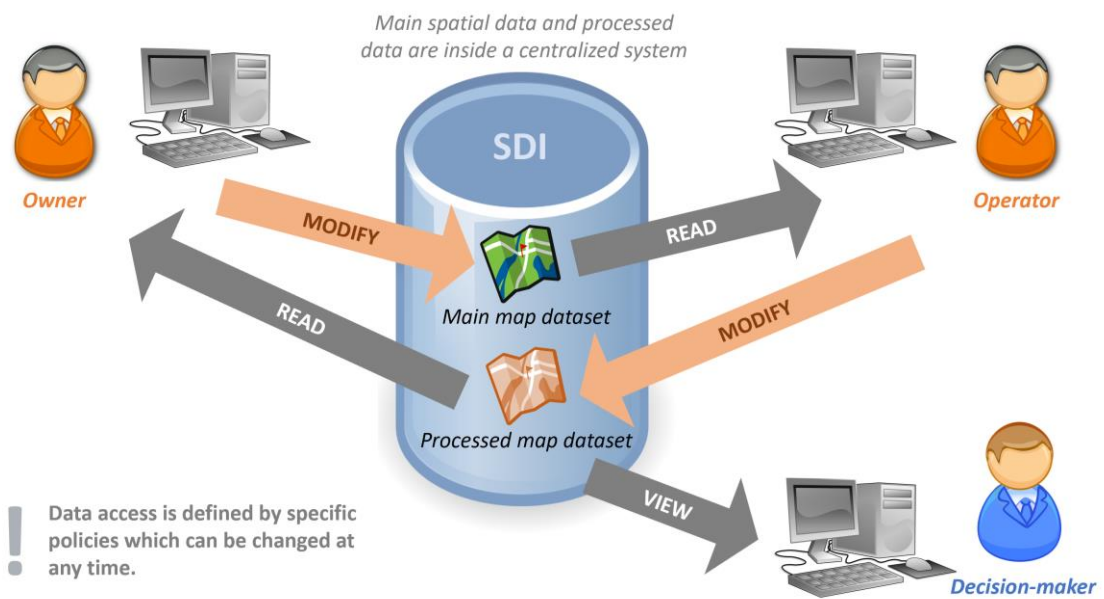
Port Authority data management improved situation

For the innovation deployment, a Spatial Data Infrastructure will be implemented integrating existing tools and platforms. 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.

The suggested activities don't need any software development, therefore the pilot action will have a "training-empowered" approach in order to achieve both an organizational improvement and a workforce skill improvement, fostering the awareness on how spatial data visualization and dynamic data processing can support decision-making process.

Main results from the stakeholders' consultation

The main results from the stakeholders' consultation mainly refer to the following instances:

- The efficiency of the organizational model should take place carrying out application tests on the basis of specific needs analysis.
- There is a widespread belief that it is necessary to improve the exchange of information between actors, applying best practices, also pushing for an update of laws and regulation.
- Many companies could innovate their services having more effective communication channels and updated and detailed information.
- Improving skills through training or specialization programs is also useful for decision makers as they can increase their ability to use and understand data and processes and better assess scenarios using different data-driven resources.
- There is a great need to integrate different data sources and improve data quality, reducing redundancies and inconsistencies.
- Many useful data must be analysed in real time, implementing automatic extraction systems.
- The overall community system can be more integrated, connecting different software platforms such as document and financial management systems and real-time monitoring systems, fostering dematerialization, better relationships between actors and fast information update.
- The opportunities of adopting open source digital resources must be exploited so to

eliminate avoidable royalty costs.

About the feedback related to the roadmap, the most frequent answers are related to the interest of being informed about the results and outputs of the activities; closer interests especially refer to:

- User needs analysis in the pilot action stage
- Processes' analyses and re-design
- Some involvement in training and educational programmes

The following chapters are the final version of the roadmap.

3.6.1   Preliminary assessment

- Current situation analysis
    - CE1. Organizational assessment
    - CE1. Data source assessment
    - CE1. IT infrastructure assessment
- Overall design
    - CE1. Long-term targets definition
    - CE1. Pilot objectives
    - CE1. Stakeholders consultation
    - CE1. Pilot objectives review
    - CE9. Overall time and resources plan

3.6.2   Pilot action "Spatial Data Management System"

- Pilot planning
    - CE1. Target definition
    - CE1. User needs analysis
    - CE8. Hardware/Software prerequisites definition
    - CE6. Spatial data set to be used for the pilot implementation
    - CE1. Involved processes and services analysis
    - CE4. Training and educational program
- Spatial datasets acquisition
    - CE6. Data acquisition
    - CE6. Analysis of the spatial data packages for the pilot test
    - CE6. Optimization and pre-processing training on the job

- Spatial Data Infrastructure implementation
  - CE8. Data model design
  - CE8. Performance requirements analysis
  - CE8. IT infrastructure implementation (HW/SW)
  - CE8. Network configuration
- Data migration
  - CE4. Workshop with involved users
  - CE6. Spatial data conversion and migration test
  - CE5. Spatial data conversion and migration training on the job
- Procedures implementation
  - CE1. Procedures objectives assessment
  - CE8. Grants policy definition
  - CE5. Procedures development training on the job
  - CE5. Information design and delivery workshop / training
- Process and services optimization analysis
  - CE2. Definition of involved processes and services
  - CE2. Identification of spatial-data-driven support to processes and services
  - CE4. Workshop with involved users
  - CE2. Process / service re-design assessment
- Dissemination
  - CE11. Publications, conferences, events
  - CE11. Websites, newsletter, social media

3.6.3 Implementation Strategic Planning and Development department core dataset

- Stage planning
  - CE6. Spatial data set to be migrated
  - CE2. Definition of data-driven processes to be improved
  - CE1. Involved processes and services assessment
  - CE4. Training and educational program
- Spatial datasets acquisition
  - CE6. Definition of the spatial data packages to be migrated
  - CE6. Data acquisition/integration
  - CE6. Optimization and pre-processing
- Data migration
  - CE5. Spatial data conversion and migration training on the job
- Procedures implementation

- - CE1. Procedures objectives assessment
  - CE8. Grants policy integration
  - CE5. Procedures development training on the job
  - CE5. Information design and delivery workshop / training
- Processes and services optimization
  - CE2. Definition of processes and services to be re-designed
  - CE2. Identification of spatial-data-driven support to processes and services
  - CE2. Process / service re-design
  - CE2. Performance assessment and review

3.6.4 Metadata system implementation

- Metadata system implementation
  - CE9: Make-or-buy analysis
  - CE8: System design
  - CE8: System implementation
  - CE4: Training-on-the-job

3.6.5 Implementation of Technical Department core dataset

- Stage planning
  - CE6. Spatial data set to be migrated
  - CE2. Definition of data-driven processes to be improved
  - CE1. Involved processes and services assessment
  - CE4. Training and educational program
- Spatial datasets acquisition
  - CE6. Definition of the spatial data packages to be migrated
  - CE6. Data acquisition/integration
  - CE6. Optimization and pre-processing
- Data migration
  - CE5. Spatial data conversion and migration training on the job
- Procedures implementation
  - CE1. Procedures objectives assessment
  - CE8. Grants policy integration
  - CE5. Procedures development training on the job
  - CE5. Information design and delivery workshop / training
- Processes and services optimization

- o CE2. Definition of processes and services to be re-designed
- o CE2. Identification of spatial-data-driven support to processes and services
- o CE2. Process / service re-design
- o CE2. Performance assessment and review

3.6.6 Implementation of Financial and State Property management Departments core dataset

- Stage planning
  - o CE6. Spatial data set to be migrated
  - o CE2. Definition of data-driven processes to be improved
  - o CE1. Involved processes and services assessment
  - o CE4. Training and educational program
- Spatial datasets acquisition
  - o CE6. Definition of the spatial data packages to be migrated
  - o CE6. Data acquisition/integration
  - o CE6. Optimization and pre-processing
- Data migration
  - o CE5. Spatial data conversion and migration training on the job
- Procedures implementation
  - o CE1. Procedures objectives assessment
  - o CE8. Grants policy integration
  - o CE5. Procedures development training on the job
  - o CE5. Information design and delivery workshop / training
- Processes and services optimization
  - o CE2. Definition of processes and services to be re-designed
  - o CE2. Identification of spatial-data-driven support to processes and services
  - o CE2. Process / service re-design
  - o CE2. Performance assessment and review

3.6.7 System integration

- Document Management System geospatial integration
  - o CE9: Make-or-buy analysis
  - o CE8: System prerequisites analysis
  - o CE9. Resources plan and procurements
  - o CE8: System design
  - o CE8: System implementation

- o CE4: Training-on-the-job
- o CE8: System test and performance assessment
- o CE8: System revision
- Financial Management System integration
  - o CE9: Make-or-buy analysis
  - o CE8: System prerequisites analysis
  - o CE9. Resources plan and procurements
  - o CE8: System design
  - o CE8: System implementation
  - o CE4: Training-on-the-job
  - o CE8: System test and performance assessment
  - o CE8: System revision

3.6.8 Interoperability protocols deployment for external actors' cooperation

- Stage planning
  - o CE1. Target definition
  - o CE1. Stakeholders needs analysis
  - o CE1. Involved processes and services analysis
  - o CE6. Related spatial data set to be integrated
  - o CE5. Needed interoperability protocols identification
  - o CE8. Hardware/Software prerequisites definition
  - o CE2. Definition of data-driven processes to be improved
  - o CE4. Definition of training modalities and programme
- Process and services optimization
  - o CE4. Workshop with stakeholders
  - o CE2. Identification of spatial-data-driven support to processes and services
  - o CE2. Process / service re-design workshop
  - o CE2. Performance assessment, evaluation and review workshop
- Spatial datasets acquisition
  - o CE6. Definition of the spatial data packages to support selected processes
  - o CE6. Data acquisition
  - o CE6. Optimization and pre-processing workshop
- Spatial Data Infrastructure improvement and adaptation
  - o CE8. Data model review
  - o CE8. Performance requirements test and assessment
  - o CE8. IT infrastructure implementation (HW/SW/Network)

- Data migration
    - o CE5. Spatial data conversion and migration workshop
- Procedures implementation
    - o CE1. Objectives analysis
    - o CE5. Procedures development workshop
    - o CE5. Information design and delivery workshop
    - o CE5. Decision support effectiveness assessment and procedures review workshop
- Educational program for executives and decision-makers
    - o CE4. Spatial-data-driven management and processing workshop
    - o CE4. Spatial-data-driven decision-making workshop
- Dissemination
    - o CE11. Publications, conferences, events, web and social media

4 Final considerations

Thanks to the stakeholder consultation, the roadmaps drafts have been updated and finalised, providing a useful guidance for developing the most promising technologies to improve the digitalisation of the project area. The guidance will help to better plan the pilot actions within the Diglogs project and to smoothly carry out the next steps to enable broad application of the studied solutions in the project area. The elaboration of stakeholder consultation provided quite non-homogeneous outcomes since each pilot partner personalised the consultation questionnaire collecting the most useful information related to each digital technology. Hence, different information have been collected and elaborated driving to the final version of the roadmap.