

DigLogs

Impact Analysis of big data for freight and passengers mobility

Deliverable 3.2.3

Responsible partner: Actual I.T.			
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Table of Contents

Introduction	3
1. Selected innovation: Maritime Big data/data mgmt.....	4
1.1. Impact on technical operations	4
1.1.1. Consequences/repercussions	4
1.1.2. Expected changes	5
1.1.3. Assessment of necessary modifications	6
1.1.4. Assessment of potential risks	7
1.2. Impact on labour market	8
1.2.1. Consequences/repercussions	8
1.2.2. Expected changes	9
1.2.3. Assessment of necessary modifications	10
1.2.4. Assessment of potential risks	12
2. Selected innovation: Data standardization	13
2.1. Impact on technical operations	13
2.1.1. Consequences/repercussions	13
2.1.2. Expected changes	14
2.1.3. Assessment of necessary modifications	14
2.1.4. Assessment of potential risks	15
2.2. Impact on labor market	16
2.2.1. Consequences/repercussions	16
2.2.2. Expected changes	16
2.2.3. Assessment of necessary modifications	17
2.2.4. Assessment of potential risks	18

- 3. Selected innovation: Port/Vessel traffic management 18
 - 3.1. Impact on technical operations 19
 - 3.1.1. Consequences/repercussions 19
 - 3.1.2. Expected changes 19
 - 3.1.3. Assessment of necessary modifications 20
 - 3.1.4. Assessment of potential risks 20
 - 3.2. Impact on labor market 21
 - 3.2.1. Consequences/repercussions 21
 - 3.2.2. Expected changes 21
 - 3.2.3. Assessment of necessary modifications 21
 - 3.2.4. Assessment of potential risks 22
- Conclusion 22

Introduction

The purpose of this deliverable is to choose the most attractive solutions to deploy and analyze the impact on of big data for freight and passenger mobility, gathered in D3.2.1 and analyzed in D3.2.2. The activity has been carried out by Actual I.T. involving other PPs.

In this Deliverable the top interesting innovations, voted by All PPs are analyzed:

- Big data/data management
- Data standardization
- Port traffic management

PPs assigned globally a clear preference for data storing (database design/data management) and data standardization issues that are a prerequisite for the efficient application of data analytics. This preference suggested that, in the Italy-Croatian program area, the application of big-data technologies is just at its starting phase, but there is a strong interest in the development of the infrastructures required for their exploitation. The analysis of these innovation is described in detail in D3.2.2.

The impact analysis also includes brief guidelines for the sector stakeholders on how to react and be ready for the change.

Impact analysis presents the current scenario and compares it with expected scenario (after the innovation deployment/implementation). Examined aspect are:

- consequences/repercussions
- expected changes
- assessment of what should be modified in order to cope with expected changes
- assessment of potential risks (e.g., identifying most problematic changes from a technical, organizational and stakeholder-role viewpoints)

Impact analysis is carried in order to support the change management process and overall decision making process.

1. Selected innovation: Maritime Big data/data mgmt

In maritime industry, a large amount of data is generated from different sources along the path of the transportation and supply chain of goods. This includes traffic data, location data, cargo data, weather data, machinery data and others. At the same time, a clear definition of the term “Maritime Big Data” does not exist. Maritime Big Data can include anything from details of the ships' performance, the freight (rates), weather data, labor costs, oil to even metal prices.

Due to the size of the maritime transport network which includes large number of independent stakeholders (seaport operators, shipbuilders and ship owners, agents, brokers, shipping and insurance companies or classification societies), large scale planning problems exist at the strategic, tactical and operational level.

Besides weather forecasts and historical data, most important data resources in case of voyage data are provided by bridge equipment, which is recorded by the Voyage Data Recorder (VDR) and external monitoring such as the Automatic Identification System (AIS)

1.1. Impact on technical operations

1.1.1. Consequences/repercussions

Maritime Big Data management can lead to several advantages, like increased safety and resource utilization, as well as to higher efficiency, sustainability and environmental protection. Integration of GIS systems and movement tracking for example, can be helpful in forming a technically competent global maritime and logistic environment.

One of intended uses is to develop innovative methodologies based on shared cartographies and geo-referenced data, in order to standardize information sources and integrate them in a unique tool able to support strategic and operational planning. The methodology could be shared at transnational level with the output of uniform information sources among similar actors.

Shipping companies are under the pressure of meeting agreed arrival times at the seaport, while being faced with the problem of the named uncertainties of weather conditions. On the other hand, seaport operations are sometimes delayed due to different reasons, such as arrival times of prior ships, loading or unloading processes.

The new methodologies and technologies will help improve today's insufficient prediction accuracy in the area of logistic processes (for example, predictions of vessel arrival times and the needed speed adjustment) due to the inefficient data management and analysis. Today's value of the data is low in relation to its acquired volume. The new solutions using Big Data Process will collect, retain and present only data with high (economical) value.

Therefore, it supports cost reduction, higher efficiency, sustainability etc. Furthermore, BDA ensures higher safety at sea by preventing collisions and machinery failures. Big Data can bring advantages to the maritime transport sector regarding efficient routing, operation optimization and safety improvements.

1.1.2. Expected changes

Introduction of Big Data Management and Analytics will change foremost the decision-making process. The so-called data-based or knowledge-based decision making is already present in numerous successful applications in the industry and maritime and logistic sectors are certainly a very suitable environment for this type of innovations.

With the introduction of Big Data Big Data Management and Analytics it is expected that stakeholders will be able to perform faster decision, more accurate predictions, react better on the changing conditions (traffic, weather,...) and therefore being able to better optimize the use of available resources.

The first aspect of expected changes will be represented by the data management consisting of acquiring and preparing the data, which means e.g. cleaning and aggregating them. After that, the second part of changes involves analytics of aggregated and prepared data, in which data will be firstly analyzed and afterwards the results will be interpreted. It is expected that these

methodologies will improve in time based on the machine learning and other algorithms based on historic and real-time data.

Some of benefits will be immediately visible for the operations of local port community, others for broader supply chain and environmental protection. The change will consist in availability of interpreted results of Big Data Analytics, which can be reused to feed the data on other processes that are depending on logistic operations (like manufacturing).

1.1.3. Assessment of necessary modifications

To implement a Big Data Management solution, several modifications will have to be carried out. A new infrastructure for storage and processing of massive amounts of data will have to be prepared. It should be sized to the point of being able to collect, process and present data in expected timely fashion. This is particularly important for the Big Data Analytics applications that should present the results in near real-time (like environmental alerts).

The modifications will be necessary also in the process of acquisition and collection of data. Some of the Big Data will be obtained with new types of devices, like IoT sensors and geo-referencing devices. The changes will have to guarantee a repeatable acquisition process, therefore with suitable communications links, data control and enough redundancy to allow availability of the service.

Some modification will be necessary in the existing sources of data, that are meaningful for the Big Data Analytics. A good example is the repurposing of existing ship VDR and AIS information, that are today used for different purposes, but can serve as a good additional source information for planned Big Data Process. The same applies also to the other sources that might be present in the initial stage or added later to the Big Data Management tools.

1.1.4. Assessment of potential risks

Big Data Management can lead to a new generation of innovations and better decisions in supply chain community but has also some risk associated that should be addressed to obtain meaningful results.

Big Data Management in general refers to the collection of large and complex datasets which are difficult to process and analyze using traditional database management tools or data processing applications. When handling Big Data, advanced data-processing techniques and tools are required in order to effectively analyze and utilize this data

Various stakeholders which are involved in the cargo transport (from origin to destination), are constrained to rely on the information provided by the other parties involved. Therefore, the availability of data to feed Big Data Management must be constant in time to assure repeatable results. Since the quality and the reliability of analyses' outcomes depend on the input data, data resources must be reliable and secure. In addition, data needs to be protected from unauthorized access.

Volume and variety of data is also a factor to be monitored. Volume of gathered data is expected to be very high, so an active policy (retention of data) should be part of the active strategy. Big Data Management system should be open to acceptance of unstructured and multimedia data too, thus allowing interpretation and correlation of data, that is not always structured.

By storing many datasets in the same infrastructure, it is difficult to overview the different owners and to avoid the monopolization of property rights because a strong demand for only one data provider leads to monopolistic deals. Mutually accepted agreements and legal framework with clear instructions and rights needs to be implemented by international and local policies to ensure competitive conditions.

Another risk factor is security and cyber threats. Wireless exchange of data for example contains the risk of interception or penetration from cyber criminals and terrorists.

And last, but not least, developing Big Data solution requires new skill sets, validation of collected data technological knowledge in analytics, statistics and software modelling. It requires experts

such as computer scientists, mathematicians and data scientists for interpretation of results of Big Data Analytics.

1.2. Impact on labour market

The general awareness about the potential of the integrated analysis of the huge amount of digital data generated by technological systems is rapidly increasing. It is quite evident that, in the coming years, processing the amount of structured and unstructured digital data will allow us to understand more effectively the dynamics that happen within cities and port areas but also that it will be mandatory to deeply redesign activities and processes, even those that are already based on information systems.

From the impact assessment on labor market standpoint, it is however equally clear that the variety and inhomogeneity of the data sources that are overall classified as Big Data, makes it very difficult to make valid estimates at an overall level, since those impacts are strongly related to the application field and the design approach.

1.2.1. Consequences/repercussions

The mentioned increase in digital data that can be processed and integrated into ICT solutions has, as first significant repercussion, the need for new design approaches due to the essential inapplicability of traditional techniques, tools and methods. Indeed, due to a large amount of data sources and knowledge needs that can be considered in ICT tools and systems development, it will be mostly necessary to carry out specific context and user needs analysis, redefine methodologies and practices or even prototype new devices and systems.

The different methodologies and techniques required to process large amount of non-homogeneous and non-standard data adopting integrated solutions require the contribution of new professionals with particular skills such as data-science, visual and interaction design, mathematics and statistics. Regarding this, important repercussions are expected in terms of education and training that, given the overall low responsiveness of the public system, will entail the need for specific investments by companies or public-private consortia.

As said, several kinds of applications will benefit from the BDA and Data Management procedures. Each of them will have difficulties estimating impacts on the labor market without taking into account the particular objective. Basically, major changes are expected in the structure of operational processes for which the adoption of innovations and new tools can gain added value. For this reason, more than significant reductions in employment, some redesign of existing processes, as well as definition of new and specific activities are expected, in relation to both the implementation of Big Data enabled systems and their application in improving performance of the port activities.

As an example of needs for new procedures, in the field of safety, when adopting a new predictive system to send collision risk warnings to operators, one will need to carefully define all technological and information aspects and assess the suitability of the monitoring staff. Most importantly, one will have to design new procedures, such as what has to be done when warning is sent and even when a potential false-warning occurs. The same system can be used to improve efficiency of port activities, providing support in reducing waiting times for mooring or in real-time re-routing. In this case, one will probably have to update operators communication tools and procedures, create new procedures to process monitoring and benchmarking indicators, introduce new efficient storage planning support tools, or even activate new procedures in the field of carbon credit trading.

1.2.2. Expected changes

Research and practices about utilization of Big Data and Data Management tools in the logistics sector shows that added value and benefits brought by these innovations are higher when also integrated processing tools and techniques are redesigned and improved. Regarding this, one of the most interesting factors is about integration of geospatial information and georeferenced and geo-referenceable data that allows to create mapped visualizations of a broad variety of phenomena, on which structured datasets and location-based services are available. Mapping techniques allow to improve efficiency of several decision making processes by providing specific information related to the places where operators work, the routes taken by tourists and travellers and similar geo-referenced data, giving the new geographical standpoint in data interpretation stage.

A key point to note is that innovations based on BDA / Data Management will significantly reduce the discretion in operational and decision making stages and, at the same time, will improve transparency in all processes and activities.

One of the most important topics, already pointed out by both, operations and management sectors, relates to the recruitment of new highly qualified professionals with specialized expertise in data science, statistical analysis, data processing, interpretation and communication/visualization. There is currently a lack of these skills and it's expected to be increasingly critical in the future, given the rapid growth in demand for ICT-based services. Given the growing complexity of urban and territorial dynamics, it is also expected that the multi-actor interaction will consequently increase, leading to the redesign of systems and tools for communication and information exchange. In the activities and processes that will be modified or re-designed, situations may arise where already employed professionals become unsuitable or start making resistance to the innovations so, in the long term, a partial job turnover, aimed at acquiring operators with more adequate skills, will occur. New professionals, specialized in data management, analysis and visualization, may not cause significant job replacement or loss, however, it may happen that some employees, who mainly perform data entry activities, become redundant due to the same information being automatically derived from other sources. The same can happen to control officers and operators who perform checks and evaluations tasks in field activities that can be replaced by automated systems based on data analysis. On the other hand, we can expect a substantial increase in need for skilled employees, able to develop new algorithms for such automated systems.

IT departments within companies, businesses and institutions will generally be upgraded to cope with the increased amount of information to be stored and processed. Most likely, the same is going to happen in departments and organizations performing complementary operations, such as statistical analysis, reporting and communication.

1.2.3. Assessment of necessary modifications

In order to cope with the digital and geo-localized data related new activities, one of the first investments to be made is in re-training of all employees involved in those processes that will be redesign according to the new technological framework. The training activities can be carried out

both at executive and policy maker level. Methods like workshops and training on the job should be considered, both on specialized and transversal topics, in order to boost interdisciplinarity and skills transfer in using the new tools.

In the field of applied training, innovative dedicated educational structures with new training programs, able to provide intensive courses, workshops and e-learning systems, could bring significant benefits in improving the employed workforce performance. New training activities may also relate other areas, such as security and privacy, data quality and performance analysis, with indicators and benchmarking tools applied to systems maintenance, where progressively the presence of human operators will decrease.

Several processes will have to be redefined and redesigned, following a methodology that involves all the actors and stakeholders right from the start. Internally, the IT departments will have to design specific procedures for data cleaning, validation and correlation, in order to gain maximum added value from dataset integration.

For many existing services and procedures, cost and benefits of adopting innovative data visualization / control / summary tools and decision support systems will have to be assessed to avoid wrong investments.

Important resources will have to be allocated to obtain proper hardware, software and connectivity equipment, in order to develop new real-time monitoring and control tools and to perform system and data integration.

In order to ensure effective and positive fallouts of complex data-enabled systems adoption, data management and communication tools should be designed using a user-centered approach, exploiting the most advanced techniques in data modeling, visualization, interaction and info-design. Moreover, all technical and non-technical stakeholders should be involved and trained to use properly digital data and new tools, thus improving knowledge and control in their activities.

The last topic about the adaptation actions to the expected changes concerns the important issue of data ownership and rights for which, when large amount of data is stored inside centralized platforms, proper agreements and regulations must be stipulated to avoid the risk of creating control power concentration and monopolies.

1.2.4. Assessment of potential risks

From what has been outlined so far, potential risks to be assessed are as follows.

In terms of skills upgrade, failures or lack in updating the employed workforce and integrating new professionals with required skills, could give rise to significant problems regarding both, process efficiency and failed investments in ICT assets.

In the case of failed or ineffective cultural and technical realignment of the workforce, significant resistance may occur both in the use of new tools and in the attitude to share and integrate datasets between operators.

The massive adoption of automated systems in the fields of assessment, support and control, could also lead to a progressive loss of critical thinking and analytical capability of the operators, who would be reassigned from this kind of roles to other activities, driving to an overall extensive reliance on machine intelligence at the expense of the human judgement capability and respective intervention.

A further risk could arise when lack of internal workforce skills causes extensive outsourcing of activities and services to external companies, exceeding the possibility of adequate control, thus leading to a loss of management control over their own tools and data assets.

The underestimation of the need to boost interdisciplinarity and develop multi-actor processes can lead to the implementation of complex and sophisticated, as well as extremely ineffective ICT tools and systems. Furthermore, the negligence of maintenance, re-adjustment and technical renewal of technological infrastructure and absence of regulatory adaptation, could inevitably lead to redesign of the whole systems from scratch, with obvious waste of resources. The deployment of complex ICT platforms that has been improperly designed and managed often leads to an excessive fragmentation of tools, datasets and activities, creating inefficiencies, performance degradation and even partial inactivity, to the extent to force partial or full system re-design.

2. Selected innovation: Data standardization

The wave of innovation technology development in shipping and logistics industry over the recent years has brought good opportunity to the whole industry for digital transformation. But, at the same time, individual companies are cautious about adopting new technologies since there are no common data standards in the market.

On the other hand, there are port authorities, terminal operators and shipping companies which are already leveraging data to intelligently plan their operations, meet demand and ensure the security of their staff and cargo. For example, several leading carriers, (including Maersk, MSC, CMA CGM, Evergreen Line, Hyundai Merchant Marine, Yang Ming Marine Transport Corporation and ZIM Integrated Shipping Services) have established the Digital Container Shipping Association (DCSA) to create common information technology standards, a common foundation for technical interfaces and data for the maritime industry.

Digital standards are now a priority in order to create value quickly and overcome the lack of a common foundation for technical interfaces and data. DCSA is helping the industry define the baselined process standards from Booking to Return, including sub-processes, milestones, events and messages.

2.1. Impact on technical operations

2.1.1. Consequences/repercussions

Data standardization will have a big impact on technical operations in maritime and broader supply chain of goods. It will define standards, that can shorten the handling of cargo data, operations handling, reduce errors and lower the cost of operations. At the same time standardized data means a better reusability of data and a better platform for the dissemination of further innovations in the future.

These process standards support a common view across the industry in relation to processes, milestones, events and messages, facilitating industry standardization and digitization efforts.

Data standardization means, that the output of on Operations Management application can be reused as the input in the other chain in the supply chain, thus eliminating the need of manual input, reducing errors and speed up processes.

With the technologies like blockchain, data can be exposed and immediately seen to the other parties, retaining the security and accountability of the cargo movements. The results are publicly available, open-source, thus everybody has access to the process standards within the Industry Blueprint.

2.1.2. Expected changes

Data standardization will require in the first place the broad consensus of the selected standard and an actionable plan to implement this news standards in existing supply chain processes and applications. The best results can be obtained, when the adoption will be so widespread, that it becomes ubiquitous.

Data standardization will change not only the applications, but the process of supply chain management itself. In some occasions eliminating superfluous process steps, in others enable new ones, particularly in the planning process, because the data will be available faster than its usual today.

Data standardization include shared information technology standards relate to transmitting, receiving and exchanging data across the industry for standardizing data, message formats and interface specifications. If the adoptions reach critical mass, data standardization will trigger changes probably in every arm of supply chain process and spark the possibility for new innovations.

2.1.3. Assessment of necessary modifications

To implement the support of Standard message formats and interface specifications there are several strategies that be implemented in specific environments. If there is a possibility to

implement standardized structures in the new generation of applications and/or module specific modules, this can be the most straightforward way to implement adoption of Data Standards.

Since most of the players in the supply chain already have some supply chain management solution in place, the other possibility is to implement data transformation, cleaning and routing solution to connect existing databases with new standardized data. Here the solution like Port Community Systems (PCS) can help resolve these needs, since in most of the cases they are already managing exiting non-standardized data. In best case scenarios this means changing the exchange interfaces (message queues, web services...) to reflect the needs of standardized data and message exchange.

Particular attention should be given to the mixing of new standardized data sources with historic data, typical for analytics and reporting scenarios. Data should be normalized and standardized before combining two or more generations of similar data.

Data standardization will in most cases require changes in data management and operation processes. Because of the standardization, some steps might become obsolete and other should be introduced. Failing to adapt processes to the new standard structures would mean not taking advantage to innovate and put data management on another level.

2.1.4. Assessment of potential risks

Data standardization across the supply chain is a complex and long-run effort that should be harmonized between most if not all the players in the supply chain in Maritime industry. The adoption rate is one of the main key factors to reach desired goals with data standardization.

Every chain in the logistic chain is important and can contribute to the benefits of data standardization. On the other hand, having too many players that don't support data standardization means that desired goals (increased speed, accuracy, planning) will not be entirely possible. Not only for the players who don't support data standardization initiatives, but also for the adopters of this innovation, because exchange of data is strong only as its weakest link.

The risk with data standardization is also in the serialization, forking and versioning of the standards. Standards and with this also standardized data usually change in time. It's important, that the strategy of implementation of data standardization supports methods of working with multiple versions, for the periods of transition from one version to the other. This can guarantee the smooth transition to newer standards without high cost and usage of resources and at the same time support the operations of the members, that have not yet transitioned to newer standard. Failing in this area means possible chaos, unexpected errors, delays and poor quality of data, for operations and Big Data Analytics.

2.2. Impact on labor market

2.2.1. Consequences/repercussions

In the long term, data standardization will be contributed to reduction of employees that today necessary in supply chain to managed data in existing operations software solutions. This includes manual entry of data and transformation of data, because lack of applies standards and automatic transformation and routing of data.

But at the same time, data standardization contributed to less stress on the data entry and verification, less errors and thus streamlining the operations. This gives the employee more opportunity to focus on quality of service, improvements in services and visibility of their work.

From the management perspective this can contributed to better resource utilization and better resource planning since data standardization contributes to less unpredictable events, improvisations and other anomalies that can today disrupt the working process and require engagement of more employees than in optimum situation.

2.2.2. Expected changes

It is very likely, that data standardization will not be a process that will be carried out in one batch of changes. Rather, the changes will come gradually change and improve the working process of

employees. At first the changes that data standardization brings should be well understood by employees and decision makers, to proceed with next steps of work process improvements and innovation.

Data quality validation will be important in the first phases of process and data standardization. When quality is verified, there is opportunity to change assignments, responsibilities and other work environment for at least some type of work roles.

As it is expected to contribute streamlining of the processes in maritime and supply chain industry, data standardization can contribute to better resource utilization, based on better planning.

2.2.3. Assessment of necessary modifications

Data standardization could bring modification of organization of a company. The roles of people managing the data flow in supply will change, in some cases replaced with automatized solution.

To reach a desired effects of data standardization in work process, employees will have to be trained to use new solutions and comply with modified processes. This training should be put in place as an ongoing, recurring process, since data standardization will bring the changes in waves as they are implemented across the local port community and broader supply chain.

In preparation of adopting new data standardization initiatives and solution, the impact on particular work process should be assessed before implementing it production level. This will allow to transfer the responsibility, retain the satisfaction of engaged employees and have the control of the processes.

2.2.4. Assessment of potential risks

As it is always the case the technology innovation with data standardization can bring new kind of risks. The first and most obvious risk is, that a particular local work environment is not ready to accept data in a new standardized way, which can generate more confusion and errors than expected benefits. Good preparation before the changes can mitigate these risks.

Data standardization does not bring total process automation. Employees should always monitor the data quality and meaning of supplied data. Too much relying on the automation can lead to the situation, when poor data quality can disrupt a newly streamlined process if “human control” is not present any more. Timely identification of this possible scenario can mitigate the minor or major disruptions in work process. A backup method is always a good solution in case there is a problem on quality or supply of data.

There is also a risk, that organization will not recognized the standardization of data as the base for process innovation and improvements, thus continuing with the same process and work organization as before the change. Adequate education and process change description can help to move to the next level of processes based on better data.

3. Selected innovation: Port/Vessel traffic management

Port or Vessel Traffic Management Information System (VTMIS) can provide real-time information on vessel status over a secure network of sensors, connected to the central monitoring/control solutions, which can notify various persons responsible for port security.

Such systems can be designed to manage ship traffic in ports, rivers and coastal areas. They can provide accurate detection, tracking and identification of small and high-speed targets and can generate automatic alarms if the target area approach is limited.

Proposed innovation can include a mobile solution for providing information to passengers about port services. It can be directly connected to a multi-actor system organizing data flows and providing real time information.

3.1. Impact on technical operations

3.1.1. Consequences/repercussions

Introduction of innovative Vessel Traffic Management Information System can contribute in better organization of maritime traffic in the crowded port environment. The system can have both beneficial influence in increasing safety of vessels, cargo, passengers and onshore resources.

At the same time the tracking of vessels allows better planning of docking and undocking operations, planning of logistic process and use of port resources. The information on status and eventually forecast of events can help various entities in the port community and in case of passenger terminals, also the end customers.

Better handling of traffic means less time spent in waiting positions, corrections and optimal vessel passage queuing to assure smooth operations.

3.1.2. Expected changes

Introduction of Vessel Traffic Management Information System can augment existing the functionality and security of existing systems and services for port operations. The solution will affect the way the traffic is monitored and routed in the port environment. Better information available will contribute to better information at the disposal of officers, better security, and better traffic flow.

3.1.3. Assessment of necessary modifications

The innovative solution requires the implementation of series of sensors, positioned both in strategic port positions and potentially on the vessels themselves. Additionally, other sources of data available for vessel identification, like Voyage Data Recorder (VDR) and external monitoring such as the Automatic Identification System (AIS) can be used as additional information sources for interpretation of traffic information.

Sensors and data sources must be connected in a secure way to the central control room for port traffic monitoring. With this information supplied, the innovative solution can generate notification and alerts based on the vicinity to the danger zones, other vessels and when traffic limitations are not correctly observed.

3.1.4. Assessment of potential risks

Port/Vessel Traffic Management Information System (VTMIS) can be a valuable tool for better security and process optimization in ports, but it cannot be the sole source of control and decision in the port trafficking. As such the solution is tool for notification of the security and traffic management officers.

From technical standpoint the risk of using VTMIS is the failure of one or more sensors in network on which the entire solution relies. In case of errors or non-functioning, there must exist a backup solution to continue the management of traffic without even without advanced tools.

The risk is also that the quality of information is not correct, so there must be a procedure in place to verify the quality of data, positioning and calibration of sensors to assure that correct data is put to VTMIS solution.

Security and traffic management officers should also receive adequate training to understand all the functionalities, causes and effects of using VTMIS system, to use it at full potential. Failing to do, the risk is that the VTMIS solution data and notification will not be used or interpreted in the correct ways.

3.2. Impact on labor market

VTMIS maritime transport surveillance and management services can be extended to management and information activities, relating to the control and management of maritime transport in the objective improving navigation safety and protecting the safety of passenger and the marine environment.

3.2.1. Consequences/repercussions

Some ports expect a significant increase in freight and passenger traffic. Therefore, they need to monitor and improve the existing VTMIS system with new technology. In the forecast of incised VTMIS traffic the service acts as a key solution in protecting human lives, the marine environment and safety of navigation.

Maritime transport management, monitoring of maritime facilities and timely action is just some of the services that the VTMIS service should provide. The purpose of the VTS service is, by providing its services, to enable safe passage of ships and the efficiency of maritime transport in the area of responsibility, with the protection of human lives at sea and marine environment.

3.2.2. Expected changes

By adding a new module to our existing system, the solution will increase the security and be able to provide a service that no other Croatian ports currently use.

3.2.3. Assessment of necessary modifications

There is a need to add a new module to existing system and a new thermal vision control system that monitors all vessels in our area managed by the Port of Rijeka Authority. To improve port security and to provide timely information to passengers and port users.

3.2.4. Assessment of potential risks

The area managed by the Port of Rijeka Authority are defined as high risk and so without said officer on duty, have a high probability of accidents occurring. The service is therefore to identify the various risk points, whether it be distance between two vessels, speed, angle of entry, etc. and then to assign levels of danger and a protocol of how an officer on duty must react in each circumstance.

Identifying dangers in a timely manner is what vessel traffic systems are developed for. Information systems now play a major part in allowing information to arrive on time, making it possible to see if there is an issue and then send the necessary information back to the recipient. In this way, all the information can be evaluated in real time and put in place preventative actions that will rapidly diminish the risk of events from happening. Information in this case, such as; position, heading and speed allow for a better understanding of potential risks.

This information can be combined with the specificities of how the traffic passes through each unique zone to develop an advanced understanding of what constitutes a possible risk and, a unique traffic organization system can be put in place. With a powerful information system, creating a traffic organization system instantly becomes more precise and better placed to prevent events from occurring.

Conclusion

D3.2.3 shows the need of better data management, in particular when expanding with sensors and other new sources of information, as a starting point for usage of advanced algorithms like machine learning and real-time analysis. To achieve this goals, the whole stack of Big Data management, data standardization and data analysis tools must be put in usage in logistic and transport sector.