

DigLogs

Impact Analysis of traffic automation system in multimodal transport

Deliverable 3.3.3

Responsible partner: Actual I.T.			
Involved partners: Port-PPs			
Version	Status	Date	Author
1	Draft	19.09.2019	Actual I.T.
2	Draft 2	18.10.2019	Actual I.T.
3	Minor changes	04.11.2019	Elevante Srl
4	Final	31.12.2019	Actual I.T.
Notes:			
DISCLAIMER <i>This document reflects the author's views; the Programme authorities are not liable for any use that may be made of the information contained therein.</i>			

Table of Contents

Introduction	3
1. Selected innovation: Maritime Transport Chain	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	6
1.2. Impact on labor market	7
1.2.1. Consequences/repercussions	7
1.2.2. Expected changes	7
1.2.3. Assessment of potential risks	8
2. Selected innovation: Vessel Estimated Time of Arrival (ETA)	8
2.1. Impact on technical operations	9
2.1.1. Consequences/repercussions	9
2.1.2. Expected changes	9
2.1.3. Assessment of necessary modifications	10
2.1.4. Assessment of potential risks	10
2.2. Impact on labor market	11
2.2.1. Consequences/repercussions	11
2.2.2. Assessment of potential risks	11
3. Selected innovation: Delivery Planning	11
3.1. Impact on technical operations	12
3.1.1. Consequences/repercussions	12
3.1.2. Expected changes	12

3.1.3.	Assessment of necessary modifications	13
3.1.4.	Assessment of potential risks	13
3.2.	Impact on labor market	14
3.2.1.	Consequences/repercussions	14
3.2.2.	Expected changes	15
3.2.3.	Assessment of necessary modifications	15
3.2.4.	Assessment of potential risks	15
Conclusion	16

Introduction

The purpose of this deliverable is to choose the most attractive solutions to deploy and analyze the impact of on technical operation side as well as labor market for traffic automation system in multimodal transport, gathered in D3.3.1 and analyzed in D3.3.2. 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:

- Maritime transport chain
- ETA
- Delivery Planning

All these innovations deal with the automation of the logistics chain in both freight and passenger sectors. Thus, in general, it can be concluded that PPs are strongly interested in this topic, rather than autonomous vehicles or other automated devices (cranes, lifts, drones, etc.). The analysis of these innovation is described in detail in D3.3.2.

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 Transport Chain

Maritime transport chain is a network of carriers, ports, freight forwarders and supporting services that spans all over the world. It is very usual that movement of cargo from source location to the destination requires handling and transport that involves several dozens of organizations during the journey of goods.

Customers and stakeholders in Maritime Industry demand more speed, less cost, more transparency, bigger security, less impact on environment, bigger efficiency, to name only a few key indicators with which we can measure success.

These goals can be achieved by streamlining all the aspects of transportation chain processes, mostly with the smart technologies that will help resolve the biggest burdens of transportation industry, like long paperwork paths, efficient use of resources and coping with ever increasing quantity of cargo.

1.1. Impact on technical operations

1.1.1. Consequences/repercussions

Global logistics still relies on millions and millions of paper documents. For their operations, information in these documents is crucial for speed of execution, efficiency and possibility of planning of operations in transport chain. Anything that can be done to improve present condition can have a huge impact on the whole industry.

Document digitalization, electronic data exchange, integration of smart sensors, data standardization, visibility and traceability of cargo thru real-time services like blockchain and other technologies can vastly improve the services in Maritime transportation chain.

All these technologies have their own benefits, but these can even multiply, if combined in innovative ways, for example with algorithms of machine learning and artificial intelligence based

on data from IoT devices and shared with others through blockchains. Together they open totally new opportunities in management, cost reduction and other areas.

Innovations for Maritime transport chain does not include just one or single technologies, but rather the combination of new services that complement and in some situations supplement existing systems and services. The consequences are changes processes, that have repercussions both in technical environment as in the required human engagement.

1.1.2. Expected changes

The introduction of above listed technologies and other innovation in the Maritime transport chain will have a substantial impact on the technology and processes in the transport chain. The benefits will be less resources used, better planning of activities, less errors, more transparency.

These changes does not necessarily require large modification of existing information systems, because in most of the cases, these “big bang” projects would be too expensive and too disruptive to the normal operations.

It is better to think of introduction of innovative technologies in steps, like additional service or interface, than can speedup, optimize or eliminate (in case innovation replaces some part of process or technology) time and resource-consuming tasks.

Technologies like blockchain, a distributed electronic ledger system that allows transactions to be verified autonomously by everybody involved in the cargo transportation. A technology that can enable a revolution is that of smart devices, also known as Internet of Things (IoT), that are present in more and more parts of the transportation chain, either as smart sensors, controllers, embedded devices in cargo manipulation machines and even ship themselves. IoT devices provide the necessary intelligence for better process handling, risk mitigation and other uses.

1.1.3. Assessment of necessary modifications

Necessary modifications to implement proposed innovations and new technologies deepened on lot of factors and can be anything as a relatively small addition to existing management system in the particular Transport chain organization or a relatively big change, that require full project and change management approach. It depends on maturity and structure of the existing technical solution and its flexibility to accommodate new data and process modifications.

The biggest issue in today used systems will be in particular their relatively fixed scope and inability to support a modified process. This should be carefully evaluated when planning the introduction of a new service or solution to better integrate with maritime transport chain.

1.1.4. Assessment of potential risks

Innovative technologies than can bring to Maritime transport chain a new beneficial opportunities, but also associated risks. One of the biggest concerns today is, that smaller initiatives and projects might not outlive their pilot stage and become a widespread solution. Most of experts agree that innovative technologies, for example Blockchain will be only as successful as comprehensive and widespread they will become.

In order to succeed they will have to be accepted by all stakeholders in the process: shipping lines, terminal operators, manufacturers, banks, insurers, brokers and port authorities. If this will succeed, the prospects are very good: documents could be processed in minutes rather than hours or even days.

Another big question is, if there will be one or several Maritime transport networks handling cargo transportation routes. Not all stakeholders are looking at deploying the same technology solutions and platforms, use same messaging and networks, so there will emerge questions about interoperability and/or standardization.

Related to this concern is also the question of closed versus open chains. A big factor of success for logistics chain solutions until now was, that these chains are »permissionless« with no central

authority granting or prohibiting the access to publicly accessible data. In Maritime Industry this may be a challenge which will have to be addressed.

There is also a variety of different languages, laws and organizations involved in moving cargoes. Because of that standardization efforts in the past were quite a slow process.

1.2. Impact on labor market

1.2.1. Consequences/repercussions

Usage of new technologies in Maritime transportation chain will trigger changes in the needs of human resources for support of modified and new processes. Digitalization of the documents and electronic data exchange will affect the need for simple manual entry of data and staff necessary to handle this processes.

At the same time, innovations in Transport chain will create new job positions with different skill sets. For example, there will be need for skilled people for advanced planning of resources and processes with the knowledge of modern planning tools. Or employees skilled for support of handling intelligent smart devices (IoT sensors,...).

There will be more need on knowledge for specific transport chain analytics and real-time process optimization, adjustment to the current conditions of resources, transport routes and similar key factors.

1.2.2. Expected changes

If the selected innovation in the Maritime transport changes transport management process, there will be need for re-training of the employees to successfully utilize the technology or

service. It is very possible, that the new process will need a reorganization of the work to better adapt to the possibilities and requirement that changes bring.

1.2.3. Assessment of potential risks

With the introduction of new innovative technologies and processes in the Maritime transport chain there can be several risks associated with employees and labor market. Depending on the type of innovation applied, a news skill sets will be needed and a specific knowledge of both transportation best parties and particular technology use will represent a biggest challenge for new employments.

The risk is also the ability of the organization implementing the new technologies to re-train or re-skill the existing personnel to utilize the innovative solution regularly and in the right way. Wrong approach to the introduction of new processes can result in dislike and ultimately the rejection of using of new procedures. This risk should be assessed with care and the appropriate steps should be used right from the introduction of new technology or service.

2. Selected innovation: Vessel Estimated Time of Arrival (ETA)

Management of vessel arrival and departure times in ports is one of the key factors not only for logistic operations in ports, but for the whole Maritime transport chain. Estimations of arrival and departures are key for planning of operations on all levels and departments.

A port which supports innovative technology (such as vessel ETA) can be able to predict with high precision the arrival and departure time of a ship and with this increase the efficiency of operations.

2.1. Impact on technical operations

2.1.1. Consequences/repercussions

Introduction of advanced estimation of vessel departure and arrival times will give the port the ability to better planning berth utilization and optimize all supporting logistic processes which depend on presence vessels in port. At the same time the new technology and process will have a beneficial impact on utilization of transport resources including less waiting time for berthing, loading and unloading cargo.

The goal of using this ETA is to achieve “right on time” management regarding planning of arrivals, departures and connected services. These estimates are useful for all actors in the port community and transportation chain, because they serve as a base for planning their own operations, better reserve an utilize resources and decrease waiting time.

2.1.2. Expected changes

Technology for better estimation of arrival and departure time can based on metering the progress of transport (arrival) and cargo loading/unloading (departure) processes and comparing the remaining transportation journey or manipulation of cargo towards previously executed (metered) operations. In this way, the estimations can be performed more often and reflect the factors that may change previously calculated estimates. In this way, with the help of machine learning algorithms, the estimated arrival and departure times will become more accurate and similar to actual times.

This approach will require measuring and calculating new estimates, then can be then forwarded over standard messaging systems to interested parties. On the receiving end, the planning solutions will have to be able to receive updates on the estimates to give the operators a more accurate data for decision and approval of operations.

2.1.3. Assessment of necessary modifications

Estimated arrival and times can be fed to existing logistic management solution and communicated to interested parties. It is preferred that this communication of ETA is compliant to the existing standards, initiatives and project in the Maritime sector, like communication and messaging platform MCP (Maritime Connectivity Platform) and IEC 61174:2015 Maritime navigation and radiocommunication equipment and systems.

To generate an accurate ETA, the technology solution must be able to collect metering data from existing logistic management information solutions used for port operations, vessels and intelligent sensors. Metering will have to be analyzed with Big Data Analysis and Machine Learning algorithms, which will be able to generate and update the estimates.

2.1.4. Assessment of potential risks

The main risk for the preparation of estimated arrivals and departures of vessels lays in the accuracy of data on which the estimates are based. If the metering data is not a correct, the estimates will not be accurate and trustworthy. The solution will have to be calibrated and monitored to gain the adequate accuracy.

At the same time, the risk is to rely processes only on the estimated arrival and departure times than will be calculated with proposed innovative solution. In case the estimates for some reasons are cannot be available or are missing, there should be in place an alternative source of estimates and verification, so that the processes relying on this data are not misled in wrong activities (example: resources reserved and then not used,).

The risk is also that the methods and standards for calculating estimates will be different from solution to solution, port to port and not immediately comparable. A standardization of methods for collection of data for estimate calculation would be beneficial to mitigate the risk.

2.2. Impact on labor market

2.2.1. Consequences/repercussions

Advanced technology for estimation of arrival and departure time will not have a direct repercussion on the labor market but will be beneficial for the better human resource utilization. Operators will be able to better plan the resource, their utilization and react to changes due to external factors that affect changes in departure and arrival times.

2.2.2. Assessment of potential risks

Risk for the employees and labor market related to the technology for estimation of arrival and departure time of vessels is low and comes mainly from the same source of risks that apply to technology consideration. If the accuracy of data used as a base for estimates is not correct, the mislead estimates could cause waiting time and lower utilization for the employees.

3. Selected innovation: Delivery Planning

Better planning of deliveries based on the real-time and predicted traffic conditions the travel time information helps to save travel time and improve reliability through the selection of travel routes pre-trip and en-route. In the application of logistics, travel-time information could reduce delivery costs, increase the reliability of delivery, and improve the service level.

A specific IT tool can be developed elaborating the two technological trends: Big Data and PCS automation.

3.1. Impact on technical operations

3.1.1. Consequences/repercussions

Delivery Planning solution can have key impact on efficiency of supply and transportation chain with better utilization of resources given the changing conditions during the transportation of the goods. A solution that can help with automatic suggestion or selection of travel routes before the trip and even during the trip, can save costs, decrease the transport time and have a smaller environmental impact on the communities affected by transportation of goods.

The proposed solution can be easily linked to the existing Port and Maritime information systems both as sources and as targets of the Delivery Planning solution. The type of data that Decision Planning system can offer to existing operation management solutions can be relatively easy to integrate in the existing solution with a suitable interface and with the help of routing, transformation solution like PCS system.

3.1.2. Expected changes

The quality of the data in a Delivery Planning solution depends on frequency and sources of acquisition of the data. This include publicly available data, like traffic conditions, weather data, transport capacity availability as well as data available in the transportation management solution, like estimated times of arrivals, number and types of cargo, transportation vehicles.

To assemble a successful Delivery Planning solution, all this data must be collected, normalized and forwarded for the decision process of Delivery Planning solution. In respect to the methodologies used today, the innovative Delivery Planning solution can change the suggestions more often that is today's business practice. Transportation providers will have to able to respond to changing requests and adopt their processes.

The possibility of frequent delivery changes will have to be verified in the existing operations management systems and processes, so that they are able to respond to the new requests and

still fulfill their service in the supply chain process. A new metrics will have to be put together and aligned among interested parties to maximize the potential of changing plans.

3.1.3. Assessment of necessary modifications

Delivery Planning solution requires a good quality of data sources to obtain useful data for the more efficient planning process. This includes making interfaces for acquisition of the data from existing sources (like Estimated Time of Departure and Arrival from PCS systems, cargo manifests, etc.) as well as new sources and sensors (location data, transport/stowage capacity monitoring, etc.)

To implement a Delivery Planning project the processing of the data must be assured, based on algorithms, traditional and based on machine learning, with an output that can be either a standalone Delivery Planning solution or an integration with existing port and transportation management solution.

The real challenge will be a modification of decision-making processes, based on the prediction and suggestions of Delivery planning solution. This suggestion will change probably very often, based on the newly acquired traffic and other conditions. For useful utilization of this suggestions, operators will have to use estimates at latest possible time in order to being able to re-route the next leg of transportation. After that milestone, changes in delivery type might not be possible or efficient and can even affect operations in a negative way. A new process of decision making and actionability of changes will be necessary to reach the desired goals.

3.1.4. Assessment of potential risks

Success of Delivery Planning can be achieved only if all the conditions for its usage are met. On the sources side, there is a risk, that not all routes to the particular port will be able to provide the required data. This will in consequence limit the usefulness of the whole planning process,

because data for some of the workloads will not be timely available or accurate to support a different decision maker process in delivery planning.

There is also a risk of legal implications regarding the long-term availability of data. Since a large part of useful data for Delivery Planning is coming from commercial and closed (not-public) systems, a solid contractual base can assure a constant availability and quality of data. Too much disruptions in this area can have a significant effect on the results from Delivery Planning system.

There is also a risk, that the Delivery Planning process will not be aligned with the real deadlines/latest time for changes in delivery methods and with this possibly disrupt the whole process. To mitigate this risks a gradual approach towards desired goals can verify that the newly developed methodology works and has a positive effect.

The risk for the effective use of Delivery Planning system is also the flexibility (contractual and technical) of transportation providers, that must be able to adapt to the changing plans as results of Delivery Planning system.

3.2. Impact on labor market

3.2.1. Consequences/repercussions

The main consequence of the Delivery Planning development would be the sensible reduction of the number of people needed in order to manage the journey of a fleet of containers and/or semitrailers and at the same time to make more efficient the workload of the fewer operative staff that remained employed. The technology would allow even a single COO to have a clear and immediate situation of the fleet, with the possibility of mapping in advance all the journeys in a fully optimized way and to change in real-time routes in case of anomalies. The workload would become less dependent on phone calls and email, making operational jobs more efficient, meaningful, less repetitive in some areas (especially in the communications side) and less discretionary, as fully operational Delivery Planning Systems would help COOs to perform their

duties by giving them the right set of information at the right time, making their decision making process more data-based and less opinion-based.

3.2.2. Expected changes

The impact of the technology chosen on organizations would be strong and evident. If implemented on a full scale with a real-time traffic information system and an integrated rail/ferry multimodal booking platform, organizations would become more efficient, they would need sensibly less number of staff to employ in order to run their operations, but at the same time they would need more skilled and trained people. A full-scale system would allow a single operator to give more than a hundred orders per minute, managing at the same time an exponentially higher number of communications to suppliers and customers than it would have been possible to handle with a traditional email/phone method. Because of this, operators will be required to become more managerial, more skillful in order to intervene only in out-of-order situations and to monitor the progress of the day-to-day schedule.

3.2.3. Assessment of necessary modifications

The necessary modifications to the organization's structures would include a fully integrated vertical system, allowing the operational base of the organization e.g. drivers, warehouse staff, terminal staff etc. to directly receive real-time instructions from the System Controller, while the System Controller would need to receive a full set of key monitoring variables in order to be able to tackle potential anomalies and to check the daily progress of the operations.

3.2.4. Assessment of potential risks

The main risk for the labor market would be a distorted use of the Delivery Planning Systems by organizations. In particular, these platforms are meant to help operational staff to take decisions on a day-to-day planning and re-routing activity while some organizations may

take advantage of the automatization process in order to simply reduce staff, to cut internal costs and to make jobs more repetitive. In an extreme scenario, it is even possible to evaluate an AI system running the Delivery Planning System alone, without any help or support by human staff. This kind of risk already came out in big companies' DPSs, where the use of algorithms could become for high volumes of traffic the best solution available for the market, though for intermodal traffic, considering the high level of involvement of human operators at all stages of the value-chain, the regulatory scheme should intervene in order to avoid human-free, 100% AI-run DPSs, favoring mixed human+AI DPSs.

Conclusion

D3.3.3 shows the importance of process automation and pressing need for obtaining a solid base for better planning as a starting point for better usage of available resources and increase of quality of services.