

D3.1.1. – Collection of the main disruptive innovations that could affect the area in the next five years

Elevante srl

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INTRODUCTION

The purpose of this deliverable is to collect and map out the main innovations in informatisation processes affecting freight and/or passenger mobility.

This activity was carried out by Elevante Srl (freight) and UniTS (passenger), with the contribution of Actual and University of Rijeka, according to the methodology prepared by Elevante Srl and then presented and approved by all partners.

Collected innovations will be briefly described and presented in order to allow partners to appraise, rank and ultimately select those innovations that are most important and relevant to them. The ranking process will be carried out by means of a comprehensive online survey tool. In the subsequent activities, a more in-depth analysis of some selected innovations will also be carried out.

Collected innovations are divided into:

- Ready-to-be-used and already happening;
- Disruptive innovations (not ready to be used, still being experimented).

INFORMATISATION PROCESSES

Informatisation is the unprecedented growth in the speed and quantity of information production and distribution and the increased role of ICT-assisted knowledge processes, systems, and networks in society.

It also refers to managed process aimed at improving information systems, control systems and other systems through the use of computer equipment, by which an organization continuously expands its IT assets and extends and deepens their appropriate use. Informatisation comprises *digitization* and *digitalization* processes.

Digitization is creating a digital (bits and bytes) version of analogue/physical objects such as paper documents, images and more. It is simply converting and representing something non-digital (even signals, location data, etc.) into a digital format which then can be used by a computing system for numerous reasons. Digitizing doesn't mean to replace the original non-digital object or data, which may however disappear because of its transient nature or be destroyed after digital conversion. But that is not the core of digitization.

Digitalization is something different. In business, it most often refers to enabling or transforming operations, functions or activities, by implementing digital technologies in the context of digitized data, with a specific benefit in mind.

Digitalization requires *digitization of data* but it means more, in the sense of how data is treated and used. It is about systems of engagement and systems of control, leveraging digitized data and processes.

Informatisation processes often create the pathway for data collection which then needs particularly tools to be managed and analysed.

PARTNERS

Partners participating on WP3 are

- PP2 – ELEVANTE Srl
- LP – University of Rijeka, Faculty of Maritime Studies Rijeka
- PP1 – CFLI, Intermodal Logistics Training Consortium
- PP4 – University of Trieste
- PP5 – Actual I.T.
- PP6 – Cluster for Innovation in Logistics and Transport System
- PP7 – Port of Rijeka Authority
- PP8 – Port of Sibenik Authority
- PP9 – Rovinj Port Authority

Partners for Freight sector:

- PP2 – ELEVANTE srl
- PP5 – Actual I.T.
- PP6 – Cluster for Innovation in Logistics and Transport System

Partners for Passenger sector:

- PP4 – University of Trieste
- PP 7 – Port of Rijeka Authority
- PP 8 – Port of Sibenik Authority

Partners for both Freight and Passenger sector:

- PP1 – CFLI, Intermodal Logistics Training Consortium
- PP 9 – Rovinj Porth Authority

WP COORDINATION

- Start Date 1.4.2019
- End Date 31.10.2019

Coordinator PP2 – ELEVANTE srl

Involved Project Partners:

- PP2 – ELEVANTE srl
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INFORMATISATION PROCESSES: DISRUPTIVE INNOVATIONS

Joint desk research carried out by Elevante Srl and UniTS (with contributions from Actual and University of Rijeka) has brought a number of innovations within the informatisation processes trend, that are not yet ready to be used. Some of them may already be taking place but in very limited testing environments, very often still requiring regulatory frameworks to keep the pace with technology advancements. Others are in the course of being implemented and turned into real-world applications. Finally, some are still being explored and investigated at a theoretical stage or exists in form of innovative start-up companies fuelled by venture capitals and gathering the interest of investors.

Collected innovations are described very briefly. They will be presented to PPs for their appraisal, ranking and final selection, according to what is important and relevant to each PP. This process will be carried out by means of a comprehensive online survey tool designed by Elevante (as WPL) and implemented by UniTS.

In-depth analysis of some selected innovations will be carried out in later stages of WP3.

Innovations are listed here in no particular order.

Systems Integration and collaborative logistics (passenger/freight)

The increasing number of different independent monitoring systems provides an even more complete information about current and predicted behaviour of an asset. The systems integration (the development of common interfaces for all systems and common databases) could allow an easy access to information and, thus, an easier data analysis.

Decision support systems (DSS) (passenger/freight)

The application of decision making techniques, can replace a subjective synthesis processes with more objective ones, leading to a reduction of human error. The information from all crucial systems should be collected in a single DSS capable to perform a reliable analysis, providing the outcomes by means of user-friendly interfaces. Moreover, DSS could bring together European and international evidence on accidents and injuries causes, suggesting links between those risk factors and the respective countermeasures.

Mobile solutions for Safety/Security (passenger)

On-board passenger ships, mobile apps can be developed to localise passengers on-board, to identify easily an unauthorised access to restricted areas, to guide people during evacuation procedures and/or to communicate to the crew a potentially dangerous situation, resulting in a more rapid reaction to emergencies. Apps can be used also for commercial purposes (e.g. payments, location-related adverts).

Wearable devices for Safety/Security (passenger)

Wearable devices (e.g. Bracelets) can be adopted to authorise passenger access to cabins or to restricted areas. They can be adopted also for localisation purposes or for counting passengers during mustering operations. They can be used also for commercial purposes (payments).

Biometric devices for Safety/Security (passenger):

Biometric devices (e.g. fingerprint/iris/facial recognition) can be adopted to authorise passenger access to cabins or to restricted areas. They can be adopted to counting passengers during mustering operations. Facial recognition could be able to track passengers' flow and provide a row localisation.

Mobile solutions for Mobility (passenger)

The mobile apps offer the perfect solution to provide people real time information approaching a port facility as well as inside a terminal. These applications could guide people in order to reduce the arisen of congestions and could also provide information about nearby interest points (e.g. services, cultural attractions, etc.).

Cybersecurity (passenger/freight)

The Marine Authority and Harbour of Singapore (MPA) has opened 24/7 Maritime cybersecurity Operations Centre in order to protect the ports and the industry of the terminals of the country. The system will monitor threats and link data-related activities in all critical maritime information infra- structures. It will be able to monitor cyber-attacks by analysing activities in the IT environment, detecting anomalies and threats and, ultimately, responding to cyber security incidents using technological solutions.

IloT platforms (Industrial Internet or Things) (passenger/freight)

Using intelligent sensors can facilitate the integration of processes and systems, improving logistics resource planning. More data can be gathered regarding operations and working environment, as well as a slew of new data-based revenue opportunities. IoT connectivity can transform day-to-day operations at sea, at port and as part of a wider logistics network. Issues can be pinpointed, downtime can be reduced, and processes can be streamlined.

5G data flows (passenger/freight)

From port authority, through the terminal operator, and then to the shipping line in a real time dynamic way. Companies have begun experimenting with a range of connectivity and data-enabled technologies. These technologies form the Internet of Things (IoT), which represents a convergence between the physical and digital worlds. 5G networks will allow to unlock the full potential of industrial IoT for transport and logistics.

E-Navigation (passenger/freight)

Since 2006 IMO introduced the concept of e-Navigation. Information and data exchange between two or more ships as well as between ships and all kinds of shore-based maritime organizations and service providers has now grown into a new dimension. This is resulting in safer and more efficient ship operations and traffic flows along many coastal regions. Autonomous ships with minimum crew will become a reality. Perhaps even no crew at all. The present situation in international shipping is characterized by rapid fundamental changes affecting the basic concepts of operating ships and even changing traditional paradigms of controlling ships.

GIS and drones (passenger/freight)

Geographic information systems (GIS) that will capture spatial or geographic data using drones (i.e. port terminal mapping).

Augmented Reality (freight)

Solutions for transport and logistics. Although AR is in relatively early stages of adoption in logistics, it could offer significant benefits. For example, AR can give logistics providers quick access to anticipatory information anytime and anywhere. This is vital for the prospective and exact planning and operation of tasks such as delivery and load optimization. Applications can be: Warehousing Operations (optimized picking, warehouse planning), Transportation Optimization (freight loading without printed lists and load instructions; completeness checks for loads and documentation; real-time traffic data to optimize routes or re-route shipments), Last-mile Delivery (driver could receive information about a specific parcel by looking at it with their AR device, AR can provide last meter navigation info).

Passenger PCS (passenger)

Passenger Port Community System (PCS): passenger notification, passenger list, routing to land public transport.

Smart contracts with blockchain (freight)

For shortening the document path increase the delivery time and visibility of document to the involved parties for more accurate planning, speed up processes increase the security of the documents required and accompanied to cargo/passengers increase the trust of data across multiple logistics actors, organisations and countries.

INFORMATISATION PROCESSES: READY-TO-BE-USED INNOVATIONS

Desk research carried out by Elevante Srl and UniTS (with contributions from Actual and University of Trieste) has brought a number of innovations in the informatisation processes trend, that are already available in the market and already used by a number of entities. These innovations could be brought to programme area without having to wait for further developments. However, local regulatory framework (if necessary) may still be lacking.

Collected innovations are described briefly. They will be presented to PPs for their appraisal, ranking and final selection, according to what is important and relevant to each PP. This process will be carried out by means of a comprehensive online survey tool designed by Elevante (as WPL) and implemented by UniTS. In-depth analysis of some selected innovations will be carried out in later stages of WP3.

Innovations are listed here in no particular order.

Sensors/Monitoring Systems (passenger/freight)

In recent years an increasing number of monitoring systems have been developed in maritime domain devoted to manage some specific issues on the base of data collected by sensors. The adoption of monitoring systems increases the situational awareness allowing a more rational asset management and resources allocations.

Onboard Emergency DSS (passenger)

After grounding or collision, the hull's integrity can be compromised, resulting in the progressive flooding of the ship. To soften the casualty consequences, on-board emergency DSS are under development capable to recognise the damage extent in an early flooding stage and simulate progressive flooding in time domain, aiding the master to take the proper decision in the early stages of flooding.

Ship to Ship/Shore Connectivity (passenger/freight)

The connectivity and information exchange between ships and shore is assured by radio and satellite communications. The exploitation of these technologies is the key for a smart handling of maritime operations and it is even more important in case of emergency.

EnMS (passenger)

An Energy Management Systems (EnMS) is responsible for the monitoring and management of different energy resources and their allocation to face normal operation as well as to counter the energy peak demands of an asset. EnMS can be implemented in a port facility as well as onboard having benefits in terms of both profits and environmental impact.

Weather routing systems (passenger/freight)

The increasing reliability of weather forecasts together with the growing computational power available onboard have been driven to the development of programmes capable to consider weather condition in planning marine operations. Weather routing systems are capable to evaluate the best ship route and speed taking into account currents, sea states and winds in order to minimise fuel consumption and/or potential navigation hazards.

GIS systems and digital cartographies (passenger/freight)

With the acquisition of data, through satellites or remote sensing systems, and their subsequent manipulation with Geographic Information Systems (GIS), it is possible to perform surveillance of the port area, distribution and classification of resources, control of the flows and positive impacts on the reduction of the pollution.

Port Community Systems (5.2.4) (freight)

PCS is an electronic platform that connects the multiple systems operated by a variety of organisations that make up a port community. It is shared in the sense that it is set up, organised and used by entities in the same sector. Port Community Systems can play a major role as Countries move towards the Single Window environment and contribute to the harmonisation and coordination of reporting formalities, processes and procedures.

Container Weight System (CWS) (freight)

Seamlessly integrates load monitoring technology onto existing container handling equipment to deliver accurate weight verification data within ports and terminals. With the IMO SOLAS regulations coming into force in 2016, CWS is the pathway to VGM compliance. Technical and commercial options are available, presenting cost-effective, robust and accurate solutions.

E-Tendering platforms (freight)

Uber Freight integrates into the SAP Logistics Business Network and this will let customers access transportation rates from Uber's digitally activated carrier fleet and gain real-time quotes and guaranteed freight capacity. This supports easier and faster decision-making based on real-time pricing and consequently increase visibility and transparency for all stakeholders. It will also have environmental benefits as it will better utilize capacity and cut emissions created by inefficient freight planning.

Vehicle Booking System (VBS) (passenger/freight)

Allows terminal operators to match terminal resources with landside demand. Terminals can configure timeslots, work-day calendars and business rules, and create and maintain customer details. Minimising manual data entry and virtually eliminating paperwork, VBS streamlines operations from ship to gate. For example, when the quayside is busy, landside resources can be adjusted to support best use of equipment. Equally, when quayside activity is lower, landside operations can be ramped up to support clearing for the next vessel arrival.

Terminal Operating Systems (TOS) (freight)

Commercially available TOS optimise efficiency at container terminals: real-time routing, dispatching and monitoring of straddle carriers, terminal tractors and other internal transportation vehicles within the container terminal. Autostow is an optimization module that automatically generates stow plans for the entire ship or by specific bay. Additional modules can automate yard planning, distributing containers throughout the yard based on predefined rules. TOS enables terminals to understand the real-time and historical performance of their business with comprehensive and agile analytics reporting.

Warehouse management system (WMS) (freight)

A software application, designed to support and optimize warehouse functionality and distribution centre management. These systems facilitate management in their daily planning, organizing, staffing, directing, and controlling the utilization of available resources, to move and store freight into, within, and out of a warehouse, while supporting staff in the performance of material movement and storage in and around a warehouse.

Document digitalisation (passenger/freight)

Digitalisation of documents in logistics process (for those that aren't already) to reach the vision of digital-only logistic chain (like Smart Bill of Lading and electronic signature).

Digital cargo id (freight)

Digital identification of cargo with smart sensors, IoT solutions, computer vision.

Stowage planning (freight)

By coordinating stowage planning systems and operating processes for carriers and terminals with the Internet of things (IoT) it will be possible to have greater visibility of containers. It will be possible to have a clearer picture of the position and conditions of their load as they move along the supply chain. The data collected through sensors will have a visibility of the conditions and movement of the goods, as well as information on the expected arrival time and critical events that could compromise the safety of the cargo.

V2V and V2I connectivity (passenger/freight)

Upcoming new communication standard like V2V (vehicle to vehicle) and V2I (vehicle to infrastructure) for peer-to-peer (P2P) real-time information gathering.

CONCLUSIONS

From desk research it emerged that a number of innovations within the informatisation processes trend, are not yet ready to be used. Some of them may already be taking place but in very limited testing environments, very often still requiring regulatory frameworks to keep the pace with technology advancements. Others are in the course of being implemented and turned into real-world applications. Finally, some are still being explored and investigated at a theoretical stage or exist in form of innovative start-up companies fuelled by venture capitals and gathering the interest of investors.

A larger group of innovations is already available in the market and used by a number of entities. These innovations could be brought to programme area without having to wait for further developments. However, local regulatory framework (if necessary) may still be lacking.

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ONLINE RESOURCES

- **5G (e IoT /AVs)**

- https://www.porttechnology.org/technical_papers/iot_5g_potentialities_in_ports_terminals
- https://www.porttechnology.org/news/qualcomm_to_demonstrate_5g_potential_for_iot?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+02-04-2019&utm_term=%5bPTI+Daily%5d+INFORM+Releases+%E2%80%982038%3a+Part+2%E2%80%99+Teaser...ONE+Celebrates+Birthday...Insight%3a+Automation+Lessons+from+Other+Sectors&utm_content=2940&gator_td=TB1GeBV%2fg9HLh9RqVdOxYozOYn0WRsFr5uFfm7CgkM2lrlx6khL6sxc5tMCDV%2biRM%2fJJ2%2fVDMrylcrPaY63jLzikUbNlcFGulYX%2f8Tqw9dhezdYZjI8Ylg6ehpy68yS35UCFg6sbTDgutEoclk%2fw%3d%3d

- **E-navigation**

- https://www.porttechnology.org/technical_papers/will_the_future_of_shipping_be_based_ashore?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+08-04-2019&utm_term=%5bPTI+Daily%5d+India%E2%80%99s+Alternative+Silk+Road...MPA+Unveils+E-Navigation+for+Safer+Shipping...ICTSI+Supports+Utilization+Initiative&utm_content=2940&gator_td=WI0LncU5FWdU2MpQ8ZleqpSx%2fUODr3xkAJf7O%2ffIJYBT7wI09O19%2fwm2lWwKavjKNIJPBSR8LsadPRN2jFaxLLGJvT8G%2bnJvCtS%2fDvWac7UQ19ag%2b8RnRPh4S5B86ng%2fx9LcnOhTBzHjvJPoyqPA%3d%3d

- **CWS (Container Weigh System)**

- https://suppliers.porttechnology.org/strainstall_uk_ltd/products/19676/Container-Weight-System--CWS--8482-/?pl=container-weight-system-cws-
- https://www.porttechnology.org/news/why_smart_terminals_use_container_weighing_systems

- **e-tendering platforms**

- [https://www.porttechnology.org/news/uber freight and sap strike digital supply chain deal](https://www.porttechnology.org/news/uber-freight-and-sap-strike-digital-supply-chain-deal)

- **E-booking systems: Truck appointment booking systems**

- [https://www.porttechnology.org/news/1 stop delivers supply chain boost to nzs largest port?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+05-04-2019&utm_term=%5bPTI+Sunday%5d+PTI+Launches+New+AIS+Portal...Insight%3a+Automation+Lessons+from+Elsewhere...Momentum+Builds+for+CTAC19&utm_content=2940&gator_td=bK%2bleYj7UIVxYUB2My0yVXgVl5jHiEaSLH%2bREGym2PEkd9aTjTmfBt1%2fJiT1qNUZlExIVto%2bC%2fze9rCq%2bo4eSclQgZi%2bROh1L2JrwDno50rOHRpLL5%2fdKjmuPkAZiN5kD2svtiQ%2fPrz9CrMqwueKQ%3d%3d](https://www.porttechnology.org/news/1-stop-delivers-supply-chain-boost-to-nzs-largest-port?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+05-04-2019&utm_term=%5bPTI+Sunday%5d+PTI+Launches+New+AIS+Portal...Insight%3a+Automation+Lessons+from+Elsewhere...Momentum+Builds+for+CTAC19&utm_content=2940&gator_td=bK%2bleYj7UIVxYUB2My0yVXgVl5jHiEaSLH%2bREGym2PEkd9aTjTmfBt1%2fJiT1qNUZlExIVto%2bC%2fze9rCq%2bo4eSclQgZi%2bROh1L2JrwDno50rOHRpLL5%2fdKjmuPkAZiN5kD2svtiQ%2fPrz9CrMqwueKQ%3d%3d)

- **Terminal Operating Systems (TOS):**

- [https://www.porttechnology.org/news/navis to optimize major colombo terminal?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+11-04-2019&utm_term=%5bPTI+Daily%5d+Autonomous+Navigation+Project+Sets+Sail...Singapore+Plans+Digitalization+Drive...Navis+to+Optimize+Colombo+Terminal&utm_content=2940&gator_td=O75W96ak1QG266sRIe49naEKvq9khjqSsR%2ftaTCOpJvNHL%2btYELUHABN%2bas0QnWW9wA2XuTdmJUwdymAQfMS2CgLPCqQW3dQJCDIjuD4hW8I00req%2fd5jAAtE9uefdBJTuiszg1EVstQuyl%2bO%2fvmlA%3d%3d](https://www.porttechnology.org/news/navis-to-optimize-major-colombo-terminal?utm_source=GatorMail&utm_medium=email&utm_campaign=Newsletter+daily+11-04-2019&utm_term=%5bPTI+Daily%5d+Autonomous+Navigation+Project+Sets+Sail...Singapore+Plans+Digitalization+Drive...Navis+to+Optimize+Colombo+Terminal&utm_content=2940&gator_td=O75W96ak1QG266sRIe49naEKvq9khjqSsR%2ftaTCOpJvNHL%2btYELUHABN%2bas0QnWW9wA2XuTdmJUwdymAQfMS2CgLPCqQW3dQJCDIjuD4hW8I00req%2fd5jAAtE9uefdBJTuiszg1EVstQuyl%2bO%2fvmlA%3d%3d)
- <https://suppliers.porttechnology.org/Navis/?/directory/Navis>