D 4.2.5 – BIG DATA MONITORING TOOL

Activity 4.2 – Software Development

December, 2021 – Final version

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VERSION CONTROL

Date	Version	Prepared by	Responsiblee	Approved by	Revision	Comment
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TABLE OF CONTENTS

ACRONYMS / ABBREVIATIONS

ACRONYM	DEFINITION
SoA	State of the Art
PP	Project partners
PT	Project Team
TC	Technical task coordinator
WP	Work package
IT	information Technologies

REFERENCE DOCUMENTATION

No	TITLE	REPORT No.	PUBLISHED BY
1	**Application Form – E-CHAIN - Enhanced Connectivity and Harmonization of data for the Adriatic Intermodal Network** 2014 - 2020 Interreg V-A Italy - Croatia CBC Programme Call for proposal 2017 Standard - E-CHAIN Priority Axis: Maritime transport	Application ID: 10048282	Lead Applicant: Municipality of Ancona

1. INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This document is relevant to the activity 4.2 Software development of E-CHAIN project - Enhanced Connectivity and Harmonization of data for the Adriatic Intermodal Network and for WP 5 Services and Transport Vehicle Integration.

The purpose of this document is to provide tool for monitoring/analysing big data needed for studying users' behaviour, upselling and resources optimization.

It is the operational document for the execution of the project being used:

- by the Task Manager (TM) and Project Team (PT) to provide detailed information E-CHAIN big data tool
- by the other Activity 4.3 Integration and testing - needed for D 4.3.2 – E-CHAIN commissioning requirements.
- By Activity 5.1 by gathering the operational data in the Pilot Sites in order to identify theKPIs (Key Performance Indicators) useful for the evaluation activity
- by the Activity 5.2 Business simulation to ease systematic data collection
- By the activity 5.3 Assessment and evaluation to prepare data for D 5.3.1 – KeyPerformance Indicators and D 5.3.3 – Assessment and evaluation report

2. BACKGROUND INFORMATION

E-CHAIN (Enhanced Connectivity and Harmonization of data for the Adriatic Intermodal Network) main objective is to enhance connectivity and harmonization of data for the Adriatic Intermodal Network, through the realization of a modular integrated software (E-CHAIN platform) for the management of intermodal transport services in port areas for passenger transport. To enhance the current situation, E-CHAIN will focus on providing new services such as an improved Port multimodal info mobility system for the passengers, a ticketing system integrated with other transport modes, an advanced touristic co-marketing tool for the operators. These services will be designed and deployed in the selected pilot sites (Ancona, Split and Venice). A Business modelsuited to adapt the technology developed in the three applicative contexts will be created and specific needs will be taken into account.

The aim of WP4 is to develop, test and implement all components of E-CHAIN platform.

3. BIG DATA

What is big data?

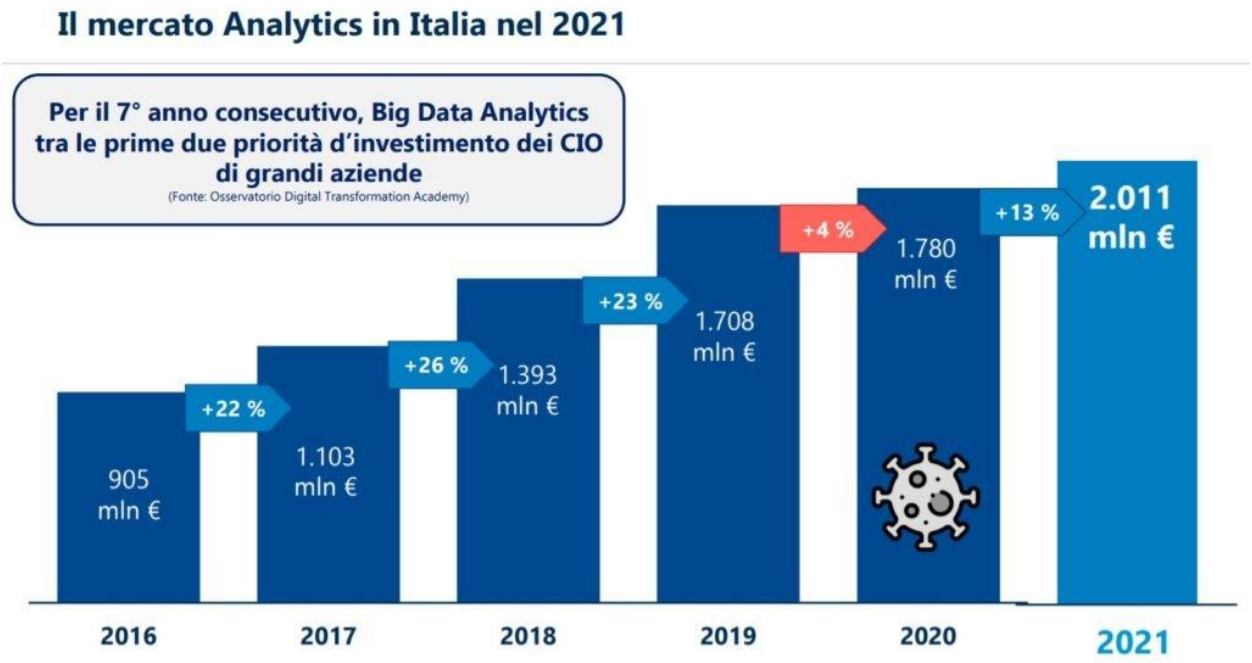
Big data can be described by the following characteristics: Volume, Variety and Velocity.

For what concerns volume, the name Big Data itself is related to a size which is enormous. Variety refers to heterogeneous sources and the nature of data, both structured and unstructured. Big Data Velocity deals with the speed at which data flows in from sources like business processes, application logs, networks, and social media sites, sensors, Mobile devices, etc. The flow of datais massive and continuous.

Data with these characteristics cannot be managed with traditional databases and systems but only through sophisticated algorithms that enable both public and private entities to make decisions using large amounts of data that grow continuously over time.

This technological progress is revolutionizing business models and the real revolution coincides with the emergence of new tools capable of linking information together to provide a broader visual approach to data, suggesting structures and models of interpretation unthinkable until now.

Insurance, manufacturing, telecommunications and media are the sectors that show the most marked growth in the use of Big Data, although there are no sectors that at least theoretically cannot benefit from the use of big data.

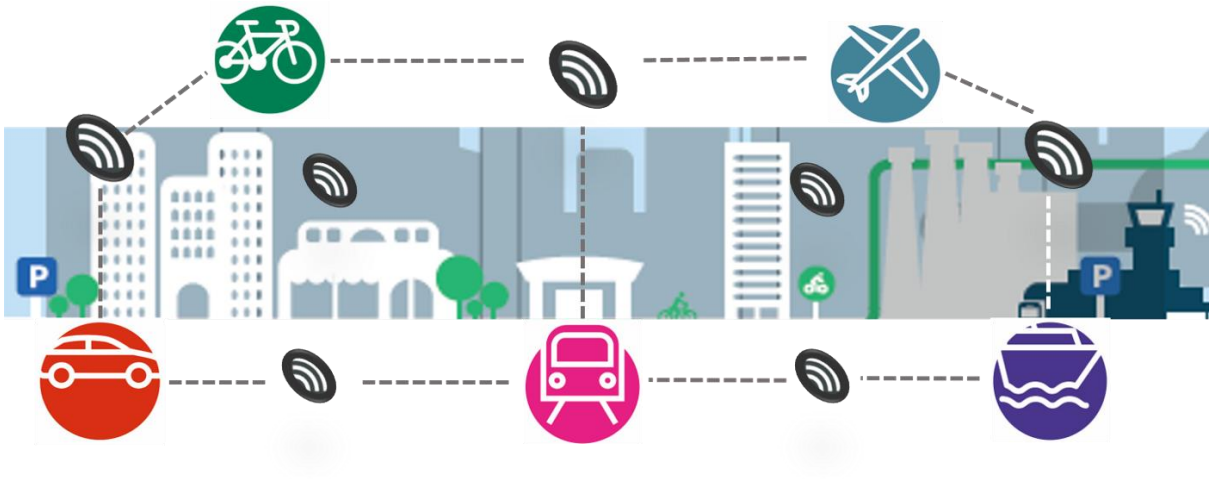


Big Data and transports

In the transport sector, public and private operators have a growing awareness of the benefits that can be achieved from Big Data processing: by applying "data-driven" approaches it is possible to identify trends, reduce costs, lower the environmental impact of the various servicesand improve customer satisfaction.

Applications related to the use of BigData are increasingly widespread and involve more and more aspects of research and practical applications.

Regarding **urban mobility and vehicular traffic management,** for example, the use of BigData allows you to:



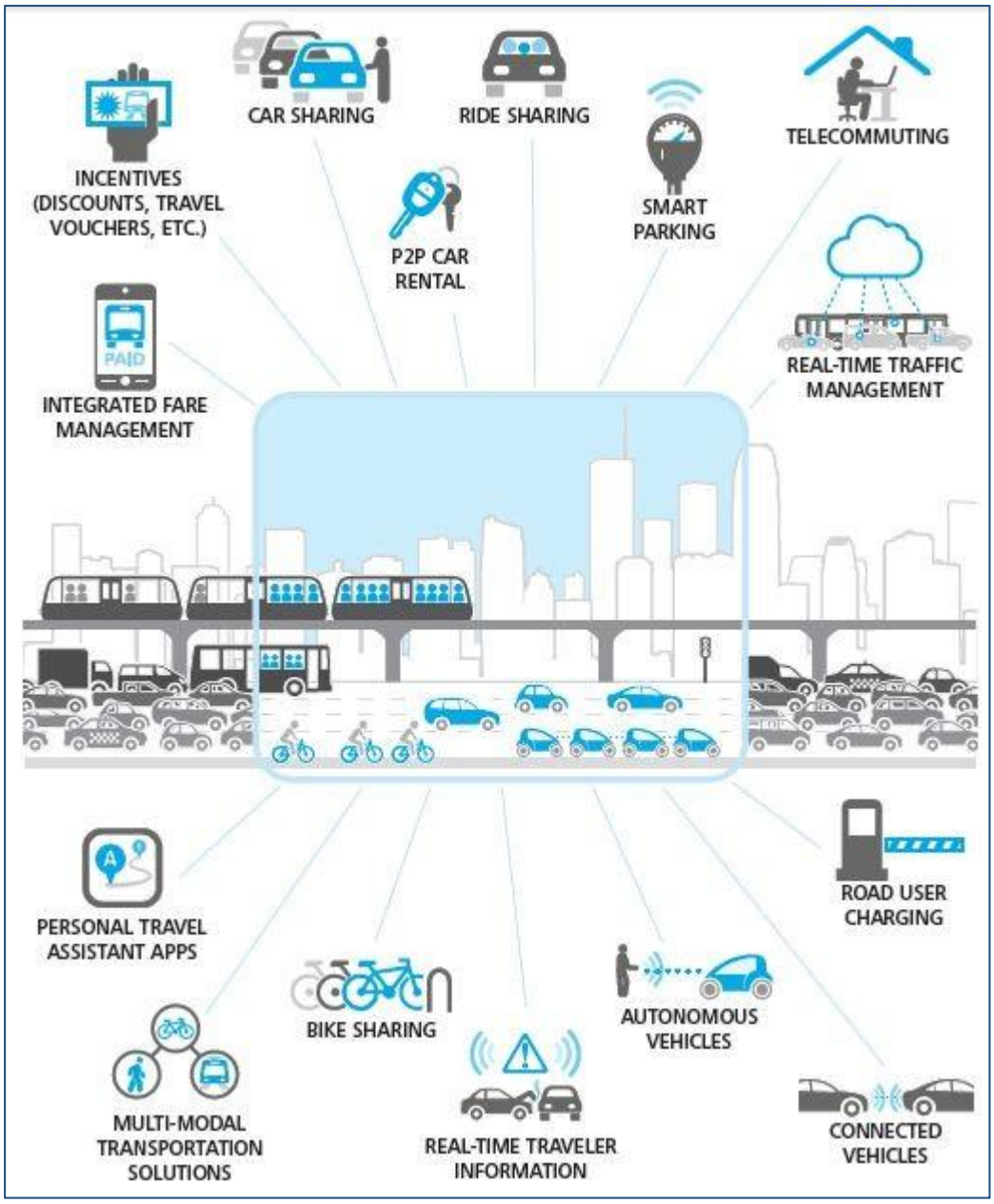
Road Transport

With reference to urban mobility and vehicle traffic management, the use of BigData can help to:

1) **Evaluate the infrastructure.** Using the so-called heat maps you can illustrate the volume of traffic across the entire network of routes and highlight the hotspots.

2) **Implement regulatory measures.** Decision makers can immediately test and evaluate the implementation of regulatory measures with the help of big data analysis and their visualization: will a new congestion tax reduce traffic in the city center? Where to implement parking bans or new parkings?

3) **Plan new mobility solutions.** The planning of new mobility services is another area in which big data analysis can help. Is another electric scooter supplier needed? What are the best locations for docking stations? Which area would be suitable for a new bike sharing service? In which areas should car pooling services, such as Uber, be allowed?



15 technology-driven trends (Source: Deloitte. Report 'Digital Age Transportation')

Maritime transport

With reference to maritime transport, we just need to think that an amount of about four trillion dollars of goods is shipped every year and considering that over 80% of them are transported by sea it is easy to understand how strategically important is the role of Big Data.

The first advantage resulting from the use of big data concerns the overall efficiency of the port system. The Hamburg port, for example, uses internet, cloud computing, internet of things and big data technologies to manage the port area, the parking lots and the harbour terminals.

Italy is approaching a more conscious use of data thanks to the so-called PCS - port community system - digital platforms for sharing data and information. The advantages are many, from the shorter lying times of the product in the ports to the cost recovery. The real-time information ofincoming and outgoing maritime traffic makes it possible to regulate the access of trucks to the port, avoiding negative effects on mobility.

In conclusion, big data analysis and visualization tools are the key to build smart and future-proof mobility policies. They offer transparency and enable city and traffic planners to make strategic and operational decisions based on verifiable facts.

Big data and Tourism

The revolution that the use of Big Data represents for any industry is perhaps even more significant for the tourism industry. It's no coincidence that airport companies and airlines companies were the first organization to make use of this resource.

Numerous are the areas in which a strategic use of data can bring important benefits: from Revenue Management to Cost Saving, from customer satisfaction to the monitoring of organizational performances.

Furthermore, Big Data for tourism offer important information not only on collective behaviors, but also on the relationship between places, things and people.

Highly advanced algorithms through the millions of data available on social networks, are able to help private and public operators to more effectively convey their marketing campaigns and to measure the sentiment towards a location or attraction in real time

It is also possible to carry out assessments and measurements on the tourist “post experience” and to produce statistics on arrivals and presences in a more agile and faster way compared to the traditional statistical survey systems.

In summary, therefore, the analysis of this type of data on one hand can help to know the reputation of a specific structure, a territory, a service or an itinerary and on the other hand to maximize tourist satisfaction, through a personalization of the travel experience and offer

3.1. IDENTIFICATION OF DATA TO BE MONITORED

With reference to the E-chain project, it will be possible to improve different type of process by crossing the data collected through the devices and channels activated by the project (Totem, Website and Web app) with those of other public and private sources (socio-demographic information, weather data, etc.)

Classification of the data that can be collected through the platform.

1) **Data from Google Analitycs**: The platform will be configured on Google Analytics in order to provide to the PL and all authorized subjects all the information based on the metrics through which it is possible to analyze the traffic of the site. (See tab below)

2) **Specific Platform Data:** with reference to the specific functionalities of the platform, itwill be possible to analyze

- Data relating to CO2 production and savings[1] (fig. 1)
- Data related to searches for travel solutions Italy-Croatia
- Number and types of searches:
- Place of Departure / Arrival
- Date of the search
- Number of multimodal trips and type of emerging combinations
- Number of "click throughs" from the e-chain site to the booking site of the transportservice provider

3) Data relating to the use of the messaging system to assist passengers all during the trip

- Number of customers who accessed dedicated links and started the editorial communication plans
- Number of sms / e-mail to customer from E-chain web platform
- Number of supplier's logins
- Number of the editorial communication plans created
- Number of non-transport supplier's logins
- Number of non-transport services
- Number of special communications from port authority or other territorial body

[1]Each transport service provider will provide the figure for the everage CO2 produced per km or per hour of navigation. It will be thus possibleto compare the data of CO2 produced for each intermodal transport solution with the dato of the CO2 produced travelling by car.

It will be possible gathering interesting data on the behavior of passengers belonging to different segments (passengers with cars, passengers with caravans, passengers with minors and passengers with reduced mobility).

3.2. BIG DATA TOOLS

There are two main tools that the e-chain platform makes available to public authorities and transport/tourism services providers.

1) A simple and intuitive interface will allow public authorities and all authorized parties to monitorthe CO2 savings resulting from the choices made by travelers.

Fig. 1

Fig. 1

2) A data monitor with useful information about the travel searches made by users

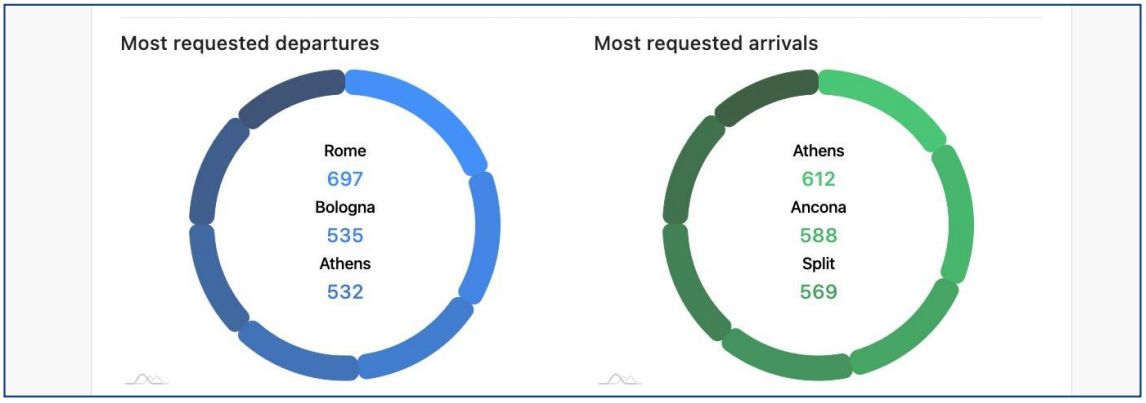


Fig. 2

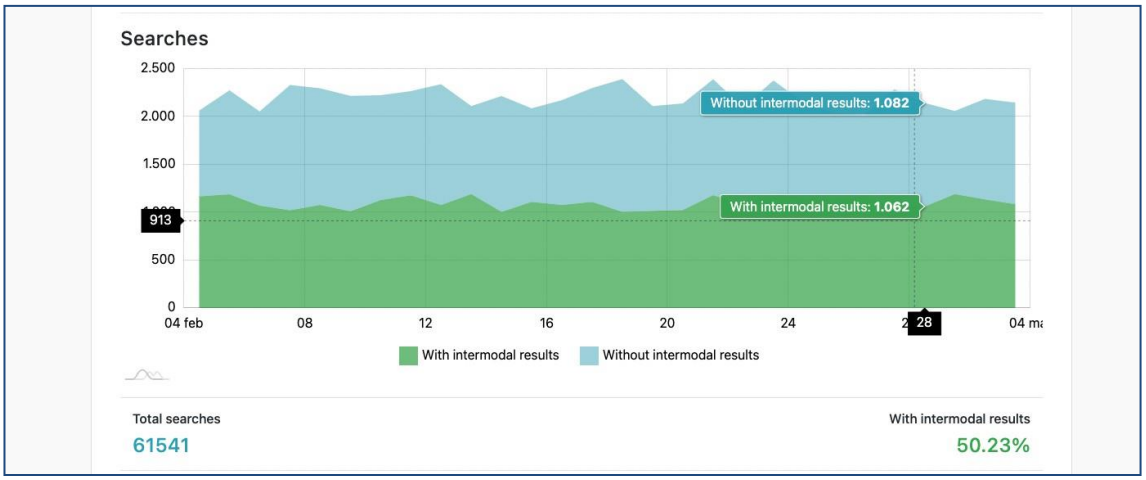


Fig. 3

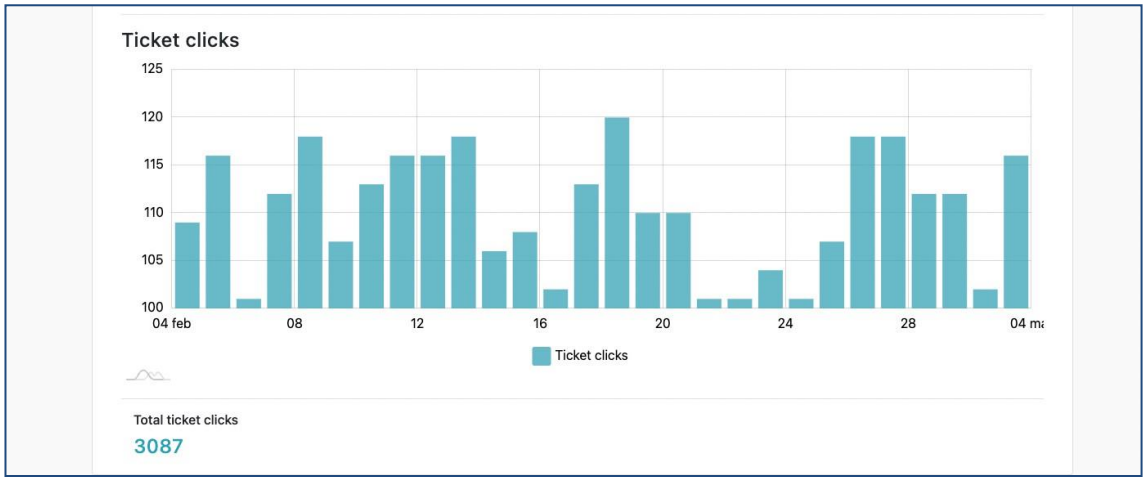


Fig. 4

3) A data monitor with all the data relating to the CRM system messaging management system.

The system returns the collected data in numeric and graphic form, allowing the suppliers and publicadministration to plan data-driven improvements of the offered services.

3.3. BIG DATA USAGE

Public Authorities

A ‘smarter’ use of the transport network is particularly important for the cities like Split, Ancona or Venice with a high seasonality in tourism.

Port cities with a huge traffic of ferry and cruise passengers are also characterized by traffic peaks atspecific times of the day, specific days of the week and specific weeks of the year.

The data provided by E-chain project could serve as a basis for innovative traffic and mobility management services also for these events: the challenge is maximizing transport capacity using existing physical infrastructure.

With reference to the flows of passengers arriving and departing from their ports, the port cities willhave the opportunity to answer questions like these:

Where are people going?

How and when do they move?

Which are the more frequented areas of the town?Are there any security issues?

What infrastructures and facilities are used?

What are tourists and passengers looking for when they arrive in Ancona/Split/Venice?

Which services are oversized and which undersized?

Examples of Bigdata use in pilot sites

Ancona/Split > Ferry passengers

1) Passengers with vehicle

- Key factor: geographical origin of passengers
- Possible action: organize access to the port area according to the expected traffic volumes
- Expected benefits: decongestion of road traffic

2) All passengers

- Key Factor: Expected arrival times for boarding
- Possible Action: Promote early arrival in the city by proposing a visit to the city or local attractions
- Expected benefits: Decongestion of incoming traffic and promotion of the destination

3) Passengers arriving by train

- Key Factor: Tickets with train + ferry combination
- Possible Action: Dimension the station / airport shuttle services according to the expected arrivals
- Expected benefits: Adapt urban transport services to seasonal variations in demand

4) Passengers traveling with camper / caravan

- Key Factor: type of vehicle
- Possible Action: Design services and offers dedicated to plain air travelers to improve thecompetitiveness of the territorial system
- Expected benefits: Promotion of the territory and cross-selling activities

Venice > Cruise passengers

1) Passengers arriving in Venice with their own vehicle
   - Key Factor: mode of transport to the port of embarkation
   - Possible Action: promote the use of shared public or private transport
   - Expected benefits: Decrease in incoming vehicular traffic

2) Passengers arriving at the maritime station from the landing pier

   - Key Factor: Type of passengers arriving (End of cruise, Hikers in Venice, Hikers for otherdestinations).
   - Possible Action: Dimensioning the services required based on the volumes of the different types of passengers arriving
   - Expected benefits: Optimization in the use of resources. Proper planning of the necessaryservices

3) Passengers arriving at the maritime station by public transport

   - Key Factor: Type of service used to reach the boarding point
   - Possible Action: Scale frequency and numbers of shuttle services from the train station orairport to the port according to the expected arrivals
   - Expected benefits: Adapt urban transport services to seasonal variations in demand

4) Passengers who make a day trip to Venice

   - Key Factor: Type of passenger arriving in Venice
   - Possible action: promotion of alternative itineraries to decongest the city viability
   - Expected benefits: Decongestion of traffic and improvement in the quality of the touristexperience

Private Operators > Ferry Operators

1) Passengers embarking their own vehicle
   - Key Factor: type of passenger
   - Possible Action: personalized communications about embarkation procedures and inboundlogistic
   - Expected benefits: Speed up of the boarding Procedures

2) Passengers with reduced mobility
   - Key Factor: Passengers with specific needs
   - Possible Action: information sharing and coordination with Port Authorities
   - Expected benefits: improvement of the service

3) Passengers arriving at the maritime station from railway station
   - Key Factor: Means of transport used to reach the port city
   - Possible Action: personalized communications about solutions, costs and connection time from the railway station to the maritime station
   - Expected benefits: improvement of the service and customer retention

Private Operators > Bus Operators

1) Passengers travelling with bus in connection with a ferry transfer

- Key Factor: mode of transport to the port of embarkation
- Possible Action: personalized communications about solutions, costs and connection time from the bus station to the maritime station
- Expected benefits: improvement of the service and customer retention

2) Passengers travelling with bus in connection with a ferry transfer

- Key Factor: mode of transport to the port of embarkation
- Possible Action: co-marketing actions with the shipping company
- Expected benefits: cost saving in marketing and advertising

3) Passengers travelling with bus in connection with a ferry transfer

- Key Factor: mode of transport to the port of embarkation
- Possible Action: co-marketing actions with sustainable mobility companies (carpooling, vehicle sharing, bicycle sharing, electric vehicles)
- Expected benefits: wider product range, enhancement of corporate image

Final conclusions

Some issues that are particularly relevant for the launch and future sustainability of the E-chain project clearly emerge from the analysis carried out on big data and on its possible use in the transport and tourism sectors.

1) The more intense the use of the multitude of data that modern technologies make available, the more easily and quickly the sustainability of transport of all types and levels will be achievable

2) The mobility challenges of the 21st century can only be achieved through the activation of new forms of private-public collaboration.

3) Thanks to its platform, the E-chain project is potentially able to generate and aggregate data from many different sources.

4) The e-chain platform is capable of creating tourism and transport services for public and private operators. It can therefore be the ideal collection point for all those data necessary to define the actions needed to achieve the goal of improving the quality, safety and environmental sustainability of marine and coastal transport services.

5) It is evident that the greater is the number of operators involved in the project, the greater is the probability of aggregating significant and relevant data. Then it would be opportune to give continuity to the project trying to involve all those private and public stakeholders that were not involved due to organizational and technological problems or due to the difficulties associated to the covid pandemic.