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Leveraging Big Data to
Manage Transport
Operations

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How can big data transform transport for the good of citizens? LeMO works to help building a roadmap to success.

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Newsletter 1

Understanding big data in transport

The major barriers to big data application in transportation are data silos, data ownership issue, data privacy, and the lack of data quality and standards. One of the most important challenges, however, a lack of expertise of technical knowledge.

Download the LeMO study here:

<https://lemo-h2020.eu/newsroom/2018/5/13/deliverable-11-understanding-big-data-in-transport-sector>

Big data policies in transport

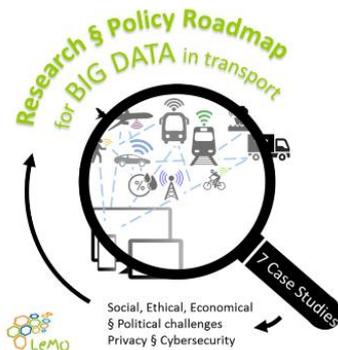
When it comes to big data in transport, the LeMO report shows that policies and initiatives taken throughout the EU and abroad focus their efforts on 4 main areas: Intelligent Transport Systems, Open Data, Automated driving and Smart mobility.

Find out how particular sets of policies facilitate the use of big data in transport and how some may hinder their access in the EU and abroad:

<https://lemo-h2020.eu/newsroom/2018/5/31/deliverable-12-big-data-policies>

LeMO explores the implications of the utilisation of big data to enhance the economic sustainability and competitiveness of European transport.

Phase 1 of LeMO answers two questions: what is big data to transport and how is it happening?



01. Unleashing the power of big data in transport

The European Commission has funded a new research project – LeMO - set to outline concrete steps for how European Transport industry can capture a greater share of the big data market by 2020: Leveraging Big Data to Manage Transport Operations (LeMO). The €1.49 million initiative is the significant to study actual practices in big data in transportation. LeMO will use information from seven case studies to identify how the use of big data in European Transport industry can harness the potential benefits associated with big data.

The ultimate outcome of LeMO will be a policy and research roadmap for transport big data in Europe that addresses the needs and concerns of science, industry, policy-makers and citizens, and a steering group to build on those gains and drive the big data economy forward. The project started in November 2017 for a duration of three years. Welcome to the first LeMO Newsletter.

<https://lemo-h2020.eu/>

02. A work in progress

The transport sector has constantly collected large amounts of data, such as data from timetables, traffic news and air schedules. However, recent developments in the quantity, complexity and availability of data collected from and about transport, together with advances in information and communication technology, are presenting new opportunities to create more efficient and smarter transport systems for people and freight. Also, ‘opening up’ data in transport by making it more widely available, and linking it with data from other sectors, is the part of the European strategy to improve transparency and encourage economic growth.

Big data provides new ways of gathering novel information about transport infrastructure from passenger and vehicle movements and allows for a shift from passive approaches to active crowd-sourcing with innovative transport solutions. For example, some GPS systems enable users to inform others about incidents on the roads. This information is transferred to network operators in real-time, allowing for rapid responses to disruptions.

LeMO will address these issues by investigating the implications of the utilisation of such big data in particular with respect to five transport dimensions: mode, sector, technology, policy and evaluation. LeMO will accomplish this by conducting a series of case studies on rail transport data, open data, real-time traffic management, logistics & consumer preferences, smart inland shipping optimized transport & improved customer service, ITS.

03. Back to basics: what is transport?

The lay definition of transportation is “an act, process, or instance of transporting or being transported” referring to the movement of people or goods (Merriam-Webster Dictionary, 2018). LeMO focuses on the physical movement of people and commodities, covering passenger transportation and freight transportation. With the spread of data as potential sources of useful information for transport, it is reasonable to ask the question "with all the data that I have access to, what can I do with it to improve mobility and transport operations?".



04. LeMo's objectives

LeMO has three main objectives:

1. To produce research and policy roadmap towards data openness, collection, exploitation and data sharing to support European transport stakeholders in capturing and addressing issues, that range from technical to institutional, including legitimacy, data privacy and security.
2. To involve European transport sector actors in order to identify and analyse concrete opportunities, barriers and limitations of the transportation systems to exploit big data opportunities.
3. To disseminate the LeMO findings, recommendations and the contribution of the LeMO to evidence-based decision making by improving knowledge on methodological and exploitation issues taking also into account economic, legal, social, institutional and technical aspects

05. Three phases to deliver results

The LeMO project aims to provide a comprehensive view that is amplifying opportunities, while diminishing limitations. The LeMO project is comprised of three phases. Phase 1 investigates the role of big data in the transport sector and identifies institutional and governmental issues. Phase 2 explores the societal impact of comprehensive case studies based on the findings of Phase 1. The findings of Phase 1 and 2 will feed into exploring the future direction in Phase 3. The created value from the course of all three phases will be disseminated through various channels in parallel.

06. What is big data in transport?

LeMO started to generate a shared understanding of current big data landscape in transport with the production of a first report released in May 2018. The report identifies a holistic view on opportunities and challenges for the use of big data in transport. Partners explored the characteristic of big data and listed a number of applied cases from governmental, non-governmental and private organisations. The document also provides an extensive survey of big data sources with the cartography of data flows. The report is downloadable on the [LeMO website](#).

07. Two trends

The focus on big data for the transport sector comes from two distinct trends. Firstly, digital technology has permeated many facets creating data that can be used in transport. Secondly, the use of this data can have a positive impact on mobility, free movement of goods & persons, transport planning & control, while the traditional transport detriments (air pollution, urban congestion, misuse of resources) are reduced or eliminated.

08. Create gold from 4 sources: data quality

While data quality is key to the spread of big data in transport, quality is a continuous issue to address. Statistical methods (e.g. univariate analysis, multivariate analysis and outlier detection) can help to ensure the data quality in pre-processing phase. Implementing a holistic and end-to-end process would be more appreciated because data quality can be monitored continuously beyond the isolated task in the data pre-processing phase. Implementing a holistic and end-to-end process would be more appreciated because data quality can be monitored continuously beyond the isolated task in the data pre-processing phase.



Nevertheless, a validation step with domain experts is inevitable to ensure high data quality. This applies to the data collected from the main four sources identified by LeMO: route-based data (collected by sensors at fixed locations of a path such as a highway or a train), vehicle-based data (collected by mobile devices or in-vehicle GPSs), traveler-based data (collected by people) and wide area data (collected by sensor networks to monitor traffic flow). Find out more here: <https://lemo-h2020.eu/newsroom/2018/5/13/deliverable-11-understanding-big-data-in-transport-sector>

09. Challenges & opportunities embedded in transport

Experts interviewed by LeMO highlight the main challenges embedded in the transport sector: reducing latency of analytics, real-time result delivery, deal with a large amount of data, transportation planning, the protection of personal & commercial data. The opportunities they identify are: cross-sector data sharing, open data platforms, and meta-data repositories. Furthermore, the lack of skilled practitioners in the job market is reported as one of the major challenges, as the demand for technical professional exceeds labour supply by far. Read the interviews here: <https://lemo-h2020.eu/newsroom/2018/5/13/deliverable-11-understanding-big-data-in-transport-sector>

10. Binge on open data but GDPR!

Open access to the widest variety of information helps to achieve the highest impact, especially relating to its social impact, when exploiting the opportunities offered by the data deluge. Open access is the key to the linking, sharing and re-use of data, which also implies high utility. The development of big data research and policy goals should be combined with open data practices to serve decision-making and meet scalability and performance challenges. Big data contains massive amounts of personal data. Therefore, another key aspect is privacy and the balance between privacy and open access. The large majority of policies that are restricting access to, linking of, and (re-) use of big data are policies aiming to protect the privacy of individuals. The regulation of data in most cases encompasses the regulation of personal data too. To discover more travel here: <https://lemo-h2020.eu/newsroom/2018/5/31/deliverable-12-big-data-policies>

11. Building a fair data ecosystem

The transport policies and initiatives studied by LeMO show that countries are focusing their efforts in the field of transport on 4 areas: Intelligent Transport Systems, Open Data, Automated Driving and Smart mobility. Policies in the public sector and private sector operate differently. In the private sector, adoption of standards and moreover terms and contracts held with external parties are favored. When it comes to sharing transport data with third-parties, a few principals usually apply: 1. customer choice, 2. fair competition, 3. privacy and data protection, 4. safety, security and liability, 5. Interoperability. The principals help build an adequate legal framework by avoiding that a very small number of companies based outside the European Union or not acquire dominant positions in the area of big data services. The primary actions to enable a “fair” data ecosystem would be to provide customers with a high level of personal data protection, to design services where customers can choose whether to share personal data, to place contractual safeguards when data processing of personal data is outsourced. Explore what this means here: <https://lemo-h2020.eu/newsroom/2018/5/31/deliverable-12-big-data-policies>



12. The 4 Vs

When it comes to the challenges in the transport sector, we identify concrete barriers corresponding to the defined four Vs. The first three Vs (volume, variety, and velocity), they are the challenges sitting in big data engineering dimension. The last one veracity is the challenge in data science dimension.

1. The first challenge is volume. It is hard to store and process the massive amount of data in a conventional database. For example, 480 TB of data were generated by cars in 2013 and it is anticipated to increase to 11.1 PB in 2020.

2. The second challenge is variety of data. The conventional relational database is not able to store unstructured and heterogeneous data such as signal data generated by a sensor, free text data collected through social media, image data generated by satellite and video data streamed by closed-circuit television.

Expected key results

- Understanding and mapping big data in European transport
- Research road map for the efficient utilisation of big data in transport
- Policy roadmap for the efficient utilisation of big data in transport
- Creating shared value for the European transport

3. The third challenge is velocity. The conventional database cannot ingest streaming data generated by multiple sensors in real time. For instance, traffic cameras on highways continuously stream video data and it aims to identify traffic condition and car accidents.

4. The last challenge is veracity, which means uncertainty and incorrectness. This characteristic emerges because big data is not bounded to the relational database management system (DBMS), which cares Atomicity, Consistency, Isolation, Durability (known as ACID properties). Therefore, data embed high potential to be in a low quality.

13. What's next?

LeMO is now entering Phase 2 to explore the societal impact of comprehensive case studies based on the findings of Phase 1. This will be done in 2018-19. Our following newsletter will report on the final results of Phase 1. What are the institutional and government issues in utilising big data in transport.



14. The LeMO team

Vestlandsforskning (Western Norway Research Institute) is a non-profit research and development institute devoted to serve the needs of businesses, industry and public bodies. The institute plays a key role in bringing research and the private and public sectors together as a community builder. The institute's Big Data Research Group specializes in the utilising of big data and semantic science for big data integration, analysis and process management. The Group offers data-driven cross-industry expertise, technological and socio-economic insight, and commitment to sustainable solutions.



The Frankfurt Big Data Lab was established at the University of Frankfurt in Since 2011. The objective of the Big Data Lab is to carry out research in the domains of big data and data analytics. Our approach is based on the interdisciplinary binding between data management, data processing, streaming technologies and big data analytics. The lab is located in Frankfurt, the financial metropolis of central Europe and targets to be a source of knowledge and expertise both for research and industry applications. The Frankfurt Big Data Lab at the Johann Wolfgang Goethe University in Germany is one of the leading and internationally recognized research groups in the field of databases, information systems and e-business.



Bird & Bird is an international legal practice with over 1,200 lawyers and legal practitioners worldwide. It specialises in combining leading-edge expertise across a full range of legal services including advice on intellectual property, information technology, commercial, corporate, EU and competition, dispute resolution, employment, and finance. It has extensive legal expertise with respect to disruptive technologies. Recent experience includes projects relating to cloud computing, big data and 3D printing. Our network includes individual lawyers with unrivalled expertise in data protection, data security, intellectual property, open data and liability issues. Bird & Bird will leverage on this expertise in the LeMO project.

Bird & Bird

CORTE is an international (non-profit) organisation bringing together national transport authorities from European and non EU countries having a responsibility in the field of road transport, road security and road safety. The CORTE Membership is currently composed of 60 Members:

- 27 national authorities / Full Members representing 21 EU countries and 19 non EU countries;
- 13 associations / Associate Members representing road sectors such infrastructure, road safety, road users, transport companies and commercial drivers;
- 20 observers representing the road transport industry.



Panteia B.V. offers policy research, market research and consultancy for national governments, provincial governments, local councils, the European Commission, national and international organisations, trade associations and the business world in general. Panteia is organised in 4 clusters, these are acting as partners for governments, the European Commission, national and international public and private organisations, trade associations and the business world in general. In consultancy, Panteia has experience in policy assessments, qualitative and quantitative modelling, forecasting and evaluation (simulation, scenario building, economic impact analysis), project appraisal, socio-economic research, market research, transport and trade research and policy advice.

