CHARACTERISATION OF THE BARRIERS AND LIMITATIONS ON UTILISATION OF BIG DATA IN TRANSPORT: THE LEMO PROJECT

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Extended Abstract: *The transport sector has continuously collected and analysed massive amounts of data, such as data from timetables, traffic news and air schedules. However, recent developments in the quantity, complexity and availability of such big data collected from and about transport systems, together with advances in information and communication technology, are presenting new opportunities to create more efficient and smarter transport and traffic systems for people and freight (Akerkar 2013). 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 (Akerkar 2018). In the transport sector, the volume of data has increased due primarily to the prevalent use of digital technologies inter alia to efficiently manage operations and improve customer experience (Teoh et al. 2018). For instance, the extensive use of mobile devices generates rich-locational data from the travellers themselves and the vehicles. Infrastructure, environmental and meteorological monitoring systems also produce data related to transport operations and users. The data velocity has increased because of advanced communications technology & media and its improved processing capability & speed. The variety of transport-related data has significantly increased. Modern trains report internal system telemetry in real-time from anywhere, and it is possible to acquire information about all crew members and passengers. The veracity refers to the quality, provenance and trust of the data. For deriving knowledge out of volumes of data, the accuracy of the data sources needs to be evaluated as well. Lastly, the value is a potential gain for an organisation when exploiting the data (Boyd, D., & Crawford, K. 2012).*

With respect to the recent developing interest in the application of Big Data within the transport sector as well as the extended scope of its applications, it is evident that most of the challenges have not yet been addressed. LeMO[1] *project is exploring the potential role of Big Data to improve the economic sustainability and competitiveness of European transport sector. A series of case studies had been conducted to provide recommendations on the prerequisites of effective big data implementation in the transport field. These case studies have covered five transport dimensions: mode, sector, technology, policy and evaluation. Through these case studies, LeMO investigates technological, methodological, governmental as well as institutional issues to contribute to evidence-based decision making. The following activities will realise this purpose of the initiative. First, we provide knowledge of obstacles and recommendations for utilising Big Data within the limitations that the barriers are creating. And then, a horizontal analysis of case studies will be undertaken to identify constructive findings and suggestions that can be traced across contexts. Based on the results, research and policy roadmaps for efficient utilisation of big data in the transport field will designed. The roadmaps will validated via a workshop to gain stakeholder consensus.*

As a preliminary result of the project in Hong et al. (2019), this paper identifies and characterises barriers and limitations by analysing the outcomes of LeMO case studies and other relevant Big Data initiatives

[1] Leveraging Big Data to Manage Transport Operations (LeMO): https://lemo-h2020.eu/

(i.e., NOESIS[2] *and TT*[3] *projects). The scope of analysis in this paper covers technological issues, as well as economic, social, ethical, legal, political aspects. All the aspects have been investigated in previous tasks. For example, for ethical and social aspects, such as trust, privacy, data ownership, social discrimination, environment, transparency, consent and control have been discussed in Debussche et al. (2018). A total of 129 barriers and limitations were extracted covering all aspects, of which 80 were legal issues. For the other aspects (i.e., economic & political, ethical & social and technological), around 14 to 24 issues were discovered, respectively. 54 issues were from the case studies of LeMO, use cases of NOESIS and pilot systems of TT.*

From the samples studied under the three projects, some of the main findings were:

- *Technological, economic and political aspects are being considered and discussed more by the industry. Further research is needed to develop technologies, business practices, and opportunities.*
- *It has been seen that there are potential barriers and limitations in legal aspects that are many and of various types. While the GDPR is an essential factor, the complexity of the new data economy also challenges many current institutional practices, e.g. competition or the concept of ownership.*
- *There are interdependencies between the barriers, which further complicates the impact of these barriers on the use of big data in transport, as well in clarifying the impact of existing solutions.*
- *It has been identified that there are interventions that can diminish the negative impacts of the barriers or convert them into opportunities. In some cases, the specific issue serves as a challenge to one stakeholder, but an opportunity to another. Multi-stakeholder perspectives must be applied to derive policy solutions to the issue.*

These observations will be further discussed and explored in the forthcoming tasks in the LeMO project and feed to research and policy roadmaps. The roadmaps will be evaluated via a validation workshop with relevant stakeholders in the transport sector.

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[2] Novel Decision Support tool for Evaluating Strategic big data investments in Transport and Intelligent Mobility Services: https://noesis-project.eu/

[3] Transforming Transport: https://transformingtransport.eu/