Artificial Intelligence (AI) Act – TM2.0 Platform Position Paper

The TM2.0 Innovation Platform (an initiative under the ERTICO umbrella of activities) wishes to provide feedback regarding the AI Act and in particular the inclusion of the management and operation of road traffic in the list of High-Risk systems in Annex III of this proposed piece of legislation. TM2.0 is in a unique position to assess developments in the road traffic sector, as it brings together all relevant stakeholders from the public and private sector with the aim to promote and deploy interactive Traffic Management.

TM2.0 acknowledges the European Commission's endeavor to regulate how AI is used and developed within the EU to ensure the use of AI does not jeopardize citizens' safety, security, and fundamental rights. The adoption of the EP's negotiating position on the AI Act on 14 June this year and the commencement of the inter-institutional discussion with the European Council on the final form of the law makes it necessary to provide some clarifications on the categorization of Traffic Management as a 'high risk' area. The elaboration of guidelines regarding the AI Act's High-Risk Use Cases by the European Commission once the law is adopted, requires that the TM2.0 traffic management community contributes to this effort by offering clarifications on some important points to be taken into account during the implementation phase.

In our view, the future High-Risk sector specific guidelines for the road traffic sector should **i) include a risk-assessment approach based on criticalities ii) be developed together with all sector stakeholders, and iii) not hinder innovation that benefits road safety**.

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i. Defining High-Risk AI applications in Traffic Management should be based on a proper risk assessment based on criticality.

The risk the use of AI in the road traffic sector bears, should always be related to the place of the AI application along the so-called 'traffic management data decision chain' i.e., a sequential or interconnected series of decisions or choices that lead to a specific outcome or result impacting, in this case, the traffic conditions/environment. A data decision chain usually contains, but is not necessarily limited to, the following steps:

1. Collection of data – obtaining the data from a data source such as a roadside unit, floating device or other IoT based detection unit or process.
2. Transformation – reformatting, reprojecting, aggregating, or otherwise processing the collected data into a condensed simplified form for the specific use case in focus.
3. Augmentation – extension, extrapolation, or interpolation along with fusion of data from static data sources, like digital maps, historic statistical data sources and similar relevant sources for the use case.
4. Refinement – quality improvements or noise resilient processing to refine and isolate the essential information.
5. Visualization – optional display, dashboard, or insights clarification for understanding the refined data in relation to the impact of the pending use case decision.
6. Functional space - this is the potential decision support outcome of the chain, which can be strategic, tactical, or operational referring to the timeframe within which the decision is taken. This is the framework that clearly defines and limits the dependencies of AI and its capacity to act as support mechanism (or as generating autonomous decisions). The functional space is defined by humans, i.e., humans decide what it is capable of.

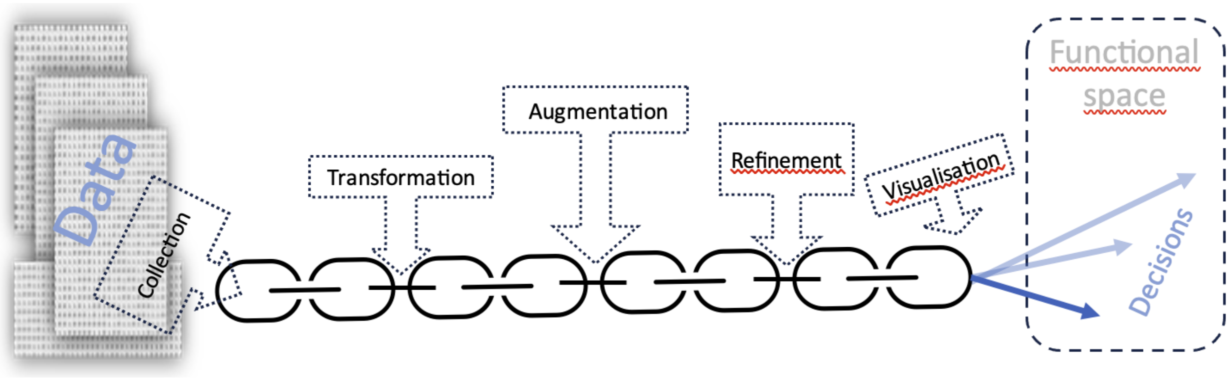

Figure 1: Traffic management data decision chain

When AI is used in relation to traffic management, some or any of the above steps are performed by methods or systems employing AI. It does not necessarily mean that the entire decision chain is operated with AI. Independently of how much it is actually AI operated or how much of the actions in this data decision chain is heuristics or exact algorithms, the important element in the traffic management data decision chain in relation to risk is the ***functional space***. With heuristics and algorithms, the outcome of a calculation can be guaranteed to a quite specific set of outcomes as the internal operation of the applied method is known to a very high level on both the theoretical and the practical levels. This is not the case with AI, where the internal mechanisms are based on statistical adaptive methods that do not necessarily give a clear understanding of the actual internal operation, nor the specific reason for any specific outcome.

The crucial part related to the risk of deploying a traffic management data decision chain is always the functional space. The functional space is the clearly defined potential action that may be activated by the decision chain. As a simple example an AI employed in a decision chain to brew the best coffee cannot actually brew any coffee at all unless the coffee machine can be directly actuated (e.g., turned on) by the decision chain. Similarly, an AI-based speed limit adaptation support system limited by discarding all advise outside a predefined fixed range (e.g., 20 to 50 km/h) after the application of AI can never result in an obviously risk increasing outcome (e.g., 130km/t speed advice). In this specific case the functional space is distinctively defined and guaranteed to be within a specific functional space that has been validated as safe independently of the actual operation of the AI-based steps or links in the decision chain.

With the increased availability of data, AI supported decisions are increasingly moving from being purely used for strategic decision support to tactical and operational decision support and automation (as defined in the traffic management use cases listed at the end of this Position Paper). Any risk or potential issues in Traffic Management should be assessed based on a use case by use case basis considering the decision criticality, the functional space definitions and limitations and whether human intervention is introduced before the functional space outcome is deployed potentially in real time. ***For "AI systems intended to be used as safety components in the management and operation of road traffic" only systems that are used for operational decision support and triggering automated decision-making functions, should potentially be defined as high-risk systems if its malfunction would pose a significant risk of harm to the health, safety, or fundamental rights of natural persons.*** When determining what constitutes a critical and significant risk the number of users, the degree and duration of the impact on public safety and the geographic spread of the area directly affected by the incident shall be considered. The table at the end of this Position Paper gives a preliminary and non-exhaustive view on which elements could be included in such a use case-based assessment.

ii. AI Act sector specific guidelines should be developed together with all relevant stakeholders.

The full stakeholder community should be involved in the elaboration of guidelines to establish real High-Risk use cases, as proposed by the European Parliament: "The Commission shall, six months prior to the entry into force of this Regulation, after consulting the AI Office and relevant stakeholders, provide guidelines clearly specifying the circumstances where the output of AI systems referred to in Annex III would pose a significant risk of harm to the health, safety or fundamental rights of natural persons or cases in which it would not."

The guidelines should give legal clarity on which specific use cases within the critical areas should be considered high-risk and which not and prevent national supervisory authorities to become overwhelmed with superfluous notifications.

The 42 public and private members of the TM2.0 Innovation Platform remain available to offer their expertise and share their experience with the European Commission and other EU Institutions bodies that are entrusted with the task of defining the deployment Guidelines of the AI Act.

iii. AI Act sector specific guidelines should not hinder innovation that benefits road safety.

As stated above, imposing obligations on AI providers merely because they operate within the areas listed in the Annex III is not in line with a risk-based approach as it focusses on entire sectors and not on identified high-risk use cases based on a criticality assessment. Consequently, many non-dangerous AI systems would be subject to a burdensome clearance procedure causing unnecessary delays in bringing new AI systems to market. This will be particularly harmful to innovation in the traffic management sector, where the use of AI has proven to be effective to save lives and bears enormous potential to enhance road safety even more in the future.

Below we present a non-exhaustive overview of Use Cases in Traffic Management, where AI has promising positive effects on road safety.

Annex I: Use of AI in Traffic Management – Use Case based Risk Assessment

Use Case (id)	Role of AI	Decision perspective: 1. Strategic - long term 2. Tactical - medium term 3. Operational - immediately	Human in the loop	Risk Assessment
Data Driven Traffic Analytics & Insights (A) e.g., using historic traffic data to decide whether to extend or build a highway	AI algorithms process large volumes of historical traffic data to identify traffic trends, accident-prone areas, and other patterns.	**Strategic:** traffic authorities use this data for informed decisions about road infrastructure improvements	Yes, the decisions are taken by the Traffic Authorities. The functional space of the decision chain is effectively empty as no output/advice will automatically be actuated in the real world. It is merely decision support to another decision maker with potentially very large economical and temporal perspectives	**Low safety criticality**
Traffic Prediction and Flow Optimization (B) e.g., based on the obtained analysis the traffic operator can decide to change intersection markings or reprogramme an intersection	AI is used to estimate and forecast traffic and congestion based on historical and real-time data and assess the impact of planned upcoming events	**Tactical:** anticipates peak traffic hours and identifies potential future bottlenecks	Yes, the decisions are taken by the Traffic Authorities As above, but with a limited perspective on economy and timeline	**Low safety criticality**
Real-Time Traffic Management (C) e.g., based on the information obtained the traffic operator can decide to open an extra lane or close a lane in case of a traffic incident	AI algorithms can analyze real-time data from various sources, including traffic cameras, GPS devices, and sensors embedded in roads and vehicles (accelerometer data & C-ITS) to identify congestion, accidents, and other incidents	**Operational**: enables immediate responses from operators to minimize traffic disruptions, enabling incident management and prevent potential accidents	Yes, the decisions are taken by the Traffic Operator As above, but with an immediate effect and limited or no cost	**Low safety criticality**

Non-critical phase management (D) (i.e.**,** traffic lights that do not have fixed times of turning red, green or amber. They adaptively change according to traffic levels or when detecting a car is approaching)	AI-solution based models help to generate optimal plans for traffic demands measured in real-time and responsive to varying traffic conditions	**Operational**: solves demanding processing and enables traffic state and flow responsive traffic signal timing	No. The equipment actuated by the decision chain is safety validated ensuring that no risk can be incurred as result of the processing.	**Low safety criticality** as the functional space is limited to non-conflicting intersection or traffic states
Hardshoulder Management (HM) (E)	Hardshoulder lane open to traffic in specific condition, with systems monitoring the traffic flow and allowing to ease the traffic when needed. (often used in combination with DLM)	**Operational:** it allows to ease traffic giving extra capacity to the road in specific flow conditions enhancing safety by controlling speed levels and lane usage to specific predefined regulations, triggered by traffic monitoring systems and processing	Yes. Triggering of hardshoulder management: hardshoulder in operation as driving lane or emergency lane is proposed to the operator based on measured traffic condition and traffic levels trend and historical data and is enabled by the traffic operator. In case an accident is detected and confirmed by the operator the hardshoulder operation is ended as to enable safe emergency operation.	**Low/Medium safety criticality – **the system is monitored and when all devices and systems are in operation the HM is enabled. In case of component failures, the HM is not operated to prevent any possible malfunctioning of the system. The traffic control center operators monitor and have the overall control to enable and disable the system. i.e., classification as low or medium criticality depends on operating condition
Dynamic Lane Management DLM) (F)	Dynamic Lane Management operates lane traffic lights and lane signs (namely Lane Control Signs - LCS) to manage lane opening, deviation and closure and optionally speed based on specific condition and traffic	**Operational:** it enables a smooth traffic management through different lane usage by allowing different vehicle category (Heavy Goods Vehicles) to specific lanes and managing speed limit and lane	Yes. In case of an accident which can be supported by sensor evidence but always confirmed by traffic center operators the specific lane configuration (open, closed, deviated**,** and reduced speed)	**Low/Medium safety criticality** – the system works in combination with monitoring and Automatic Incident Detection systems in order to reach best performance, in case of any component failure

	situation and traffic flows (it can be used in combination with HM)	usage based on the traffic situation	is set in order to preserve safety condition.	the system is operated in a safe condition in order to secure safety. All operations are monitored and controlled by a human operator. i.e., classification as low or medium criticality depends on operating condition
Adaptive speed limits (G)	Detection of optimal speed for optimum throughput in specific corridors or areas	**Operational**: The speed limits are immediately updated to reflect the expected speed further ahead in the corridor to decrease shock waves and erratic behaviour	No. The signs are immediately updated. The functional space is defined by the speed limits that are possible to display and potentially also relations between adjacent signs	**Medium safety criticality -** displaying 110 – 30 – 110 – 30 on subsequent signs or 110 and 30 on adjacent lanes will increase accident risk by inducing discrepant speed patterns.
Responsive & Adaptive Control (H) (i.e.**,** traffic lights that do not have fixed times of turning red, green or amber and have no built-in safety mechanism)	AI-solution based models help to generate optimal plans for traffic demands measured in real-time and responsive to varying traffic conditions	**Operational**: solves demanding processing and enables traffic state and flow responsive infrastructure adaptations like lane direction reversal, metering, or signaled flow control	No. The equipment actuated by the decision chain is freely operated with full safety dependency on the AI/chain outcome. The functional space contains every single possible state of actuated signals including green/green conflicts and similar hazards.	**High safety criticality**

Annex II: About TM2.0

The TM2.0 Innovation platform (www.tm20.org) was launched in 2014 under the ERTICO umbrella of activities, bringing together 42 public and private organisations working on interactive traffic management. The TM2.0 members range from Ministries and Cities to Service Providers and Research centers and is working on business and governance models and solutions for the future of traffic management. The objective of TM2.0 is to provide a discussion forum on interactive traffic management for stakeholders in the entire Traffic Management Procedure value chain.