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THE CHALLENGE OF THE PASSENGER CENTRIC TRANSPORTATION – SMART4PAX

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Abstract: Today, new services, offers, products open a realm of possibilities to the imagination of individuals, leading to profound changes in the way we move. While transport was very often viewed as a constraint, mobility becomes a way of life.
In human societies, mobility is increasingly understood in terms of social links' creation, opportunities and synergies rather than pure problem of travelled distance (Amar [1]). The Human mobility becomes individual in the sense where each one conceives his own "mobility cocktail". Changes in individual preferences, behaviors and lifestyles together with innovative Information Communication Technologies (ICT) are likely to impact the way travelers plan their mobility behavior and value their own mobility choices. This mobility behavior and choices concern all the different transport modes that have to be used to perform the full trip i.e. the door-to-door travel is therefore intrinsically multimodal. Multimodality presupposes the availability of a large range of transport options and various combinations of them that can transfer passengers from their origin to their destination. One stake of multimodality is the ease to change scale, for instance when travelling successively by air with an intercontinental flight and by route with bus or car. Communication technologies and data sharing henceforth are essential part of transport systems. They enable transport mode operators to propose new services to facilitate the traveller's empowerment and autonomy. Beyond traditional transport modes organized by operators, additional services indeed provide travelers with means to organize, control and optimize their own door-to-door mobility and to turn their travel time into useful or even enjoyable time. These services add value to the travelers' mobility space-time and may change their perception of travel time. Along the way these services can impact travelers' mobility choices.

Today the transportation system is oriented on the various means of transport, the objective here is to put the passenger in the centre of the transportation system, and to provide Smart solutions to improve Passenger Seamless Mobility and experience.

We will address the challenge of the Passenger Centric Transportation through 4 pillars:

- **Smart for Enhancing passenger experience**, new relation to the journey putting the passenger in the centre of the decision-making process, taking into account its profiles its needs and expectations.

- **Smart for Safety and security**, (e.g. secure exchanges to reduce the constraint of controls in the airports and Train stations improve the safety and security holistic survey approach)

- **Smart for Multi-modality**, efficient combination of various transport mode according to the expectations of the passenger, an "Unique electronic ticket » for the whole journey…, the environmental issues…

- **Smart for Mobility as a service**, new set of services for the traveller journey, new services to facilitate the traveller's empowerment and autonomy. Beyond traditional transport modes organized by operators, additional services indeed provide travellers with means to organise, control and optimise their own

door-to-door mobility and to turn their travel time into useful or even enjoyable time. Passenger health and concern are follow-up during the journey.

1. INTRODUCTION

The transportation domain is changing radically since the last decade, our relation to the travel and to mobility is now passing through new services, offers. mobility becomes a way of life. In the 90th, the challenge of the air transportation was to improve the collaboration between the various actors for a more safe and efficient transportation. That conduces to the evolution of the Central flow management unit to the Network Manager **[2]**. The Collaborative Decision Making concept putting in place collaborations with airlines, Air National Service Providers, Airports take shape in various airports **[3].** In the last 5 years, the transportation domain change its paradigm and start a mutation putting the passenger in the center of the decision process and introduce the concept of Mobility as a service (Maas) https://en.wikipedia.org/wiki/Mobility_as_a_service.

The Object of this paper, is to set the scene on the current situation and generate some thought about what could drive new initiatives for addressing the challenge of the passenger centric transportation. It takes its roots from what have been published by the main institutions (Eurocontrol, IACAO, IATA, ACI…) and partners on the subject. This document is based also on a proposition Motivate (MulTimodal VAlue of TimE - List of participants: ENAC : Isabelle Laplace, VTM Consultore: Sofia Kalakou, Stiftelsen SINTEF: Trond Bakken, ITS Norway: Trond Hovland, Instituto Superior Tecnico: Filipe Moura) and exchanges during its preparation. This document has also as objective to set the scene of the SMART4PAX concept.

The SMART4PAX concept is based on 4 pillars:

- **Smart for Enhancing passenger experience**, new relation to the journey putting the passenger in the centre of the decision-making process, taking into account its profiles its needs and expectations.
- **Smart for Safety and security**, (e.g. secure exchanges to reduce the constraint of controls in the airports and Train stations improve the safety and security holistic survey approach)
- **Smart for Multi-modality**, efficient combination of various transport mode according to the expectations of the passenger, an "Unique electronic ticket » for the whole journey…, the environmental issues…
- **Smart for Mobility as a service**, new set of services for the traveller journey, new services to facilitate the traveller's empowerment and autonomy. Beyond traditional transport modes organized by operators, additional services indeed provide travellers with means to organise, control and optimise their own door-to-door mobility and to turn their travel time into useful or even enjoyable time. Passenger health and concern are follow-up during the journey.

The document will start by set a panel of the main references of what have been done in term of passenger Centric Transportation documentation, then the Smart4Pax concept is presented by its 4 pillars, a specific emphasis is afterward given to the data sharing as backbone of the concept. Then the conclusion will open the floor for the next steps and future initiatives.

2. PASSENGER CENTRIC APPROACH

The passenger centric approach has been pushed since the last 20 years: ENAC after the project Meta CDM http://www.meta-cdm.org in 2013 push the approach of putting the passenger in the center of the decision-making process for the operations. IATA and ACI set up the NEXTT initiative **[**4], IATA published the StB Simplifying the Business in 2017 [5], Amadeous Passenger first – 2014 [6], Sabre published a passenger centric approach for the airports [7],
The Mobility as a Service concept have been pushed since 2014 and gives the floor for a set of Initiatives funded by the European Commission and allowing to push the concept of putting the passenger in the centre of the decision-making process, http://www.maas4eu.eu, https://maas-alliance.eu

But what is the reality of our transportation sector in these approaches today. The progression in the cities starts to be visible; there is more and more means to offer new services to the citizens in term of mobility. Bikes, Cars,

Public transportation, trains, buses…. But we should notice that there is still gaps between the various modes of transportation in term of cooperation and effective offers of smart solutions to the mobility concerns.

The EU Transport Commissioner Violeta Bulc has called for 2018 to be the "Year of Multimodality" in order to reach the goals set by the Paris agreement in term of sustainable development and to ensure the European transport is safe and our industry remain competitive on the global market.
https://ec.europa.eu/transport/themes/logistics-and-multimodal-transport/2018-year-multimodality_en

Ground transports have fostered their collaborations during that year. But air transportation got difficulties to follow this trend. The patchwork of responsibilities for the various Air National Service Providers, the various airports responsibilities, make the collaboration process difficult to address.
At the level of the Network Manager of Eurocontrol, the approach remain flight centric and not passenger centric [8]. The information on the passenger flow is known at the level of airlines but not at level of the network.
It seems obvious that there is a need in order to have means to provide the right level of services to the passengers and to have an efficient passenger centric transportation to collect information and set up new services for the passengers. Some initiatives have been set at airports in collaboration with the cities, but that does not reach the network level yet.

3. SMART4PAX - PILLARS

3.1. SMART FOR ENHANCING PASSENGER EXPERIENCE,

The idea in this approach is to set up a new relation to the journey putting the passenger in the centre of the decision-making process, taking into account its profiles its needs and expectations.
In human societies, mobility is increasingly understood in terms of social links' creation, opportunities and synergies rather than pure problem of travelled distance. The Human mobility becomes individual in the sense where each one conceives his own "mobility cocktail". Changes in individual preferences, behaviors and lifestyles together with innovative Information Communication Technologies (ICT) are likely to impact the way travelers plan their mobility behavior and value their own mobility choices. This mobility behavior and choices concern all the different transport modes that have to be used to perform the full trip.
Consideration about the type of passengers and its concerns are crucial in this approach. It is important to consider the constraints such as families traveling with young kids, the elderly having some medical or mobility concerns, persons with reduce mobility, persons having issues to read and understand different languages, persons with medical concerns, business travelers that would like to have some time to work during their travel time. Passenger health and wellbeing are also to be carefully followed during its journey.

An interesting approach was pushed by Nathalie Lenoir and Isabelle Laplace [9], that illustrates the new paradigms for the relation of the traveler to the duration of the travel from door to door. The notion of useful time and lost time are introduced creating a new way to measure the travel duration.

The notion of stress should be addressed specifically. The passengers are under permanent stress on reaching their next connection, from their departure up to their final destination. There are really concerned by airports or station access time, control and checking process duration, disruption of various type as strikes, unexpected unavailability of a mode of transportation between two places, the transit in an airport or station that could take more longer than foreseen, the list could be very long…. This passengers stress is really impacting the passenger experience and also reduce the possibilities to use effectively the travel time for more valuable activities than running from one point to the other or waiting in a room for hours without being able to do anything else than siting (or even standing up) for un unknow duration.
New key indicators of the passenger experience should be put in place, in order to measure how the transportation sector answer to the passenger expectations. It is really by these means that various facilities and mode of operation will be probably improved.

3.2. SMART FOR SAFETY AND SECURITY,

The safety is key for the transportation sector, it was always important for all transportation modes to ensure the right level of safety to the travelers. When of the main issue to address in that context, is the number of persons in a given place and the means to evacuate in case of emergency. The fire, in a suburb of Athens (2018) is one of the worst cases that we faced in the past years. The safety-first issue should push the transportation means to be efficient and agile to the possible disruptions.

Safety is addressed actually in silos, and the cooperation is only performed around airports, stations, cities in the best cases. This challenge is not easy to address without a level of cooperation between the various mode of transportation. The objective to ensure a safe journey should be consider from the start up to its ends without discontinuities.
Security aspects are even more difficult to address, the transportation system should be able to be resilient and resistant to possible attacks.
The security at the stations or airports could be improved by sharing key information on the passengers crossing the various critical areas. A smart survey with units sharing information are keys to ensure a better level of security. Secure exchanges on key passengers' information could reduce the constraints of controls in the airports and train stations, and it would improve the holistic approach on safety and security survey.

3.3. SMART FOR MULTI-MODALITY,

This mobility behavior and choices concern all the different transport modes that have to be used to perform the full trip, the door-to-door travel is therefore intrinsically multimodal. Multimodality presupposes the availability of a large range of transport options and various combinations of them that can transfer passengers from their origin to their destination. One stake of multimodality is the ease to change scale, for instance when traveling successively by air with an intercontinental flight and by route with bus or car. Communication technologies and data sharing henceforth are essential part of transport systems.
This multi-modality should allow the passenger to make choice according to his expectation and preferences. Environmental issues should be considered and presented to the passenger for helping him to take it into account in his traveling choices.
The single ticketing is an approach that will simplify drastically the journey for the travelers. But it should be addressed by all the mode of transport involved in the journey. That could not be achieved without breaking the walls of communication and exchanges between them and without sharing the key information.
The resilience of the transport system is based on the cooperation between the various modes of transports for facing a disruption. An airport closure, a congestion between two cities could definitely be addressed by using the combination of various mode of transportation.
Another challenge of the coming year if the capacity to face the expected demand in term of travels(for aviation [10]). This demand capacity balancing could not be solved without a cooperation of the various mode of transport to face it. (Mykoniatis,G. et al [11].). Therefore, coordination and cooperation between the various transport networks are key to address the future demand, safety, disruption, environmental issues of the transport system.

3.4. SMART FOR MOBILITY AS A SERVICE,

New set of services for the traveller journey, new services to facilitate the traveller's empowerment and autonomy. Beyond traditional transport modes organized by operators, additional services indeed provide travellers with means to organise, control and optimise their own door-to-door mobility and to turn their travel time into useful or even enjoyable time. These services add value to the travelers' mobility space-time and may change their perception of travel time. Along the way these services can impact travelers' mobility choices [9].

4. DATA SHARING THE BACKBONE TO THE FUTURE TRANSPORTATION SYSTEM

For addressing the challenges of the future transportation, the secure sharing of information is essential, It is information shared between the various modes of transport, their relevant network of operation, information their various operational teams, all the security teams involved in the path of the trips, but also, it is information to share with the passengers, and between them. Means to exchange information between the user of the transportation modes is crucial to get a vision of the situation in time. "Waze" approach on the ground transportation could be a good approach to be extended to various mode of transportation.

The security concerns need to get information from the passengers in the various areas they are crossing, to get this crucial information is demand of the willingness of the passenger to share it with the authority or publicly.

This issue could perhaps be addressed by new services or facilities that could be offered to the passengers accepting to share their information; by example a simplified security check or a set of customize services according to passenger's profile during his journey, tailored health survey, better forecast so less stress….

11 CONCLUSIONS

This paper set the scene of the current situation and generates some thought about what could drive new initiatives for addressing the challenge of the passenger centric transportation. It introduces the concept of SMART4PAX with its four pillars:

- **Smart for Enhancing passenger experience**, new relation to the journey putting the passenger in the centre of the decision-making process, taking into account its profiles its needs and expectations.
- **Smart for Safety and security**, (e.g. secure exchanges to reduce the constraint of controls in the airports and Train stations improve the safety and security holistic survey approach)
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The information sharing appears to be the backbone of the SMART4PAX concept. The future challenge of passenger centered transportation push the various mode of transportation to share and collaborate in order to offer safe, efficient, enjoyable journey to the passengers.

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