Public Policy for Intelligent eTransport, eMobility and Smarter Cities

Roumiana Y. Ilieva [1]

Abstract **The policy role of the government in the eTransport is streamlined. The significance of the energy efficiency of co-operative transport management systems is outlined. Support to eCall implementation based on 112 is discussed. The importance of Traffic Simulation and Management is argued. Some Public Policy directions for Intelligent Car Awareness Actions are described. The need for Action at European Level is outlined. The great potential of Intelligent Cars and the Problem of their Market Implementation are accentuated. Policy context of the use of ICT for adaptive urban transport management infrastructure and services is discussed. The importance of a broad utilization of ICT in Transport Management and Infrastructure is emphasized. Ontology-based models for Smart Connected Electro-Mobility and scheduling and routing in eTransport are drawn with Protégé.**

Keywords - **intelligent eTransport, eTicket, smart cities, electro-Mobility, traffic simulation**

I. INTRODUCTION

Metropolitan performance management presently depends not only on the city's donation of hard physical infrastructure, but progressively more, on the availability and quality of intellectual knowledge communication and social infrastructure. The last form of investment is significant for urban competitiveness. It is against this background that the concept of the "smart city" has been introduced as a strategic device to encompass modern urban production factors in a common framework and to highlight the growing importance of ICTs, social and environmental capital in profiling the competitiveness of cities [1]. The implication of these two assets (social and environmental resources) drives a laborious way to distinguish smart cities from their more technology burdened equivalents, drawing a clear line between them and what goes under the name of either digital or intelligent cities.

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II. POLICY CONTEXT OF THE SMART CITY MOBILITY STATE-OF-THE-ART AND TRENDS

The concept of smart city as the next stage in the process of urbanization has been quite fashionable in the policy arena in recent years, with the aim of drawing a distinction from the terms digital city or intelligent city [3]. Its main focus is still on the role of ICT infrastructure, but much research has also been carried out on the role of human, social and relational capital, as well as, environmental interest as important drivers of urban growth.

The European Union (EU), especially, has dedicated constant efforts to conceiving a strategy for reaching urban growth in a smart sense for its metropolitan city-regions [4][5]. Other international institutions also believe in a wired, ICT-driven form of development. The Intelligent Community Forum produces, for instance, research on the local effects of the worldwide ICT revolution. The OECD and EuroStat Oslo Manual [6] provides a toolkit to identify consistent indicators, shaping a sound framework of analysis for researchers on urban innovation. At a mesoregional level [7] observes renewed attention for the role of soft communication infrastructure in determining economic performance.

The availability and quality of the ICT infrastructure is not the only designation of a smart or intelligent city. Other explanations stress the role of human capital education in urban development. In [8][9] it has been shown that the most rapid urban growth rates have been achieved in cities where a high share of educated labor force is available.

Novelty is driven by entrepreneurs who renovate in industries and products which require an increasingly more skilled labor force. According to [17] an educated labor force – the 'creative class'– is spatially clustering over time, because not all cities are equally successful when investing in human capital. The attention of researchers and policy makers has been attracted from the tendency for cities to diverge in terms of human capital. It turns out that some cities, which were in the past better endowed with a skilled labor force, have managed to attract more skilled labor, whereas competing cities failed to do so. Policy makers, and in particular European ones, are most likely to attach a consistent weight to spatial homogeneity. In these conditions the advanced clustering of urban human capital is then a major anxiety.

According to [2] smart cities intelligent transport can be ranked along eight main axes:

- Intelligent Car Awareness Actions;
- ICT for adaptive urban transport management infrastructure and services;
- Energy efficient co-operative transport management systems;
- Support to eCall implementation based on 112;
- Smart Connected Electro-Mobility;
- Traffic Simulation & Management;
- eTicket;
- eTransport.

These eight axes associate with traditional regional and neoclassical theories of urban growth and development. Above all, the axes are based respectively: on theories of regional competitiveness, transport and ICT economics, natural resources, human and social capital, quality of life, and participation of citizens in the cities governance.

The main goal of the paper is to focus on some of these axes giving them an ontological analytical view. An overall ontological idea for the Smart Mobility of a city and corresponding policies is presented with the help of Protégé software as a hierarchical tree in figure 1. On its bases an onto-graph is derived in figure 2. The detached axes will be discussed separately as follows.

Figure 1: Smart Mobility ontology tree

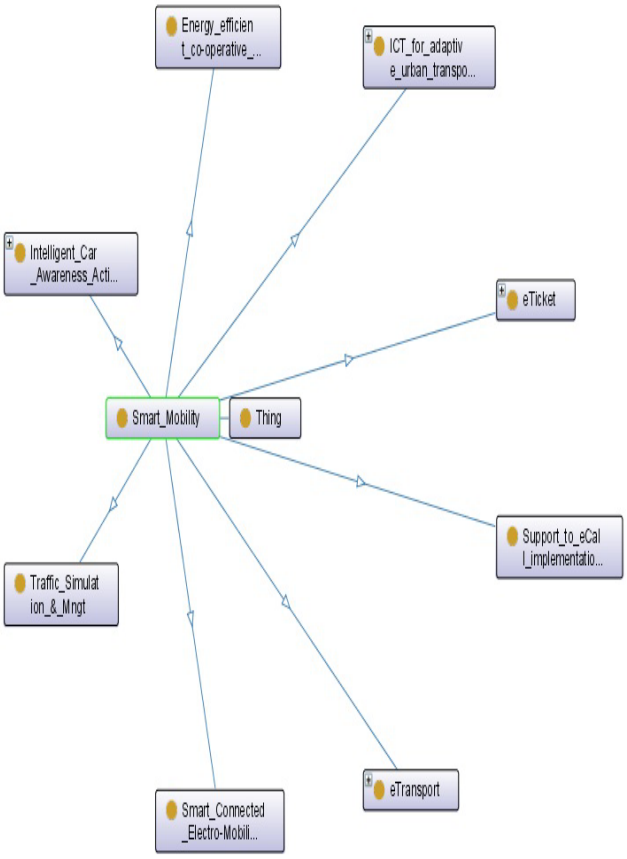

Figure 2: Smart Mobility onto-graph

A. Intelligent Car Awareness Actions

Modern societies depend heavily on mobility, but transport entails severe problems, such as congestion of road networks and urban areas, harmful effects on the environment and public health, waste of energy and, above all, accidents which cause fatalities, injuries and material damage. There is a necessity for action at European level.

The Intelligent Car Initiative [6] is a policy framework set up by the European Commission to tie up all activities relating to 'intelligent' automobiles. Its objective is to improve road safety in the EU, to cut back the number of road fatalities and accidents, to decrease the number of traffic jams, and to reduce fuel consumption and road transport's CO^2 emissions [7]. The term covers all vehicles that are equipped with modern ICTs. The Intelligent car initiative is composed of twelve specific actions in three "pillars" [6], [8]:

- Coordinate and support the work of relevant stakeholders, citizens, Member States and the Industry, in the Intelligent Car Initiative.
- Support research and development in the area of smarter, cleaner and safer vehicles and facilitate the take-up and use of research results.
- Create awareness of ICT-based solutions to stimulate users' demand for these systems and create socio-economic acceptance.

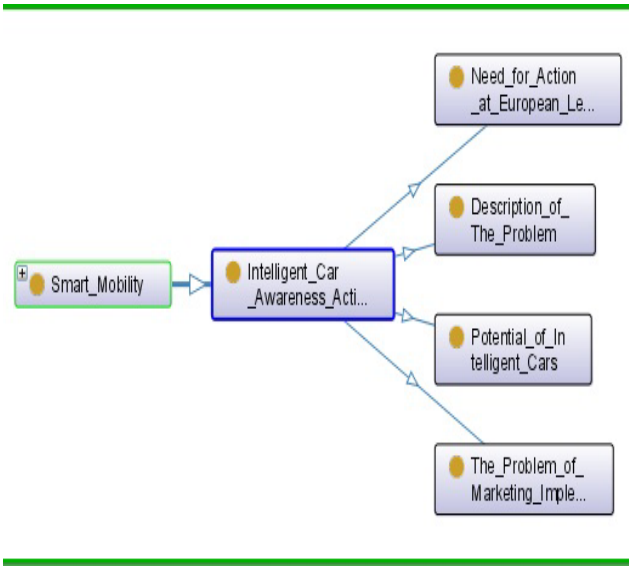

Figure 3: Intelligent Car Awareness Actions Ontology

B. ICT FOR ADAPTIVE URBAN TRANSPORT MANAGEMENT INFRASTRUCTURE AND SERVICES

A transportation management system is a subset of supply chain management concerning transportation operations and may be part of an enterprise resource planning system [15]. The objective is to use ICT based services and infrastructures to reduce energy consumption in urban transport. Multimodal Real Time Traffic and Travel Information services provide drivers and travelers with real-time information about the transport network in order for them to optimize their journeys and consequently their use of energy [16]. New services for demand management in urban areas and intelligent logistic solutions also contribute to energy conservation [10].

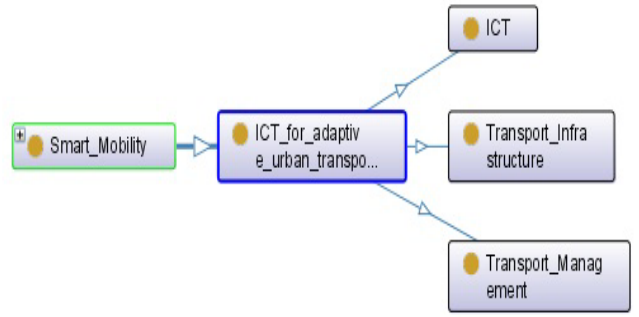

Figure 4: ICT for Adaptive Urban Transport Ontology

C. SMART CONNECTED ELECTRO-MOBILITY

The lack of petrol is what anticipates civilization in the near future. Production and manufacturing today are closely related to the use of petrol. However, increasing awareness on climate change prompted notable need for use of alternatives in many fields [11]. One of those fields is the automobile industry.

Technology should be used in the best possible way so that world and human kind can keep on going forward, e.g. technology should develop in a substantial way. A substantial technology development model could be viewed in the way shown in figure 5.

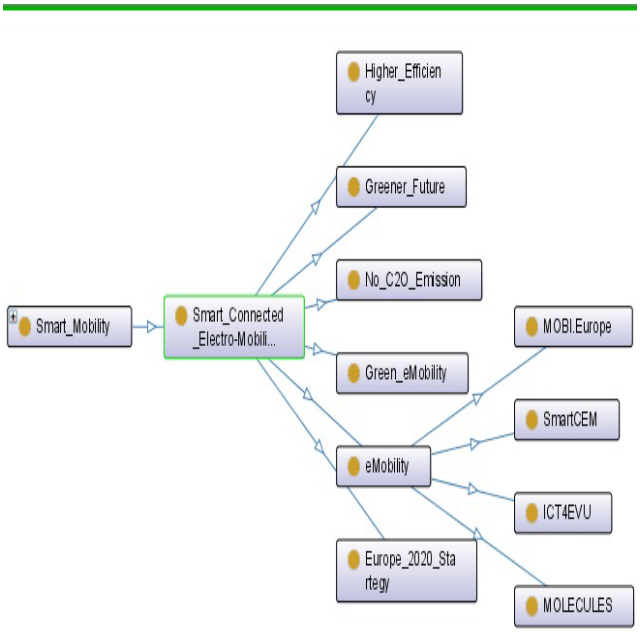

Figure 5: Smart Connected Electro-Mobility onto-graph

A corresponding interactive innovation model should look like this one in figure 6.

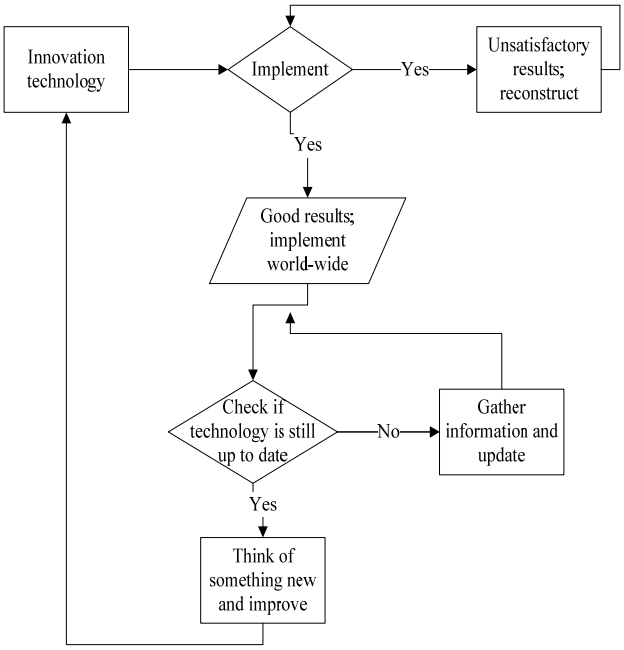

Figure 6: Smart Mobility Innovation Model

The idea of this model is that technology should be persistently improved regardless of outstanding results. Scientists must constantly search better and better ways to save nature, improve production, and improve life. However, focus should be on finding new and innovative technologies not only on improving already existing ones. In every sphere there is a possible growth or improvement plateau that after being reached cannot be further developed. This means that totally different new approach should be considered in order to be changed the overall view.

D. TRAFFIC SIMULATION AND MANAGEMENT

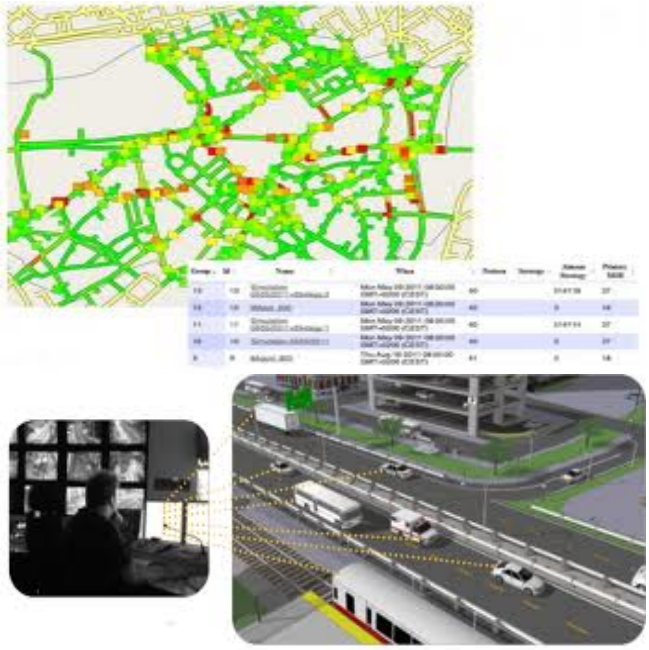

Figure 7: Traffic Simulation and Management [9]

The effective traffic management must be considered when improving transportation. It can be achieved through effective simulation. It is better to predict eventual traffic difficulties in order to have a solution for such cases. So simulation is as important as management.

Nowadays simulation can be created through use of powerful software programs. That is why the results received through simulation are reliable. On the other hand, after simulation has been done management techniques can be changed according to the desired results, e.g. less traffic jams, better speed control and fewer accidents [10].

Seemingly effective management and simulation is the essential concept for changing the economy towards a greener future. Without simulation results and losses would not be calculated and predicted thus leading to total failure of a great idea. Without proper management proper realization of this great idea would not be possible.

E. ETICKET ONTOLOGY

eTicket is most commonly associated with airline issued tickets. Electronic ticketing for urban or rail public transport is usually referred to as travel card or transit pass. It is also used in ticketing in the entertainment industry [13]. eTicket Ontology should contain digital and mobile ticketing systems as well (figure 8).

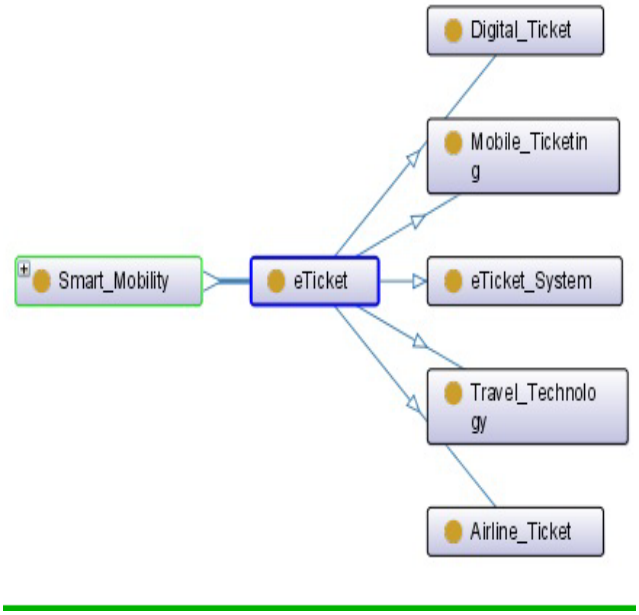

Figure 8: eTicket Ontology

F. THE ROLE OF THE GOVERNMENT IN THE ETRANSPORT

Modernizing local government is about enhancing the quality of transport services and the effectiveness of local democracy [11]. This is amongst the important topics in exploiting new technologies to enhance the services it offers. The requirements for best value will ensure those transport services are cost-effective in meeting the needs of local customers.

One of the key areas of the eGovernment agenda is public consultation. The government is involved in the development and implementation of new transport policies and initiatives across the whole city.

The customer is always central to the work. Smart Transport undertakes and each round of research conducted – whether with customers directly or through research organisations – has focused on how the site can be improved, enabling proactive rather than reactive development.

According to [14] the key areas of the eGovernment agenda for Intelligent Transport are:

- On-line Consultation
- Electronic Travel Information - Journey Planner
- Electronic Ticketing (eTicketing) - eCard
- Electronic Traffic Management - Congestion Charge Scheme
- Electronic Travel Information - Mobile Journey Planner and Kiosks
- Broadcast Travel Information - Television and Radio
- Electronic Travel Information - Travel Alerts
- Mobile Travel Information - PDAs
- Countdown which provides real-time passenger information on the arrival of buses at bus stops to enable customers to make choices about their journey options.
- Tele Services - Customer Services and Travel Information

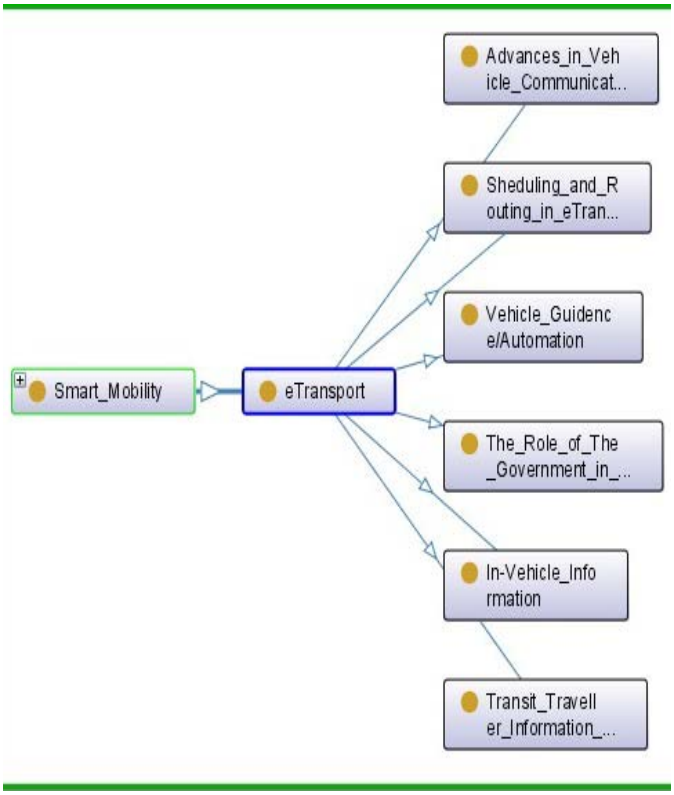

Figure 9: eTransport Ontology

III. Smart Mobility Additional remarks and Future Initiatives

Intelligent Transport has approached eGovernment as an integral part of the day-to-day planning and operation of the organisation rather than as a separate initiative to be developed in isolation [14]. eGovernment is and will continue to be a essential part of Intelligent Transport's process to improve access to the streets and public transport system. In turn this will improve access to employment, education, leisure and other facilities for the benefit of all citizens, visitors and stakeholders alike. By delivering the objectives within its business plan Intelligent Transport will drive forward many of the stated aims within the national eGovernment agenda culminating in public services that are:

- joined up,
- accessible,
- delivered seamlessly,
- open and accountable,
- used by eCitizens,
- delivered or supported electronically.

Intelligent Transport's commitment can be demonstrated, not only through the eCard or journey planner and the web site, but also through improvements to the support systems. The development of integrated HR, finance and procurement systems and the review of secure broadband opportunities is at the heart of joined up governance. Intelligent Transport's business planning process enables it to build and exploit, either directly or via partnerships, emerging technologies as Interactive-TV, mTicketing and 3G Telephony [14].

IV. Conclusions

In conclusion, electric automobiles can be our future transportation means up to maybe 2020, but after that world will need to change again and use other technologies to save ecological balance and provide enough opportunities for development. Programmes like CIP, EC transport policy 2020 and beyond, Digital Agenda for Europe and so on are temporary solutions. They cannot be considered as immense salvation. As Cas Holman said "Today's solution is tomorrow's problem", so preparing for eco-friendly future requires substantial backup technologies that can be used if necessary.

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