**Dynamic City Traffic Management System**

Ass. prof. dr. Stane Bozicnik a, Tomislav Letnik b

a Associate professor, University of Maribor - Faculty of Civil Engineering, stane.bozicnik@um.si
b Lecturer, University of Maribor - Faculty of Civil Engineering, tomislav.letnik@um.si

---

**Extended abstract**

**Objectives and motivation**

Access restrictions for urban freight transport has been recognized as the most important and most dominant instrument for city authorities to influence urban freight transport (Muñuzuri et al., 2005; Danielis et al., 2010). The same holds good for private cars. Majority of European cities (in particular those with historical centres) have introduced traffic control management systems to optimize the use of limited urban (traffic) infrastructure and to reduce congestion, noise and total emissions from goods and passenger transport in the city centres. Implemented systems are in general fixing delivery time windows for goods, limiting and defining conditions for entering and parking of motor vehicles of inhabitants, business owners and other users.

Historical centres are in many cases categorized as pedestrian zones. These measures represent one of the most controversial tools used to limit the mobility of passenger cars and delivery vehicles in the city centres. The desirable effect of achieving a more pedestrian-friendly city is opposed with the danger of diminishing the accessibility of persons and goods to the city centre, with its subsequent degradation (Muñuzuri et al., 2005). In praxis, we are facing the problem of rigid and inflexible traffic control schemes implemented in the (old) city centres of European cities. Consequently, city centres are additionally losing their attractiveness for business social and other activities.

The aim of the article is to review literature and analyse current practices of city centres access systems and to suggest solution(s) for dynamic and user-friendly city traffic management system by means of use of the latest ICT solutions. The article will develop also a model for continuous development and exchange of (new) solutions among the cities based on living lab approach.

**General description**

Globalization heavily influenced transformation of economic, social and physical structures of cities all around the world. The constantly growing urban areas are faced, because of global production, also with growing demand for city logistics. Traditional commercial districts of the city centres were abandoned because they could not compensate for the requirements of changing expectations of the city dwellers from commercial areas (Kılıç, S. E., 2008). Problems behind the loss of attraction of traditional commercial districts are beside that also the following: rise of new attraction centres in the suburbs; increasing insecurity as a consequence of the desertification of urban centres; high costs and difficulties in accessibility and parking in the urban centres; lack of leisure or entertainment facilities in urban centres; change in consumption and purchasing habits and growing competition among the different forms of commerce (P.A. Vidinha, F.M.R. Faria, 2007). These problems have attracted new forms of commerce (such as mall shopping, internet shopping etc.) thereby resulting in progressive deterioration of inner-city traditional commercial districts, creating new social and economic problems (J.L. Balsas, 2000). European city centres are important places of living and holding the value of cultural heritage, therefore many cities are searching for appropriate solutions and measures to revitalize (old and historical) city centres within the framework of sustainable volume of traffic.

Cities are trying to provide good conditions for dwellers and business activities, but at the same time are faced with contradictory effects. Dwellers would like to have city centres without traffic, noise and CO2 emissions, commercial activities on the other side, good and frequent accessibility to their shops. For the sake of finding reasonable solution the following measures to reduce motorized traffic and thereby reduce CO2 and greenhouse gas emissions in urban areas are predominantly implemented: (1) Consolidation of goods flows within the urban area (e.g. consolidation centres); (2) Use of new non (or low) polluting vehicles (e.g. electric powered vehicles) and (3) Regulation (usually focused on restricting certain types of activity by time of day, size/type of vehicle etc.) (Danièle Patier, Michael Browne, 2010). Urban freight transport schemes have been neglected in the past but there is more and more evident that their establishment could represent very important factor for keeping city centres alive. Urban freight transport (UFT) is namely essential to urban economies, as it is required to replenish food and other retail goods in shops, deliver documents, parcels and other supplies and to remove waste from urban areas (DG move EC, 2012). Taking that into consideration, city authorities have to make those systems as flexible as possible but in reality restrictive and non-flexible measures are preferable implemented under the patronage of negative environmental effects caused by delivery vehicles.

The cities are clearly recognizing the phenomenon of deterioration of city centres but on the other side using strict and inflexible access rules for entering of commercial and other vehicles in the city centres. As a rule, access to the city centres is currently possible by means of RF-ID (or other) cards, which open the sink cylinders installed at the entrance/exit points. The delivery time window enables access to
the restricted city zone only a few hours early in the morning and in the evening. Delivery vehicles are accessing freely, without coordination and optimisation of delivery flows to the delivery points. Parking and entering in the city centre is as a rule prohibited for non-residents.

In practice there is no central overview over the actual dynamics of arriving/departing transport missions in the city centres within the given delivery time windows. By means of central control/coordination point “a broker” could dynamically coordinate and optimise the supply flows and decrease congestion and optimise delivery times in the city centres.

There is a need for development of new innovative solutions that will improve logistics and other traffic processes in the city centres, make them more efficient and more user friendly for all stakeholders, by means of use of the latest technological (ITS) and organisation solutions (open innovation based on living lab).

Results and conclusions

Technology and solutions enabling improvement of efficiency, flexibility and sustainability of city traffic has been available for some time, but deployment of it has been relatively modest. Also EC has pointed out that, one of the key issues that may slow implementation, is the availability of the most appropriate organizational, institutional and business models to facilitate the delivery of ITS solutions at a local level (DG move EC, 2012)

New technologies can create new innovative ideas and new business models that were not possible in the past. The paper suggests establishment of a dynamic, user friendly, city centre traffic management system, which by means of modern technology (e.g. smart phone, tracking – tracing devices etc.) enables more flexibility for management and control of the traffic in the city centres. The agreed upon limits of the traffic volume in the city centre will be taken into account, however innovative approaches and (ITS) solutions will be used to make the traffic within the given limits more flexible and user friendly. On this way city centres can become more attractive for business, residents and visitors.

Basic traffic problems in all city centres are similar, but each city has its own specific conditions for which solutions should be continuously looked after or developed. An open innovation framework based on living lab approach is a useful tool for sustainable development and use of the available or specifically developed (ITS) solutions in different cities. A basic model for living lab approach will be suggested in the paper.

References

- S. Božičnik, ITS based city logistics scheme of Maribor, 12th BESTUFS Workshop "Urban freight strategies: Laissez-faire or following a comprehensive strategy", 13th-14th October 2003, Hotel Habakuk in Maribor, Slovenia
- S. Božičnik, T. Letnik, Control and enforcement in urban freight transport, BESTUFS II interim report, 2007
- S. Božičnik, A transport ordering system for the Automotive Cluster Slovenia: concept & economic assessment, "Capitalizing past experiences: ICT & logistics projects, tools & concepts as baseline for KASSETTS", 18th December 2008, Bologna, Italy
- J. Muñuzuri, J. Larrañeta, L. Onieva, P. Cortés, Solutions applicable by local administrations for urban logistics improvement, Cities, Volume 22, Issue 1, February 2005, Pages 15-28

Keywords: City traffic; Dynamic traffic management; Living lab