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Intermodal Traffic Management System for Vienna

1 Summary

After 30 year of experience with computer controlled traffic signals, the City of Vienna is now going to install a Traffic Management System, which will be used to support the political goal of a change in modal split. In the region and the city of Vienna several control centres are in operation, from the road administration, the fire brigade, police which cooperate in actual situations in a direct way. A new centre from the ASFINAG is under construction for Traffic management on motorways. The new Mobility Management System is planned as tool to provide service not only to the transport system users, but also to the different administrations in the city and provide the data base for transport related measures.

2 Introduction

Computer controlled signalisation is un use in many cities for more than three decades. Different system have been applied and developed, mainly for optimisation of traffic flows of cars and to some extend also for public transport. This systems have been developed in line with the dominating view on the transport system. Speed of car traffic, short travel time and prevention of congestion were the goals of such systems. Maximum capacity of intersection in pcu, green waves and priorisation for trams and public busses were aimed at first. In the beginning computers were expensive and software has to be developed sometimes by the user. This situation has changed totally during the last two decades. Computer capacities for this purpose is nearly unlimited and cheap and there is more than enough software available for nearly all purposes.

The practical problem of today is, to select the right configuration with the necessary flexibility for future technological development on the one side, and on the other side to understand the transport system a little bit better than in the past.

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It is interesting, that the amount of congestion in cities as well as the decline of public transport in modal split has more or less nothing to do with the technical standard of the computerised traffic management system. This is only a tool which can be used in the wrong or right way. It is obvious that the industry who want to sell the hard- and software products and all the equipment praise their products and stir up the feeling that everything will be better, if electronic equipment is optimised. Contrary to this promised experience show that good traffic engineering with a minimum of electronics provide also good results.

3 Goals of the Project

The City of Vienna has set the ambitious goal to change the modal split till 2010 from 37% car traffic to 25% and public transport share from 37% to 42 % ; the remaining share should be covered by pedestrians and cyclist. The operative goals of the project is to keep the high level of public transport trips in the city centre, where the modal split for pt is much higher, to enhance the share of pt. Cyclists and pedestrians in the inner districts and to try to stabilise the modal split in the peripheral districts.

It is obvious that this goal can not be reached only with traffic management measures alone. If land use and infrastructure development goes into the wrong direction, as it was in the past, where parts of ring motorways were built which subsequently induced city sprawl and peripheral shopping centres, who both are undermining not only this goal, but also the healthy city economy, traffic management can only act as a fig leaf.

An other goal was that the existing control centre has to be renewed in the near future and together with this measure a number of older local signal systems will also be replaced.

4 We have to understand the Traffic System

Beside all the technological and technical progress, how it is called, the main actor in the system remain the same: the transport system user.

Many of the assumptions about his behaviour were totally wrong. Therefore the slogan "the behaviour in transport is irrational" was born, which is totally nonsense. Not the behaviour of users is irrational but the assumptions of traffic experts.

If we make a closer examination of the basic formula

M = D x V

Traffic experts know that M is the flow, D the density and V the speed, since they have learned the relationship between this three variables in the so called fundamental-diagram, which is the one-dimensional finger print of a cross section. Speed was a kind of taboo in traditional transportation science since there was the believe that high speed save time. So they tried to reduce either the density by offering new lanes or enhance the speed, to increase the capacity. Unfortunately the result is always the same: more congestion and less public transport share. Traditional transportation science do not take into consideration two substantial thing: first the (real) behaviour of the users and second the (real) system effects.

May we first take system effects into consideration:

In the transport system no time savings as the result of increasing speed are observable. *Knoflacher 1987, Schaeffer 1997, Schmidl 19.., Meyer 19..*

So time saving do not exist at all, a fact which can be found already in Lill´s law 1889.

But the activities of traditional traffic experts have effects on the whole system – and finally on their own measures, which they do not take into account since feed-back-effects of this kind are not taken into consideration.

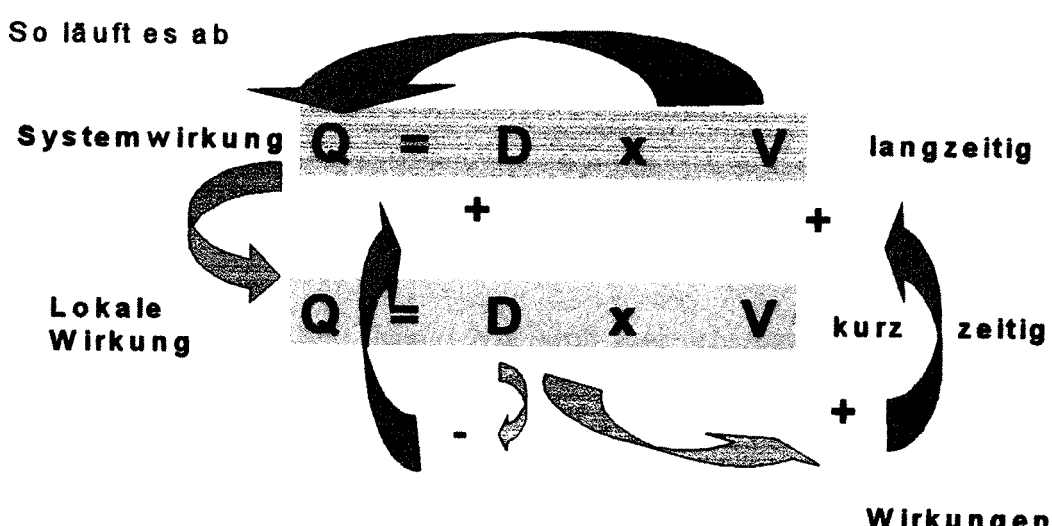


Fig 1 show in a simplified form one of the feedback effects from local activities to the system level and back. The result is a positive feedback loop which produce exponential growth of car traffic.

If we look to the real human behaviour: people are intelligent selfish and active and they follow their sensation. The sensation is always the result of irritation. If the irritation is positive it has the effect of an attractor – it attract people, contrary the negative sensation.
This basic behaviour *(Knoflacher 198.)* was never taken into consideration in transportation science before, since it is not in the traditional field of transport disciplines, neither in technique nor in economy. Traffic congestion was seen as negative and was treated with positive measures, like more roads, more green time at intersections etc. If congestion would really have negative effects, no traffic user would be there – there would be no congestion on car traffic.
Congestion is the result of to much positive irritation and can only be treated successfully with negative irritation, either by reducing the number of lanes or shorten the green time.
If we want to change the modal split the measures have to take into consideration this basic behaviour of people. So the irritation for using the car have to be negative by a group of measures. The irritation for all other modes must be so positive that people are encouraged to change to this modes. During the last five decades, transportation engineers educated in the traditional way have done exactly the opposite and have produced the problems they promised to solve.

5 Some Principles for an Intermodal Mobility Management System

Mobility management is based on information. Clear information prevent problems it they are given in the right place at the right time. The right management of informations is therefore the crucial part of the system.
What can be done with a MMS?
In a city the MMS can organise space, time and quality and accuracy of information. In principle space availability and time slots are nothing else than a kind of information as well. The situation today is characterised by excellent information for car drivers with a lot of signs, signals, parking facilities, radio and tv informations. The situation for public transport user us fair. For cyclists and pedestrians the situation in some parts (pedestrian areas. Cycle paths) is fair, but in general this three modes have a much lower level of positive information compared with car users.

The behaviour of people is the result of the structures. This structures are man made and the result of political, economic and technical decisions. So the problems are also man made.

Since during th last five decades many mistakes in the transport system happened, the management system has to be seen as a process, which has to be improved during its use.

MMs has to be an added value to the city, it has to ad value to all system users. **Fig 2.**

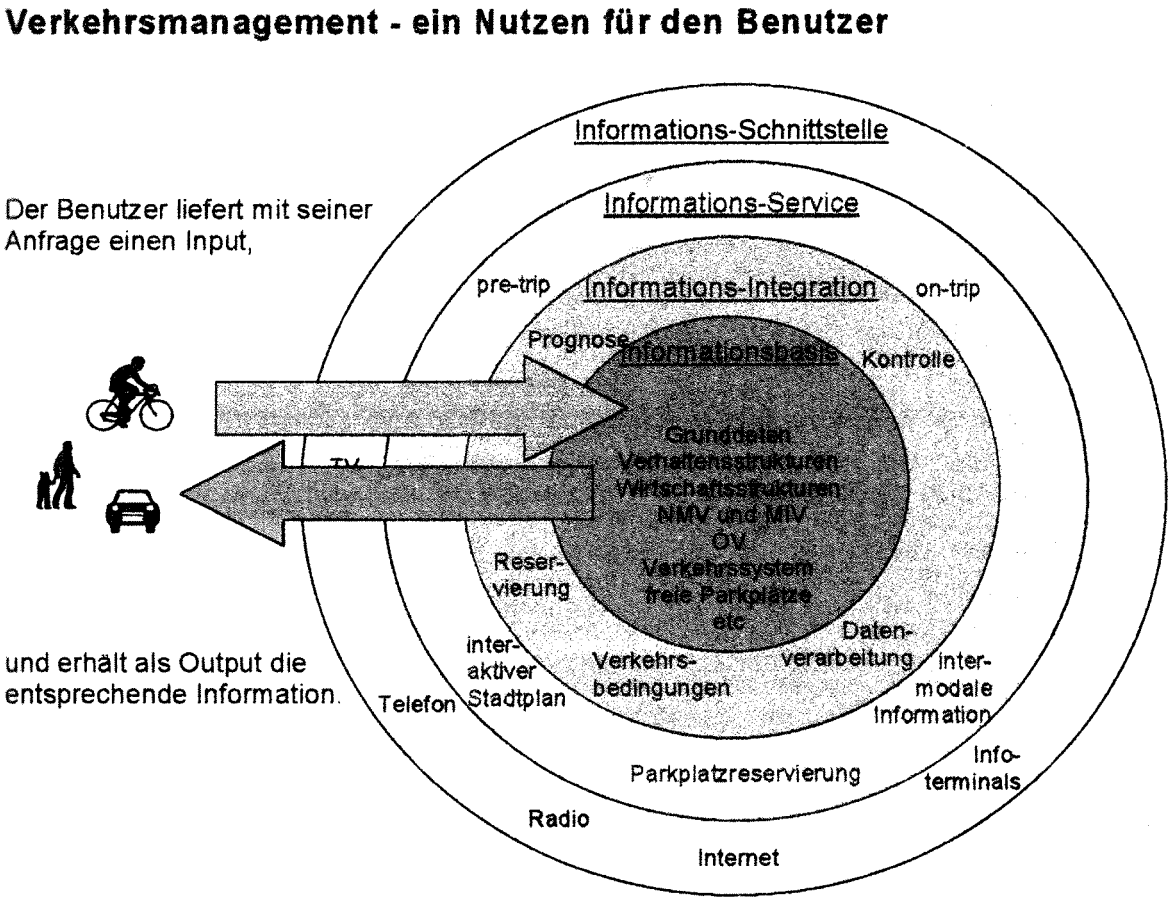


Fig.2 Traffic management system – has to add value to all users

Traffic management is connecting all users in the city, the people, the economy, the developer, the planning and operating divisions, the different services. It has to provide short, medium and long term informations. It has to act as an interface between administration and user groups. **Fig. 3**

Verkehrsmanagement - als Schnittstelle zwischen User und Verwaltung

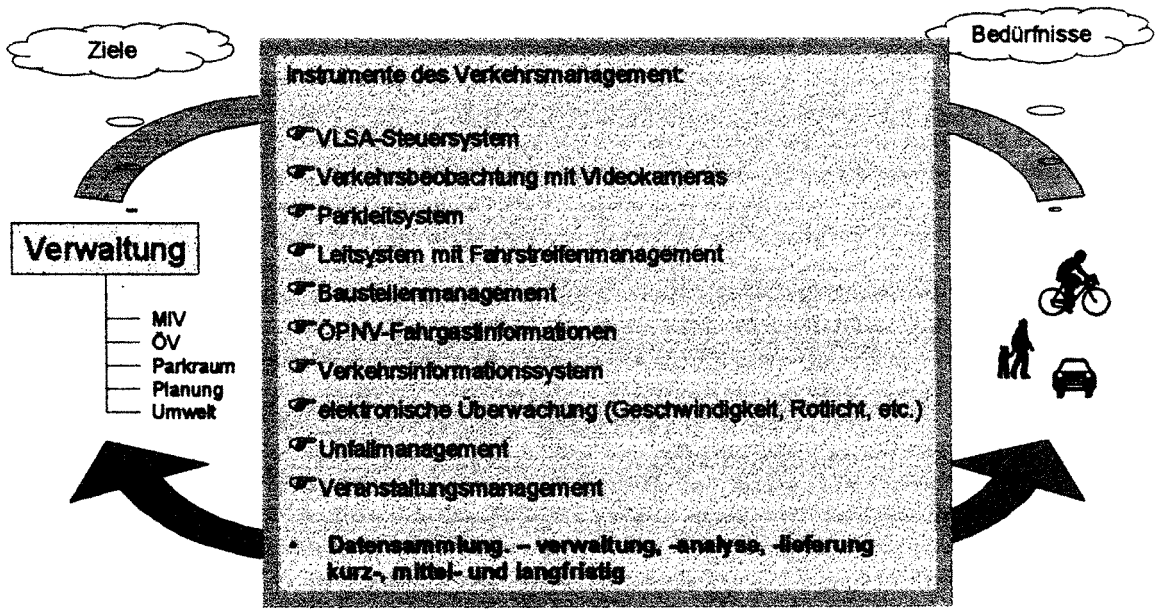


Fig.3 Traffic Management as interface between administration and user groups

The existing structures in most cities act in a bilateral way, depending on the actual case. There is no common database for all sectors of the administration which produce sometimes duplication of work. A good organised MMS can save time and money – and human resources too. The most important element of a functioning MMS is the recognition of feed back effects, overlapping and interactions of isolated action into other fields, which are not intended.

For example the construction of a new road which was seen only from the view of capacity for car traffic has always interactions on public transport, on cyclists, on pedestrians, on city economy and on the environment. This has not been taken into consideration so far, but has caused accumulative negative effects in many cities. **Fig 4**

Beispiel für Wechselbeziehungen

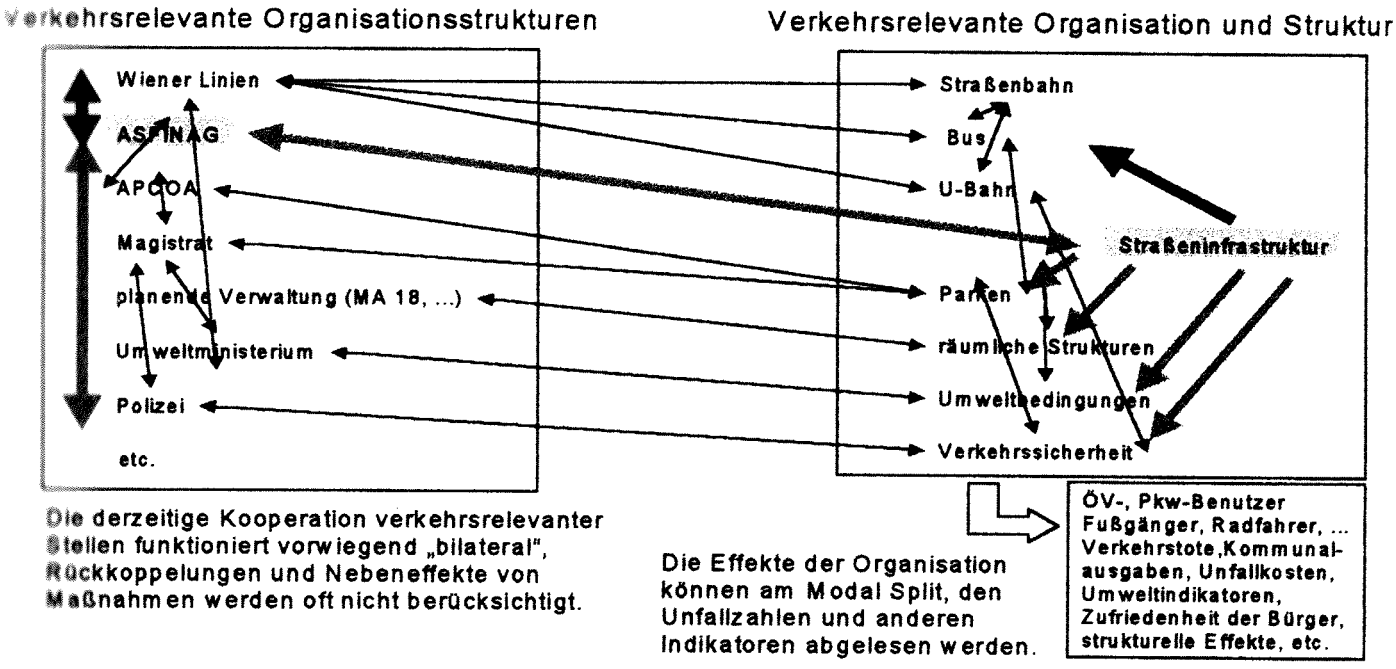


Fig 4: Example of interrelations between road construction, local economy, environment, public transport, police activities etc.

Today many information run parallel, are nor related to the user and do not take into account cross- interrelations as it should be. A good organised traffic management system can act as a platform, supporting all users, from the administration to the people on the road. Lack of information is not only often the cause for the misuse of the transport system, it is also very often the cause for delays for necessary measures. If it is possible to develop the Mobility management system as a platform open to all sides and as a clearing station for incoming and outgoing information it can be a useful tool.

Koordination und Informationsaustausch durch Verkehrsmanagement

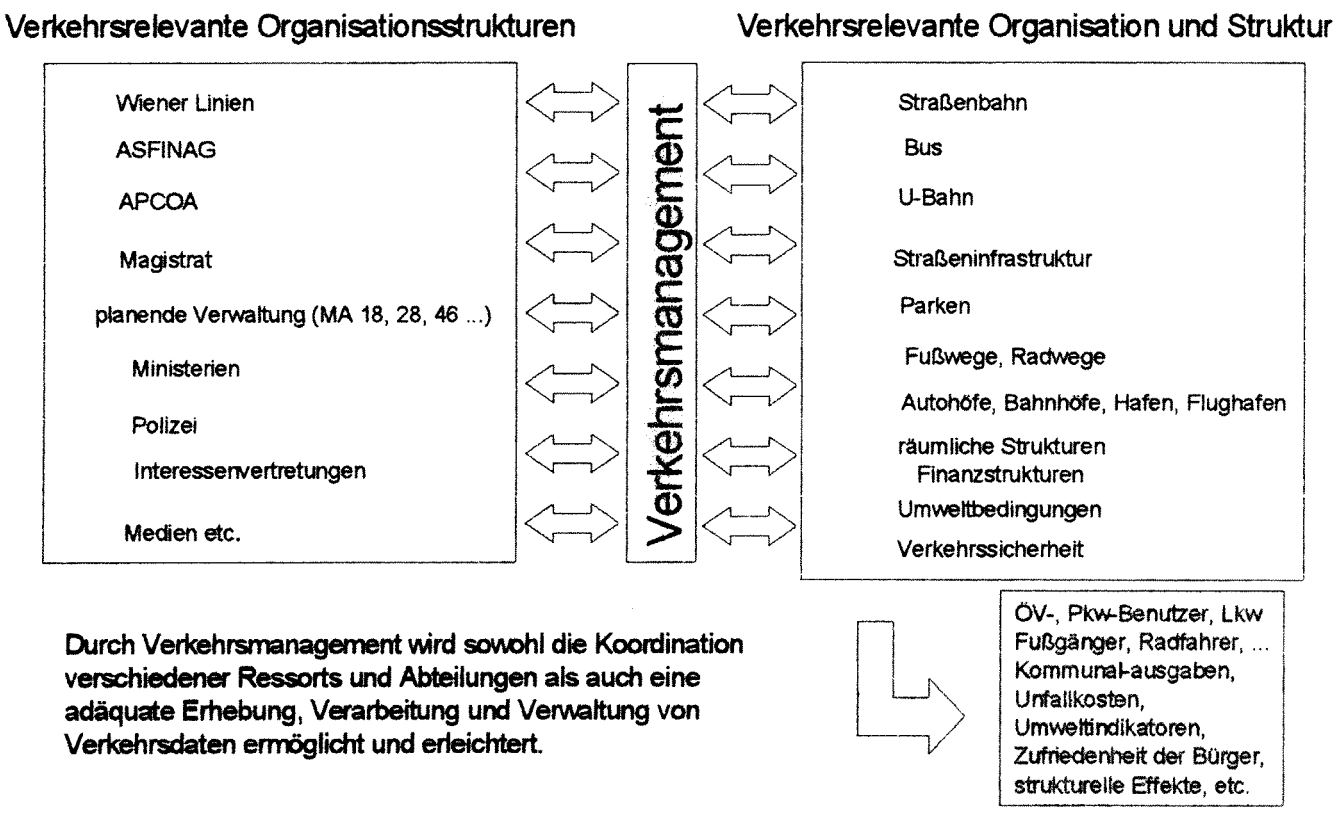


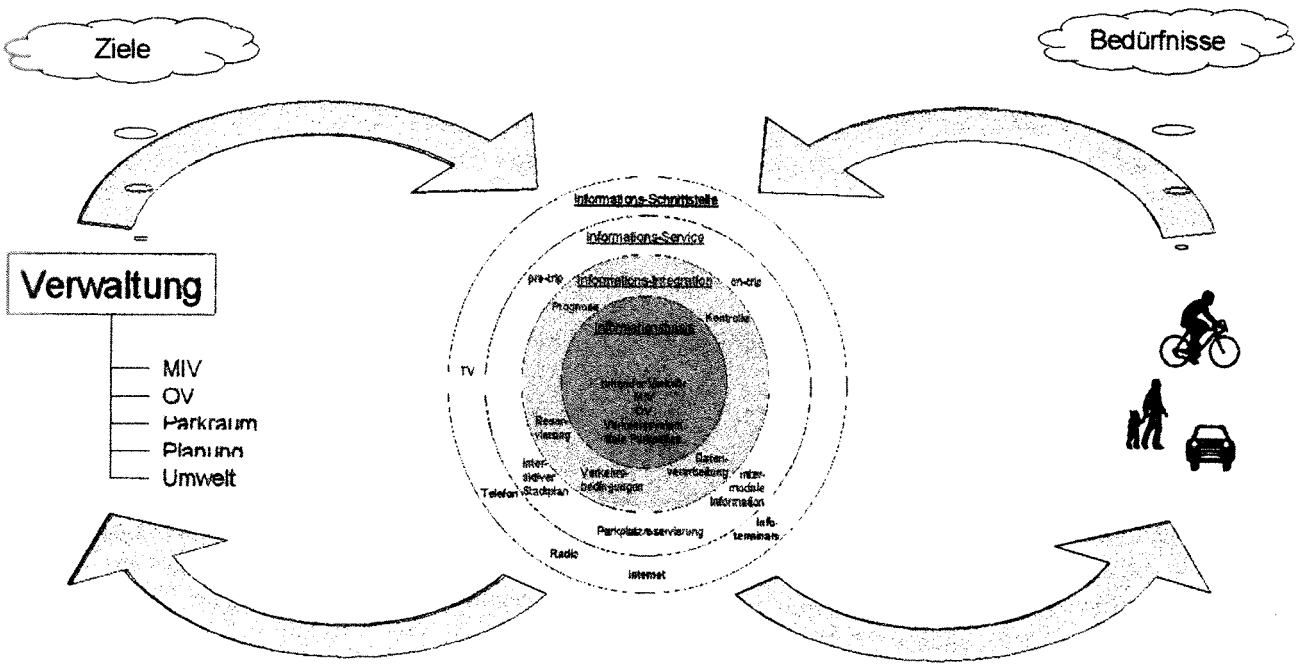
Fig. 5 Traffic Management System should be used for coordination between administration bodys, transport providers, external bodys, media, users, data base...

Monitoring the traffic system whether it is developing towards the desired goals or not is one of the duties of the system. On line data collection and continuous analysis will help decision makers to react early and accurate – if they are willing to use the system.

The most difficult work will be bring a balanced information flow into a information system which is totally occupied by lobbies of car drivers. Their privileged position has to be balances with all other system users. In the local districts the development ist still behind the goals and many (not all) local politicians are still in favour of car traffic and convert pedestrian sidewalks into parking areas, or hinder efficient traffic calming measures. A total new approach will be necessary to change the old one-eyed view on the transport system into a more realistic view. This takes time and can be only done step by step. But

without a Traffic management system this steps will not be very systematic. This procedure can only be successful if all users get the same access to the informations and a continuous flow of information can be established.

Fig 6. A continuous exchange of information between administration and all user groups is necessary to make the necessary changes possible.



Die Instrumente des Verkehrsmanagement ermöglichen Interaktion zwischen Verwaltung und Benutzer. Effekte von Maßnahmen werden sichtbar - ein erneuter steuernder Eingriff ist möglich.

6 Conclusion

The Traffic management system as it is planed in Vienna has a clear goal, given from politicians, which is very ambitious. The measures introduces by the system will support and monitor the way toward this goal. Only one part of the system is therefore computerised signalling and optimisation. Optimisation has to follow an overall strategy which objectives are not derived from the traffic system itself. Traffic has a service function and not more and has to fulfil this function within the given limits of space, time and energy. The traditional view on the traffic system has not taken into account the reality of

man and the system of man and technical transport means. To escape from this man made cul de sac the traffic management system will not only be a tool for better and smoother car traffic, but much more an instrument for a better balance of information, space, time and irritations between the different road users for the overall benefit for the city, its economy, culture and environment.

The work to realise the System has began and will continue till the end of 2002 for the first stage, the implementation of the new Traffic management centre. This first step is the beginning of the process of mobility management, which will continue in the following years.

If the process will be successful it will be dependent not only on scientific analysis but also on trial ant error – like the real world.

References:

Knoflacher, H.:ZUR FRAGE DES MODAL SPLIT; Straßenverkehrstechik, Heft 5/1981, Sept./Okt. 1981

Knoflacher, H.: HUMAN ENERGY EXPENDITURE IN DIFFERENT MODES: IMPLICATIONS FOR TOWN PLANNUNG; International Symposium on Surface Transportation System Performance, october 1981

Knoflacher., H.: KANN MAN STRASSENBAUTEN MIT ZEITEINSPARUNGEN BEGRÜNDEN. Internationales Verkehrswesen 38, heft 6/1986, Nov./Dez.

Knoflacher, H.: KATALYSATOREN FÜR NICHTMOTORISIERTE. Gemeinde-Stadt-Land, Heft 3/1987, Hannover, Seite 21-29

Knoflacher, H.: DAS LILL'sche REISEGESETZ - DAS WEBER_FECHNER'sche EMPFINDUNGSGESETZ UND WAS DARAUS FOLGT ? Mobilita 195, Bratislava

Schafer, A. (1998): The Global Demand for Motorized Mobility. Transportation Research Part A, Vol. 32, No. 6, pp. 455-477,.

Schmidl, H. (1990): Mobilitätskennziffern des werktäglichen Personenverkehrs im räumlichen und benutzergruppenspezifischen Vergleich. Dissertation eingereicht an der Fakultät für Bauingenieurwesen, Technische Universität Wien.

Meier, E. (1989): Neuverkehr infolge Ausbau und Veränderung des Verkehrssystems. Dissertation an der ETH Zürich. Schriftenreihe des Instituts für Verkehrsplanung, Transporttechnik, Straßen- und Eisenbahnbau (IVT) – Nr. 81, Zürich.

Knoflacher, H. (2001): Zeitgemäßes Verkehrsmanagementsystem. In: Eine Stadt im Verkehr. Verkehrsmanagementsystem Wien. Perspektiven Sonderheft. S.9-14.

Stadtentwicklungsplan für Wien (step) 1994. Beiträge zur Stadtforschung, Stadtentwicklung und Stadtgestaltung – Band 53. Wien 1994.

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