International Congress on
Urban, land and environmental planning and informatics in planning in the transition era
22-24 October 1997, Athens

THE NEED OF TRAFFIC INFORMATION SYSTEMS INTEGRATION IN THE URBAN PLANNING PROCESS

George Yannis, John Handanos and John Golias

National Technical University of Athens
Department of Transportation Planning and Engineering

CURRENT SITUATION

Traffic planning and management are indispensable elements of the continuous urban planning process of modern cities, whereas they started to be an indispensable parameter in the city environmental planning.

Only a pro-active policy in traffic planning and management can ensure success of the overall urban and environmental planning process.

New technological developments have several applications in the field of urban traffic planning and management allowing for more sophisticated and appropriate solutions.

OBJECTIVES

to present the necessity and the possibilities for integration of urban traffic information systems in the planning process

- to identify the needs and the benefits from articulating several traffic information systems into a coherent urban planning approach
- to investigate possible problems and limitations of this systems integration and to propose alternative solutions

METHODOLOGY

systems integration at two levels:

- integration into a coherent traffic planning and management process
- integration within the overall urban & environmental planning process

URBAN TRAFFIC INFORMATION SYSTEMS

from simple algorithms and computer programs for traffic counts to advanced models and information systems for the simulation and the management of the urban traffic

- Traffic data collection and processing
- Capacity analysis and simulation
- Signalisation
- Traffic safety
- Parking management
- Public transport management

TRAFFIC DATA PROCESSING SYSTEMS (1/3)

Key activity on the quality of which all other activities depend.

Data refer basically to:

- vehicle classification data
- intersection turning movement volumes
- crosswalk and corner pedestrian traffic counts
- data from moving vehicle surveys
- data from radar speed surveys
- vehicle delay data
- data on arrival times and gap intervals
- average arrival rate and average service rate

TRAFFIC DATA PROCESSING SYSTEMS (2/3)

Some of the simple procedures which use all or part of the above data are the:

- estimation of the turning movements at an intersection
- determination of the peak hour
- calculation of the peak hour volumes by lane movement
- calculation of the peak hour factor
- simulation of the performance of freeway bottlenecks
- measurement of the travel time benefits of changes in roadway design
- calculation of delay, queue length
- estimation of the annual impact of urban freeway congestion in terms of congested travel, motorist delay and excess fuel consumption
- calculation of the effects of bus stop spacing on traffic

TRAFFIC DATA PROCESSING SYSTEMS (3/3)

Advantages

- provide reliable and ready-to-use results in several specific traffic management cases
- provide results responding directly and sufficiently to the problems addressed

Disadvantages

- not interconnected between them or linked to other traffic planning and management systems and consequently their results can not be used by other systems without prior further processing
- their inability to be incorporated in an integrated traffic planning and management approach is a major drawback of these systems

CAPACITY ANALYSIS SYSTEMS (1/4)

The generation of traffic planning and management schemes which may improve the traffic flow is an iterative process, concerning the examination of a single solution or a number of alternative options.

Main characteristics of the systems:

- can tell how well a traffic scheme will work
- require additional data by the engineer for the various options proposed
- each system concerns a certain traffic appraisal which is suited to a certain type of traffic management scheme concerning
- schemes involving single junctions
- schemes involving a network containing a group of junctions.

CAPACITY ANALYSIS SYSTEMS (2/4)

Single junctions

- determination of the level of service based on delay methodology
- obtain different solutions using optimum cycle time, pre-determined cycle time and required cycle time
- include procedures to estimate cycle length and signal timing
- add optimisation options that produce the best possible capacity analysis for the given conditions
- computations concerning the queue length, the service flow rates and the over-saturated delay

CAPACITY ANALYSIS SYSTEMS (3/4)

Network

- traffic assignment
- simulation of geometric improvements, bus operations, lane closures
- simulation of urban streets at different level of detail
- modelling of individual vehicle flow
- evaluation of the operational effects of various traffic demand, types of traffic control and/or geometric configurations
- measurement of effectiveness including delay, operating costs, fuel consumption and emissions
- determination of the optimum timing settings
- calculation of bay length and left turn capacity with and without a bay analysis of various complicated left turn signal treatments
- calculation of signal timing plans for interconnecting series of interchanges
- optimisation of signal timings for large multi-arterial networks

CAPACITY ANALYSIS SYSTEMS (4/4)

Advantages

- provide reliable and ready-to-use results in several specific traffic management cases

Disadvantages

- they are not interconnected between them or linked to other traffic planning and management systems
- duplication of the data input work and the limitation of the scope of their outputs and their overall usefulness

TRAFFIC SAFETY SYSTEMS

Traffic safety information systems are basically considered as decision support systems.

A traffic safety system can concern cases from a limited scale (in depth analysis of certain type of accidents in a certain axis) to a large scale (all types of accidents in the whole city).

Traffic safety information systems are classified into three broad categories:

- systems only with accident data files
- systems with accident data files and links with other external data files
- systems containing accident and other data files

Even though efforts for linking traffic safety information systems with other data are intensified, related results remain poor, specially at urban level.

SYSTEMS INTEGRATION WITHIN THE TRAFFIC PLANNING PROCESS (1/2)

The output data of the various traffic systems can automatically be transformed in a form allowing their further processing by another system, whereas the systems can allow for a wider range of input data facilitating their interconnection with other traffic systems.

- augmentation of the quantity and quality of the proposed traffic solutions
- more efficient participation of the engineer
- repetitive and laborious combinations of results would be carried out by the traffic systems themselves
- the co-evaluation of results from traffic data processing, capacity analysis and simulation and signalisation optimisation may reveal solutions which are not necessarily evident by the separate operation of the systems.

SYSTEMS INTEGRATION WITHIN THE TRAFFIC PLANNING PROCESS (2/2)

The various traffic problems are part of the overall urban traffic pattern and therefore respective solutions should not be considered separately but all together in the framework of the overall traffic pattern.

Solutions to the various traffic problems should be considered altogether aligned with the hierarchised traffic improvement objectives. The efficient joint evaluation of the various traffic problems is possible only when all traffic information systems are integrated into a coherent sequence of systems allowing for the production of complete traffic solutions.

SYSTEMS INTEGRATION WITHIN THE URBAN AND ENVIRONMENTAL PLANNING PROCESS (1/2)

The development of the transportation plan of the city can be successful only if it is aligned to the urban development plan of the city.

Success of small, medium and large scale plans is possible only if transportation and urban planning parameters are continuously revised in the light of changes of each other.

Traffic solutions should be easily re-evaluated:

- in the light of their effects to the overall transportation and urban development of the city.
- according to the results of their implementation and the respective citizens' reaction.

SYSTEMS INTEGRATION WITHIN THE URBAN AND ENVIRONMENTAL PLANNING PROCESS (2/2)

The direct production of complete traffic solutions through the integrated traffic information systems allows the improvement of the urban planning solutions as the impact of the solutions to the new traffic situation is also directly taken into consideration.

- shorter and more reliable decision process.
- different time schedules concerning priorities of the various steps required can be tested on time
- correct planning of all required interventions and minimises the probability that the proposed scheme becomes obsolete

The direct co-evaluation of the results from the various systems leads to the improvement of the level of service and of the travel speed, as well as to the decrease of the travel time and of the traffic congestion which fall exactly within the objectives of environmental planning .

REQUIREMENTS FOR THE SYSTEMS INTEGRATION

- optimisation of information flow between systems and the outside world (systems compatibility)
- efficient data quality control (data definitions, collection and processing practices, data compatibility and comparability)
- alignement of the structure and operation of the integrated traffic information systems to traffic and urban planning policy and its objectives
- efficient management structure (appropriate organisational provisions)

CONCLUSION

Today, the existing information systems have a great potential for supporting several activities related to traffic planning and management.

The interconnection of the various traffic information systems into a coherent integrated system will definitely facilitate the engineers' task and will open new horizons for the support of traffic related decisions.

Planning and management of the traffic and the general urban environment should be able to evolve as the city life evolves and this is only possible if the supporting information systems can easily evolve as a whole towards the new traffic and urban reality.

The integration of the various traffic information systems will transform the notion of urban and environmental planning by creating a direct interrelation between traffic parameters and urban planning decisions.

PERSPECTIVES

The integrated approach in traffic information systems can be not only the first step towards integration of all related information systems in the urban planning process (traffic, transportation, land use, GIS, cost models, etc.) but also a very good example for equivalent systems integration in the field of land planning process.

Further consideration is of course required for the improvement of the integration of information systems in the urban planning process as well as for the advancement of relevant systems integration in the context of global environmental and land planning. Care should be taken that this integration is flexible enough to adapt to the conditions of the current transition era where user needs and supporting systems evolve rapidly.

International Congress on
Urban, land and environmental planning and informatics in planning in the transition era
22-24 October 1997, Athens

THE NEED OF TRAFFIC INFORMATION SYSTEMS INTEGRATION IN THE URBAN PLANNING PROCESS

George Yannis, John Handanos and John Golias

National Technical University of Athens
Department of Transportation Planning and Engineering