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CHAPTER 11

An Innovative Approach to Urban Environment Sustainability: the MOSCA Project

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11.1 Introduction

In most European cities the Central Business Districts (CBDs) are emptying of citizens and heavy industries, while the concentration of commercial activities (the tertiary sector) is constantly increasing. People prefer to live out of the city, going downtown for business and shopping. As a consequence traffic increases and less people use public transport which is often insufficient in suburban areas. Meanwhile the current management practices (regulations) of freight logistics are mainly based on constraint and limited access to the city centre for freight operators. Such an approach is often unsatisfactory and unpopular for both city managers and freight operators.

The MOSCA project – co-funded by the European Commission IST (DG-INFSOC) under the Fifth Framework Programme – aims at finding new ways of supporting transport planning and management in cities and agglomerations. MOSCA stands for: Decision Support System for Integrated Door–to-Door Delivery: Planning and Control in Logistic Chains.

Key applications are tools for integrated planning and control of production and transportation processes supporting sustainable development. MOSCA aims at highly reducing several problems affecting freight distribution in European metropolitan areas, such as booking and reservation procedures, vehicle routing, loading/unloading areas reservations, emergency management support.

The MOSCA methodology is based on software solutions to encourage the meeting of the city administrations (information suppliers) with the freight logistics operators (information consumers). Thanks to MOSCA suppliers of information can even become consumers and provide a better quality of the information in the next iteration. Therefore the vision is that sophisticated technology allows the actors involved to collaborate on urban freight distribution. Each local authority or company, influencing traffic by its decisions on traffic regulations, road maintenance and transport, is considered to be both a sender and a receiver of traffic–related information. Common planning tools are improved by modules which allow the lack of integration of business traffic and freight transport in existing tools to be overcome and which consider the changing needs of the users of the urban infrastructure networks.

The supply side is represented by local authorities, responsible for traffic infrastructure, while the demand side is constituted by production and transportation companies. This is the reason behind the fact that MOSCA system has been designed as "facilitator" to integrate different and (often) opposite needs of City Administrations (e.g. Municipalities) and Operators (e.g. transportation and production companies). Therefore a collaborative approach model, which involves both city administrations and freight logistics operators, is proposed.

From the technological point of view, MOSCA is designed for future added value services with several modules (short path, tour planner, on-line routing, shop delivery planning) being implemented in this project. The core concept is based on state-of-the-art technologies with open interfaces to other services. Synergy, sharing technologies and services among stakeholders in the urban environment are the key words in the MOSCA approach.

This chapter summarizes the specifications, results, achievements, outputs, conclusions of the MOSCA project.

11.2 Objectives

The key objective of the MOSCA project is to provide a set of tools for improving the efficiency of door-to-door transport of goods in urban areas by collaboratively providing demand and supply-side information in one single environment/system. Starting with this idea a number of modules were developed which try to answer the main problems and needs of the cities' administrations and transport operators.

The basic motivation of the MOSCA scientific approach is the hypothesis that all organisations, institutions and citizens affected by urban traffic will benefit from sharing knowledge and information. Exploiting information which is only locally available yields some myopic profits, but in the long run, co-operative strategies pay off better.

The main challenge is an improvement of the complex situation of business traffic and freight transport in European metropolitan areas and as a consequence an improve-

ment of the negative impacts for the environment and the citizens. Starting points are booking and reservation procedures for loading/unloading areas, vehicle routing as well as transport modelling.

Supply-oriented system components provide more precise transport models which allow the city administration to make more precise business traffic and freight transport planning. Furthermore a more precise estimation of social costs is possible. By use of information from the demand side (i.e. tours), represented by the production and transportation companies, existing models can be improved to some extent. Demand-oriented system components allow improvement of the knowledge of the loading/unloading situation at shops or private customers (e.g. time windows, time patterns). The use of dynamic information is foreseen (e.g. changing traffic situation, new incoming orders).

The main project outcomes are validated prototypes for demand services and integrated supply-oriented traffic and transport models together with a user-oriented decision support system (DSS) and these are described below.

11.3 Methodology and approach

The design of the MOSCA system has been performed starting with the user requirements to identify both the supply and the demand side (the essential role of user needs analysis was discussed in Chapter 2). From the user requirements, a set of suitable applications were selected. For these applications necessary modules have been identified and developed. Once the MOSCA tools have been implemented and tested the results have been analysed and then evaluated.

11.3.1 Information system specification

For the definition of the user requirements a survey (in parallel) in Germany, Italy and Switzerland was carried out. This task was the basis for the MOSCA system architecture design. As a result of the interviews with potential end users a catalogue of requirements, available technical equipment, objectives and measurement criteria was established. The list of user requirements is shown in Table 11.1.

The user requirements have been translated into the functional and technical specification of the MOSCA system. Functional specifications have been developed (on the basis of the survey results) by splitting the system into modules referring to communication, storage and user interface. MOSCA modules and functionalities are designed as solutions to the needs and problems of both the supply and demand side. A modular structure was chosen where a rough distinction between supply side and demand side modules was made.

Needs of cities and institution	Needs of production and transport companies
Freight transportation models and analysis of the traffic system	On-trip control
Optimisation of freight transport	Carrier-customer information exchange
Customer services	Customer access: problems found when approaching the point of service
Integration of information	City access: administrative regulations of city access with freight transport vehicles
Impact measurement: (Freight) transport and social cost	
Location planning	

Table 11.1: **User Requirements**

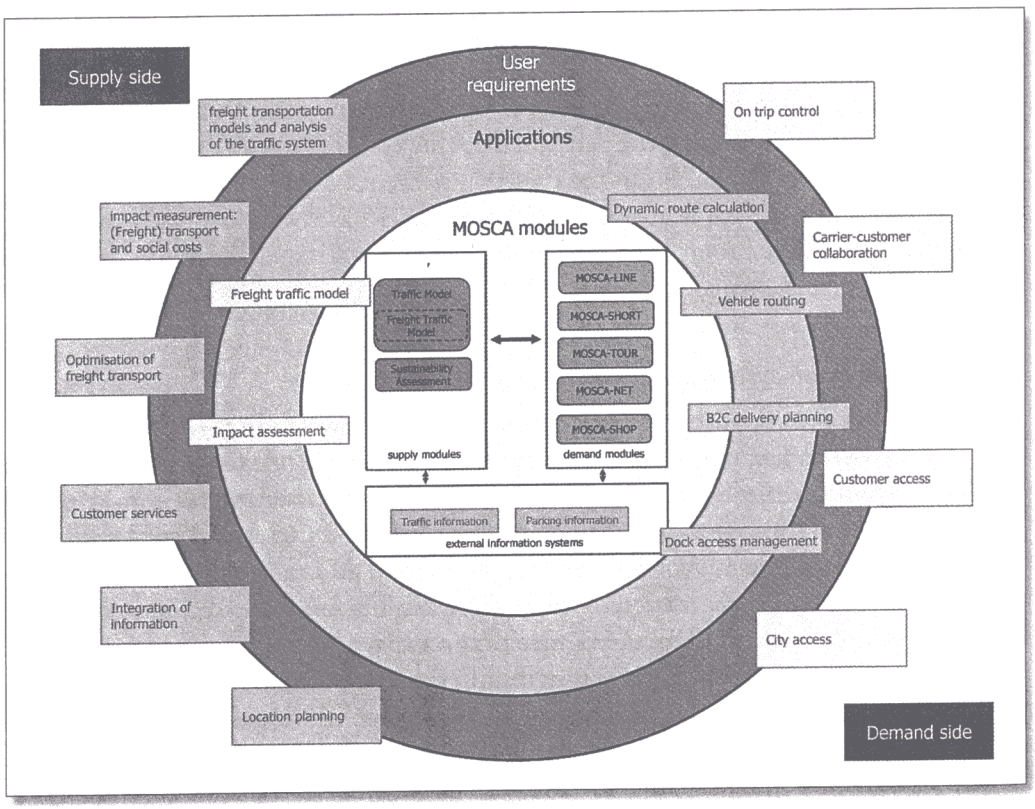

Figure 11.1: **Relation between MOSCA modules and user requirements**

Figure 11.1 gives a summary of how the user requirements (external circle) impact the applications (middle circle), which are in turn mapped into the MOSCA modules (inner circle).

From the technical point of view the MOSCA system consists of several modules with simple input-output relations and these are described below.

11.3.2 Supply-oriented system components

The main objective of this task is to develop models and supply-oriented system components based mainly on urban road networks, on demand models and on road based shipments. These models and systems are developed for usage as a DSS for city planners allowing a sustainability assessment, an important criterion for assessing the environmental and social impact of traffic planning.

The current environmental legislation and laws and the relative implementation in European cities and which software tools exist for estimation of environmental effects in urban areas have been analysed.

One of the two modules developed as supply oriented system components is the sustainability assessment module - MOSCA-SUSTAIN. Data and information, available at city-level, have been used in this module. A schematic concept of the software assistant, which can help cities to assess evaluated active (e.g. road closing) and passive (e.g. road surface) noise reduction measures has been developed, and several scenarios have been calculated (see Figure 11.2).

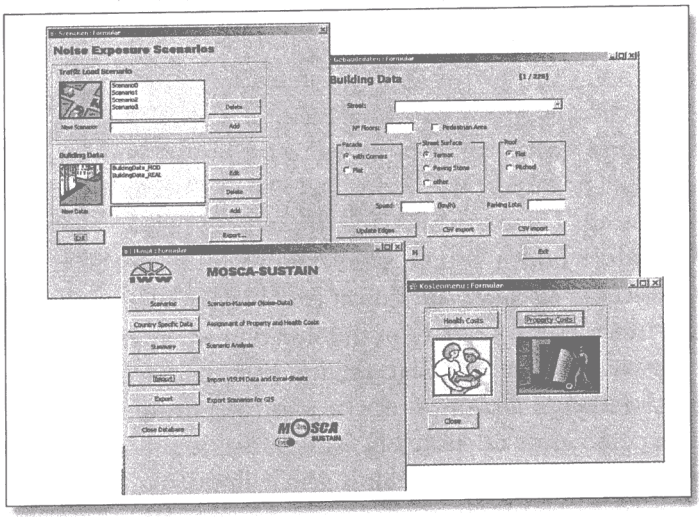

Figure 11.2: **Screenshot MOSCA-SUSTAIN (source: Glücker et al. 2003)**

The other module is MOSCA-FREIGHT (VISEVA-W) for modelling of urban business traffic and freight transport demand (see Figure 11.3). VISEVA-W is now integrated into the overall model structure of the VISEVA model for passenger transport demand and

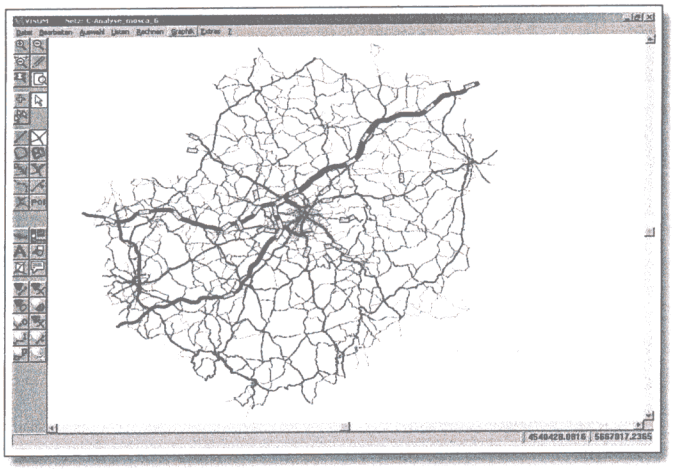

Figure 11.3: **Screenshot MOSCA-FREIGHT (source: Glücker et al. 2003)**

the VISUM model for traffic assignment. A "user manual" showing how to set up an urban business traffic and freight transport demand model by use of VISEVA has been produced.

Furthermore the integration and modelling of specific issues for freight transport policy managers and also the integration of individual transport in the MOSCA-FREIGHT module as a DSS have been analysed.

11.3.3 Demand-oriented system components

The objective of this task is the development of services for logistics and production allowing users to access the information system in order to store and retrieve traffic related data. Service architecture and dedicated systems for integrated production and transportation planning with sustainability support have been developed. MOSCA demand side modules are software tools which can be provided to the private end-users of the MOSCA integrated environment (transport operators, B2C-clients, shops, etc.) for information exchange and processing. These modules are summarised below.

MOSCA-SHORT is an algorithm which finds a "robust" path within a city if variable traffic conditions are given. MOSCA-SHORT can calculate convenient (reliable) paths between two points in the case of a dynamic urban traffic network in the situation where travel times along the network arcs are not known in advance with certainty. The results can either be just information on the length/duration of a path or may be a list of location identifiers that allows the user to re-construct the route calculated by MOSCA-SHORT.

MOSCA-TOUR is an algorithm to plan delivery tours for a vehicle fleet if variable traffic conditions are given. MOSCA-TOUR is embedded into logistics application software, which must invoke it to provide data of the orders to be serviced, the objective function, and the characteristics of the vehicles' fleet. Distances and travel times can either come from MOSCA-SHORT or a traffic model. After receiving all input data, the algorithm calculates

the most efficient vehicle routes. The result is a set of optimized routes that is output back to the logistics application software.

MOSCA-LINE is an algorithm to plan on-line deliveries following unexpected events such as a new customer request or a traffic jam. MOSCA-LINE is able, given the current position of vehicles, the road network situation and the list of orders to be processed, to reorganize the next stops on the basis of the available information. The module can also gather information about the traffic conditions from the incoming communications from vehicles and it can use this information to produce better plans, taking into account new traffic situations.

MOSCA-NET is a web service for managing preferred delivery locations (information hub for delivery data of freight consignments). MOSCA-NET receives information about delivery locations, profiles and time windows from B2C, i.e. private customers. Customers store the information on the module's database using the user interface while being connected on-line to it. The information on delivery location and time windows is given upon request to logistics application software if it queries MOSCA-NET using the query interface application (Figure 11.4).

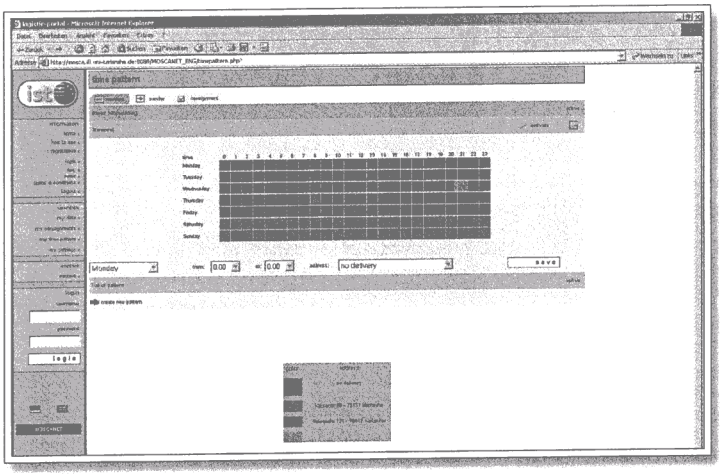

Figure 11.4: **Screenshot MOSCA-NET (source: Glücker et al. 2003)**

MOSCA-SHOP is a web service to schedule the reservation of ramp access for urban freight deliveries (Figure 11.5). It provides information on free dock access and allows booking of access time slots. This module is mainly used by carriers for planning of service anticipating waiting times at the shops' loading dock. The carrier enters shipment data and requests dock access bookings. Shops give their accessibility information and instructions for carriers to MOSCA-SHOP. Using this functionality, dock reservations and delivery instructions are passed to the carrier and incoming requests are sent to the shop. Additional functionality can recommend access times to carriers. A quality

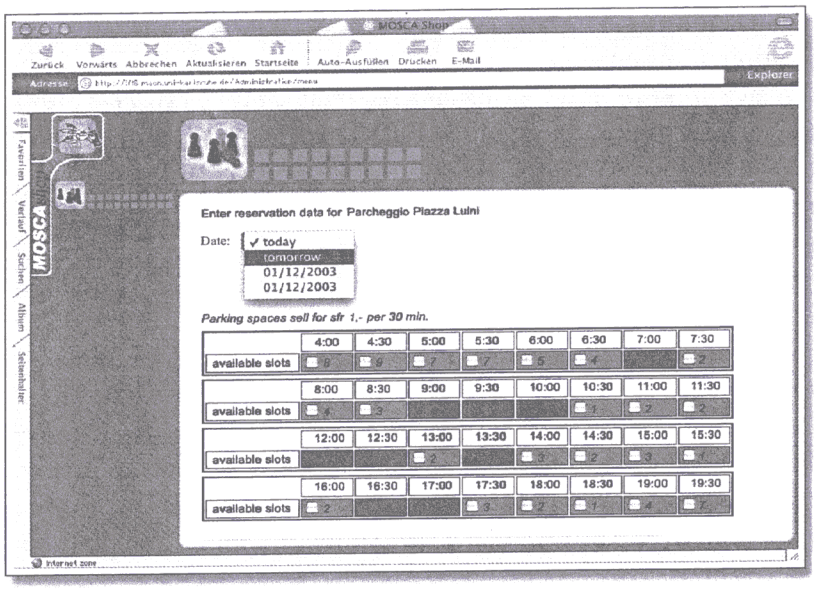

Figure 11.5: **MOSCA-SHOP Reservation for Parcheggio Piazza Luini (Lugano)**

feedback function allows carriers to assess the quality with which shops adhere to their access guarantees and at the same time gives shops the possibility to assess the quality of service of the carriers concerning dock access regulations.

11.3.4 Test sites

Four test sites (Stuttgart, Chemnitz, Padova and Lugano) have been selected in order to test the MOSCA modules in a real environment. The four test sites present rather different situations with regard to the number of inhabitants of the city and surrounding areas, the geographical situation, traffic conditions and measures taken. Therefore the test environment and the implementation of the different modules are of very high interest.

11.3.5 Evaluation of information system and the test sites

The effects of the MOSCA system and prototyped technologies were evaluated on the basis of the user needs surveyed at the beginning of the project and the experiences recorded during the project. The effects of the modules are quantified in terms of costs, utilization, lateness, traffic flow, travel time, trip number, etc. A fuller discussion of methods available for the evaluation of the telematics applications is found in Chapter 7.

The Relaxed Cost-benefit analysis (relaxed CBA) is an evaluation method which can cope with several inputs and outputs. It is a sensitivity analysis which can find best solutions if the cost levels e.g. for noise exposure vary, and was used for comparison of the different MOSCA-modules and at test-site level. Performance values for each module and test-site were calculated with this evaluation method.

The evaluation has therefore been divided into two main parts. The first part includes the evaluation of the MOSCA-modules and the second part includes the evaluation of the MOSCA test-sites.

11.3.6 Dissemination and exploitation

MOSCA dissemination activities are aimed both at promoting the project and improving access to useful inputs from other relevant projects and organisations Moreover this task aims to encourage the acceptance and subsequent exploitation of the project results by end-users. The specific objectives of both awareness raising and dissemination activities are to:

- identify the target audience with whom MOSCA needs to have links;
- initiate and carry out activities which increase awareness of the MOSCA system among the target audience;
- provide an interface between MOSCA and other interested actors;
- establish the dissemination of the results for the freight transport operators to use and for the information of transport decision makers;
- establish the dissemination of the results for a wider community than those directly interested and concerned with the topic of the project.

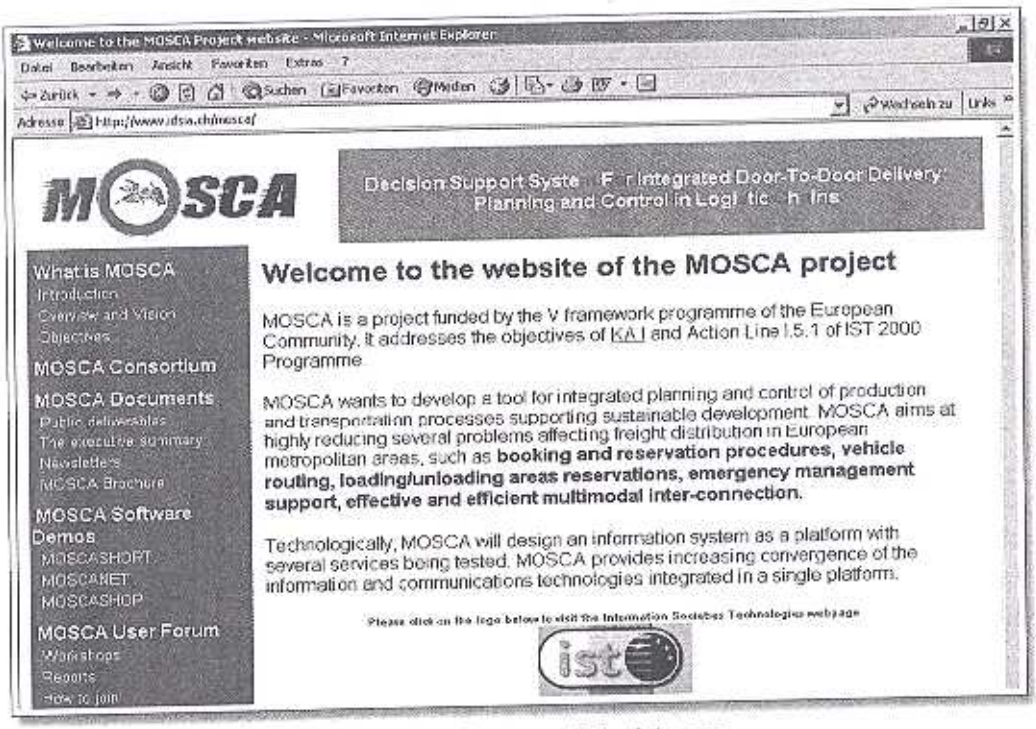

Figure 11.6: MOSCA Web Site Interface/Home Page www.idsia.ch/mosca

11.4 The MOSCA system architecture

Starting from the user requirements a set of suitable applications has been selected. For these applications necessary modules have been identified and developed. The MOSCA system modules communicate with each other and further external systems. A modular structure was chosen where a rough distinction between supply side and demand side modules was undertaken. Figure 11.7 shows the communication flows between the modules in MOSCA and the external traffic information module.

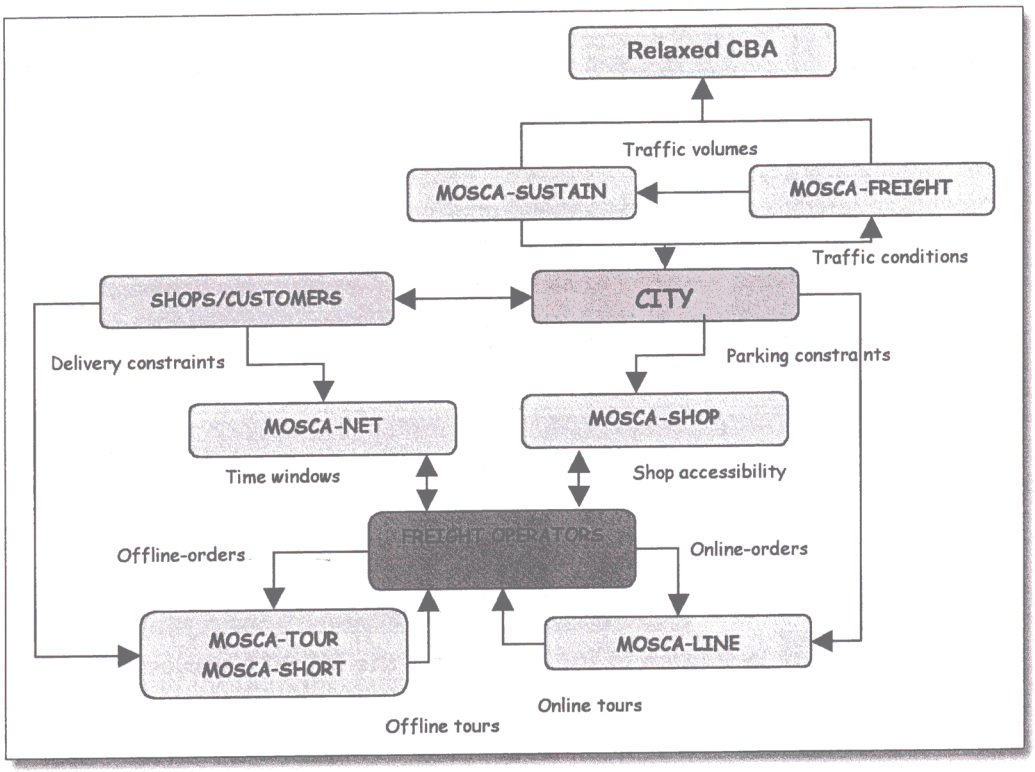

Figure 11.7: **The MOSCA information system**

As MOSCA-LINE, MOSCA-SHORT and MOSCA-TOUR are algorithms that are being called from application software they are shown as being internal to the software. MOSCA-NET and MOSCA-SHOP communicate via user interfaces to human end users. In addition, MOSCA-NET also has a communication link to application software and in particular to MOSCA-TOUR. Traffic information is not used directly in MOSCA but through the traffic model as an interface.

11.5 Testing the MOSCA modules

The key results of the testing phase of the MOSCA modules are shown in Table 11.2.

Module	Main Results
MOSCA FREIGHT	The module allows the calculation of business traffic and freight transport demand matrices of a city or region. The effort for data collection/processing depends on the availability of behavioural data and the definition of business traffic classes. VISEVA supports individual definitions of business traffic classes. The module can be integrated in an overall model structure including a passenger transport demand model (VISEVA) and a network/assignment model (VISUM). Based on this model detailed analyses of the commercial transport in connection with the passenger transport are possible.
MOSCA SUSTAIN	The module allows the calculation of noise emissions and the according social costs. A rather high number of data input is necessary but as a result good estimations of the real noise levels are possible.
MOSCA-SHORT	The heuristic algorithm for the robust shortest path is very suitable to be applied to real problems. The concept of robust path, applied here for the first time to a road network problem, can be very useful. The results of the tests suggest that it is the fastest algorithm available at present to solve robust shortest path problems, at least on road networks.
MOSCA-NET	It is possible to integrate personal time windows which can then be used by transport operators.
MOSCA-LINE	The architecture developed is able to work on real problems. The tests reported give an idea of good values for the number of time-slices in a real problem. In particular the results obtained suggest that a number between 10 and 50 (e.g. 25) represents the best compromise between too short run for the heuristic algorithm on static-like problems and not enough up-to-date information.
MOSCA-SHOP	Both the integration of shop-related data and the integration of information on parking spaces in the MOSCA-SHOP data base via the Internet are possible.
MOSCA-TOUR	The model includes a TDVRP (time dependent vehicle routing problem) integrated with a RSP (robust shortest path) algorithm to deal with a complete graph, represented by the data available. The time dependent VRP is suitable for an application to real world situations, like an urban context, where traffic data are available and where traffic conditions can not be neglected for accurate optimization/planning.
Relaxed CBA	The relaxed CBA is an evaluation method which can cope with several inputs and outputs. It is a sensitivity analysis which can find best solutions if the cost levels (e.g. for noise exposure) vary.

Table 11.2: **Main results per module**

11.6 Evaluation of the MOSCA modules

The aim of the evaluation is to document MOSCA project efforts with users in real-life situations. Based on the user needs surveyed at the beginning of the project and the

experiences recorded during the project the effects of the MOSCA System and prototyped technologies were evaluated. Whether the prototypes are successfully fulfilling the user requirements was accounted in the evaluation process. The evaluation of MOSCA modules is mainly based on the input of the MOSCA module developer and on the results of the test site implementation. The evaluation of the MOSCA modules was achieved via relaxed cost-benefit analysis developed during the MOSCA project. For this evaluation a virtual test site has been created where the impacts of the different modules can be easily documented.

11.6.1 The virtual test site

The facts of this virtual test site are described below in Table 11.3.

noise exposure [persons]	< 45 dB	30.000
	45- < 50 dB	8.000
	50- < 60 dB	10.000
	60- < 65 dB	5.000
	< 65 dB	2.000
distance [km]	car	58.753.800
	HGV	10.368.000
travel-time [km]	car	1.175.076
	HGV	259.200

Table 11.3: **Facts of the virtual test site for the evaluation of MOSCA-modules**

For this "virtual" test site six main scenarios have been calculated:

- current situation (basis for comparison);
- implementation of MOSCA-NET;
- implementation of MOSCA-SHORT;
- implementation of MOSCA-LINE;
- implementation of MOSCA-SHOP;
- implementation of MOSCA-TOUR in combination with MOSCA-SHORT (MOSCA-TOUR is only available in combination with MOSCA-SHORT, so it would not be sensible to assess MOSCA-TOUR on its own).

For each main scenario four sub-scenarios have been calculated: a) only the module/ actual data; b) speed limit (set up of a speed limit - 30 km/ h - in the virtual test site); c) HGV access restriction (access restriction in the city centre for all HGV with more than 7.5t (total weight); d) road closing (close down of one important main road for all HGV).

Data used for the evaluation of the MOSCA modules is based on the impacts of each module on the virtual test site, which were given by the module developer or calcu-

lated in parts with MOSCA-SUSTAIN. With MOSCA-SUSTAIN it is possible to calculate the number of inhabitants concerned about noise. Therefore it is not possible to assess MOSCA-SUSTAIN on its own because it is part of the evaluation process. It is also not possible to assess MOSCA-FREIGHT because this module delivers the data input for most of the modules in the form of information about travel times, traffic network, etc. So it is accounted for in the context of the evaluated modules. Figure 11.8 visualises the efficiency scores calculated for all MOSCA modules in combination with the pre-defined sub-scenarios. The calculation was done with the Relaxed-CBA method. The relaxation steps are 2.5% which means, starting from fixed prices, the margin increases at each relaxation step ± 2.5%.

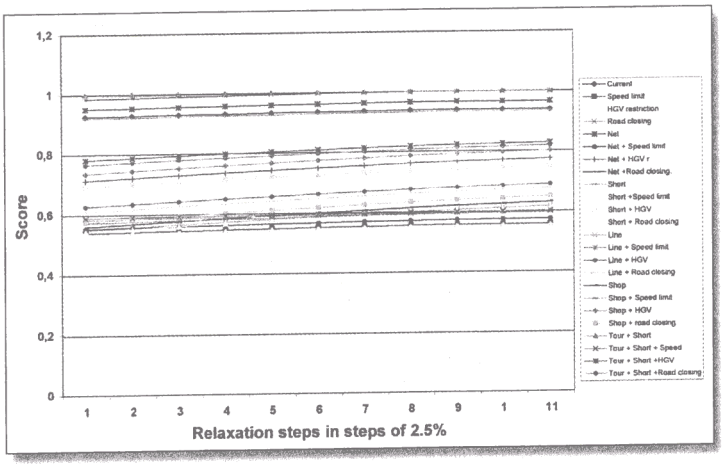

Figure 11.8: **Relaxed-CBA for all MOSCA-modules in combination with four sub-scenarios**

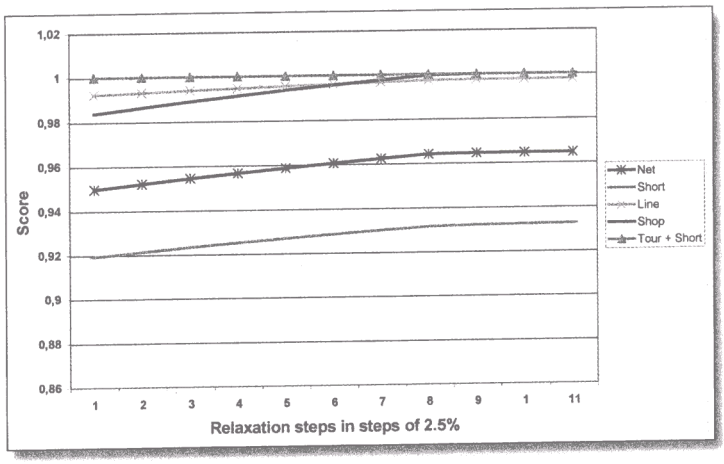

Figure 11.9:**Detailed depiction of the stand-alone modules**
(Part of the Relaxed-CBA for all MOSCA-modules in combination with four sub-scenarios)

To illustrate the different efficiency scores for the MOSCA modules more clearly Figure 11.9 shows some result-lines from Figure 11.8 in more detail.

The results-lines, which can be found in Figure 11.9, are the efficiency scores for MOSCA-NET, MOSCA-SHORT, MOSCA-LINE, MOSCA-SHOP and MOSCA-TOUR in combination with MOSCA-SHORT.

From the previous diagrams it is possible to see what MOSCA-TOUR has achieved in comparison to the other MOSCA modules and the MOSCA modules in combination with the four sub-scenarios, against the highest efficiency score (100%). MOSCA-LINE and MOSCA-SHOP accomplish the highest efficiency score after a few relaxation steps.

MOSCA aims to exploit project outputs supporting applications in existing and newly developed information systems. The information system development is market-led having involved both transport operators and relevant service providers. Software tools and methods are now available at different levels with regard to the future exploitation:

- The MOSCA-FREIGHT prototype can easily be led towards a new product
- The prototypical application MOSCA-SUSTAIN can easily be passed towards a consulting application
- MOSCA-TOUR, MOSCA-SHORT and MOSCA-LINE are scientific prototypes which can be led to customisable applications for products
- MOSCA-SHOP and MOSCA-NET finally represent first examples which can be developed towards first scientific prototypes.

11.7 Recommendations for future research

For MOSCA-TOUR an improvement of the features of the module might be accomplished by also considering the dependence of path on time. In this test the vehicles' capacity optimization has not been considered if different sized vehicles are used. Furthermore, the optimization of the tour starting time was not looked at for the complexity of the problem in the time dependent context. Here further research is necessary.

For MOSCA-FREIGHT additional research is necessary especially with regard to the available data and integration of specific "business" cases into the model. For many specific questions the module derives the basis for the calculation of the demand matrices but the necessary primary data (e.g. with regard to the behaviour of certain industry sectors) are not available. Therefore up to now these business cases are not integrated in the model.

For MOSCA-SUSTAIN further adaptations and work has to deal with the special situation in different cities with regard to the data availability in order to reduce the high effort for manual data editing. More detailed information about the cost rates (health- and property cost) or other cost rates to be examined might also be integrated in future.

11.8 The MOSCA User Forum

The MOSCA User Forum is an open panel of key actors allowing the establishment of an effective bridge between research and production/transportation operators on ground reality. These groups worked at different stages of the project, accordingly to project activities as follows:

Start Up - User Forum representatives were invited to the kick-off meeting and involved in the start up of main project aspects;

Step - User requirements: they gave their input in the identification of system components (modules) and data collection for the definition of the user requirements in order to set up MOSCA system technical and functional specifications;

Step II - Test sites: User Forum representatives were directly involved during the test site activities. In particular they provided information and data for implementing MOSCA test sites, also supporting measuring performance and acceptance of the MOSCA system;

Step III - Evaluation: User Forum members provided their feedback for the MOSCA system and module evaluation.

Continuous information exchange and calibration of the project progress were achieved throughout the MOSCA User Forum preferred channel. Some of the members of this board have themselves been promoter of MOSCA outcomes and added value partners in the synergy between National initiatives (e.g. in Italy ARTIST) and EC R&D projects. Thanks to the involvement of the User Forum Members, including both city administration from different European cities, and selected logistics operators, the working steps of MOSCA have been examined and approved for further development activities.

11.9 Main conclusions

The objectives of MOSCA have been achieved by development, implementation, testing and evaluation of the different MOSCA modules which can be used in combination or separately depending on the aims of the potential users. It was demonstrated that the MOSCA tools are able to improve the management of the logistics process promoting a mutual exchange of information between logistics operators and city.

The combination of the new software tools, information exchange platforms and algorithms with existing models and planning software will improve the working and information basis of all users (e.g. traffic planners, citizens, transport operators).

The MOSCA project therefore has successfully provided software tools to assist authorities to plan, assess and control freight transport tailored to their needs and production/transportation operators in better planning their transport services. Possible interactions between the modules have been evaluated: MOSCA-FREIGHT delivers data on traffic flows

for MOSCA-SUSTAIN but it is also able to estimate the effects on the transport network (if e.g. MOSCA-SHOP or MOSCA-NET were implemented in the city). The relaxed cost benefit analysis allows an overall and standardised comparison of different measures in a city which were modelled and assessed by use of MOSCA-FREIGHT and MOSCA-SUSTAIN. The MOSCA-SHORT, MOSCA-LINE and MOSCA-TOUR modules represent algorithms which improve the tour planning of transport operators. They make use of the output of a transport model in the wider sense and *vice versa* the information on the tours can be used in a transport model like MOSCA-FREIGHT for calibration.

Outlook

The MOSCA-FREIGHT prototype will become a new product and also the prototypical application MOSCA-SUSTAIN will be used as a consulting application. MOSCA-TOUR, MOSCA-SHORT and MOSCA-LINE are scientific prototypes available to become customisable applications for products. MOSCA-SHOP and MOSCA-NET finally represent first examples to be further developed towards first scientific prototypes. The method of the relaxed cost benefit analysis is implemented as a software application. For the future further improvements are foreseen. The aim is to establish the relaxed cost benefit analysis as a widely used evaluation method.

In future, planning and control of traffic and transport will gain still greater importance. In view of the continuing need for better efficiency and route optimisation, the MOSCA goal is the promotion of new approaches by introducing more intelligence in the transport infrastructure planning and use. This is in line with the EC policies regarding intelligent infrastructure and goods urban transport.

MOSCA puts particular emphasis on the use of telematics in "mobility chains" for freight, promoting competitiveness, economic growth and employment, safety and operational efficiency. Transportation and the mobility of goods will be facilitated by the MOSCA information and communication system modules providing traffic management and other transport planning services. A method like the relaxed cost benefit analysis realised as a software tool facilitates the decision of the city planners between alternative measures. It therefore represents a very valuable decision support tool.

The prototypical MOSCA developments and algorithms will flow into new product development to harmonize freight related urban transport planning (e.g. optimisation from the public side) and might also lead to an improvement of transport planning tools for private operators. MOSCA is a new approach offering advantages due to the growing interest of cities in goods movements and to the expected structural changes within city delivery caused by e-business. Thus an increasing demand for urban planning and modelling tools is expected to lead to an increase of turnover and market gain in the next years. The MOSCA outcomes will be used at the policy planning level in order to evaluate the impact of alternative structural and managerial decisions, enabling a more

efficient and sustainable development of urban goods delivery systems all over Europe. Not only will the city planners work with better and more detailed reflections of their traffic networks but also the transport operators will ask for more detailed and up-to-date traffic information. Up to now on-line traffic information or new urgent orders are not (or only rarely) integrated in the tour planning of transport operators. In future the more difficult traffic conditions but also the higher service requirements of the clients will ask for a more precise and flexible transport organisation. The new algorithms (MOSCA-SHORT / MOSCA-LINE / MOSCA-TOUR) developed within MOSCA project can make use of this information and allow the transport operators to immediately integrate special events like e.g. traffic jams or construction sites in their tour planning systems. Also time-patterns of the shops or private clients (MOSCA-SHOP / MOSCA-NET) can be integrated which allow a more efficient pick-up and delivery planning. These abilities will certainly contribute in the competitiveness of the transport operators.

It can be concluded that not only the more difficult traffic conditions but also the new legislation and customer requirements will ask for a wide use of new transport planning and assessment tools in the future. The MOSCA modules are therefore important tools to meet the future challenges in European cities and regions.