The MOSCA project

Innovative approaches approach for a sustainable freight transport

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PROJECT OVERVIEW

- Background
- Project objectives and description
- Key concepts
- The methodology
- MOSCA modules
- The User Forum
- How to get information
BACKGROUND

Which barriers to city sustainability

1. in most European cities the Central Business Districts are emptying out of citizens and heavy industries, while the concentration of commercial activities (the tertiary sector) is constantly increasing.
2. less use of public transport
3. pressure in city centres caused by congestion

A radical approach to city development and planning is needed

Find mitigation measures for enhancing quality of life in cities is a duty
Freight transport in urban areas: WHICH PROBLEM

- **Time constraints:**
  - cities **restrict access** to commercial areas to fixed time periods
  - contractual times of delivery and pickup are harder and harder to respect, as the **traffic increases**
  - Congestion may considerably reduce the average speed

- **Access constraints:**
  - Often in urban centres there is **not enough space** to load and unload without affecting the traffic flow (double lane parking, etc.)
Freight transport in urban areas: WHICH MEASURES

City Administrations regulates through the implementation of restrictions such as:

- Time of access
- Vehicle size

Consequences:
Additional transhipments and high number of small tracks
Difficulties in matching customers’ demand

➔ There is room to study, develop and implement new models, new algorithms, new organizational arrangements in logistics.
AN INNOVATIVE APPROACH TOWARDS SUSTAINABILITY: URBAN LOGISTICS

The MOSCA project (Decision Support System for an integrated door-to-door delivery: planning and control in logistic chains) co-funded by DG INFSO (V FP)
Starting date: July 2001
End date: June 2003

The vision: improving freight logistics in urban areas thanks to optimisation software and shared access to traffic information
## THE CONSORTIUM

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<tr>
<th>No.</th>
<th>Participant name</th>
<th>Participant short name</th>
<th>Country</th>
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<td>1</td>
<td>FIT Consulting srl</td>
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THE MOSCA SOLUTION

A *collaborative* approach model involving both city administrations and freight operators. Technologies are used to improve the performance of city freight logistic processes, seen as a *shared resource*.
KEY CONCEPTS

The basic motivation is the hypothesis that all organisations, institutions and citizens affected by urban traffic will benefit from sharing knowledge.

➤ In the long run co-operative strategies pay off better

Supply side is represented by responsible for traffic infrastructure (local authorities)

Demand side are production and transportation companies.

Starting points are booking and reservation procedures for loading/unloading areas, vehicle routing as well as transport modelling
The **NEED of cities and institutions** can be split up in six main fields:

- Freight transportation models and analysis of the traffic system
- Impact measurement: (Freight) transport and Social costs
- Optimization freight transport
- Customer services
- Integration of information
- Location planning

The **NEED for the demand side** can be categorized as follows:

- City access: administrative regulations of city access with freight transport vehicles
- Customer access: problems found when approaching the point of service
- On trip control: information on traffic situation and possible actions while underway
- Carrier-customer: collaborative planning of service to business and private customers
MOSCA ADDED VALUE

MOSCA system has been developed considering the following characteristics in order to be compliant with user requirements:

- To guarantee compatibility with existing tools and conformity with the standard technology architecture.
- To be adaptable and modular with respect to existing environment (e.g. tourism, public transport, GIS, etc.).
- To interact with continuous modification of policy measures adopted at city level.
- To be a non intrusive system (data privacy strongly influences the availability in providing accurate and punctual data).
- To be easily accessible to interested actors (friendly interface).
MOSCA TEST SITES

Main objectives
• Testing the functionalities of all modules
• Linking MOSCA developments as close as possible to a 'real' environment

Stuttgart and Chemnitz as high level test site
Lugano as mid level test site
Padova as lower level test site
SUPPLY-ORIENTED SYSTEM COMPONENTS

Objectives:

- to provide a more precise transport models which allow authorities to do more specific planning with regard to business traffic and freight transport.

- to provide a more precise estimation of social costs.
MOSCA FREIGHT (VISEVA-W) is an integration of freight transport into available urban transport models allowing modelling urban business traffic.

VISEVA-W is now integrated into the overall model structure of the VISEVA model for passenger transport demand and 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.
MOSCA FREIGHT IN CHEMNITZ

To develop a consistent urban commercial transport (UCT) demand model (origin-destination matrices) and to successfully assign all passenger transport (already available) urban commercial transport matrices by use of VISUM.
MOSCA SUSTAIN

MOSCA SUSTAIN is a sustainability assessment module allowing the assessment of every measure concerning noise, (change of the traffic flows, active noise reduction measures, etc.).

Based on the important meaning of traffic noise, the module allows user to assess noise reduction measures in a monetary way.

MOSCA SUSTAIN is ready for the EC noise Directive 2002/49/EC:
• determination of exposure to noise (strategic noise mapping),
• tool for the information of the public and developing of action plans (monetarily assessment of noise reduction measures).
For the testing of the module 4 scenarios are defined which presume changes of either the traffic volumes on the regarded road network or of other circumstances (e.g. a different paving). As a result good estimations of the real noise levels are possible.
DEMAND-ORIENTED SYSTEM COMPONENTS

Objectives:

- to improve the knowledge of the loading/unloading situation at shops or private customers (time windows, time patterns)

- to improve the use of dynamic information (changing traffic situation, new incoming orders)
Information tools, computer support

- **MOSCASHORT**
  - „robust“ routes in the city

- **MOSCANET**
  - shared delivery TW

- **MOSCASHOP**
  - access to shops and parks

- **MOSCATOUR**
  - plan delivery tours

- **MOSCALINE**
  - real-time orders and deliveries
MOSCA SHORT

**MOSCASHORT** is an algorithm which finds a “robust” path within a city if variable traffic conditions are given.

It calculates reliable paths between 2 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 be a list of location identifiers that allows to re-construct the route calculated.
MOSCA NET

MOSCA NET is a web service to manage preferred delivery locations for recipients of freight consignments. It receives information about delivery locations, delivery 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 online to it.

Its primary objective is therefore to serve as an information hub for delivery data, accessed by private customers and logistics service providers.
MOSCA NET IN STUTTGART

Differenciate time patterns for different seasons, senders or consignments

Specify your preferred delivery location and -time

http://mosca.ifl.uni-karlsruhe.de
MOSCA SHOP

MOSCA SHOP a web service to schedule the reservation of ramp access for urban freight deliveries. It provides information on free dock access and allows booking of access time slots.

It can be used by carriers to plan their service anticipating waiting times at the shops’ loading dock. On the input side the carrier enters shipment data and requests dock access bookings. Shops give their accessibility information and instructions for carriers to MOSCASHOP.
All information on the parking spaces in Lugano are integrated into a data base and are now available via Internet.

http://mosca.ifl.uni-karlsruhe.de/lugano

Any luganese parking lot bookable

Reserve up to 3 days in advance

Choose desired timeslot according to availability and price
MOSCA TOUR

MOSCA TOUR is an algorithm to plan delivery tours for a vehicle fleet if variable traffic conditions are given. It is embedded into logistics application software, which must invoke it providing data of the orders to be serviced, the objective function, and the characteristics of the vehicles’ fleet.

A solution has been found in Bio-inspired algorithms, able to adapt and to learn from experience.

A heuristic method based on Ant Colony Optimization paradigm which solves the Vehicle Routing Problem with Time Dependent Travelling Times (TDVRP).

An extensive research has been carried out to understand and test the real effectiveness of this model.
MOSCA TOUR IN PADDOVA

Planning of delivery operations for a given set of customer data, a given fleet of trucks with fixed capacity and given road network conditions

- *Time dependent* vehicle routing problem
MOSCA LINE is an algorithm to plan online deliveries, in front of unexpected events such as a new customer request or a traffic jam. It 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 LINE IN LUGANO

It was applied the On-line VRP algorithm to a set of data provided by Pina Petroli, a fuel oil distribution company. For the testing day:

• 50 customers
  • a fleet of 5 vehicles

Customers orders were made to appear randomly during a working day of 8 hours.
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<tr>
<th>MOSCA Test Sites</th>
<th>Modules to be adopted</th>
<th>Expected results</th>
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| **Stuttgart** – Germany | MOSCASUSTAIN | Set up of noise register for part of the city centre  
Impact measurement of special policy measures |
| | MOSCANET and MOSCASHOP | Analysis of real data, estimated potential of optimisation |
| **Chemnitz** – Germany | MOSCAFREIGHT | Set up of complete model for the whole city  
Interaction with passenger transport model |
| **Lugano** – Switzerland | MOSCASHORT and MOSCALINE | Software application providing user friendly interface to the algorithms |
| | MOSCASHOP | Assignment of parking spaces  
Web-based service |
| **Padova** – Italy | MOSCATOUR | Optimisation of delivery tours by use of real time information |
THE MOSCA USER FORUM

It is an “open board” composed respectively by the demand and supply actors.

The **Supply Group** is composed of representatives of local and national bodies involved in the urban transport process (e.g., ministries and regional authorities as well as environmental or energy agencies).

The **Demand Group** is composed by freight transport operators, postal companies, shipping/forwarding agencies, good distribution actors, national associations (e.g. Trade) and some key SME of this sector, representing the business/commercial transport interest in the urban transport delivery system.
STAKEHOLDERS INVOLVED

• Local Authorities (Municipalities-Regions)
• Logistic Operators
• Postal Companies (logistic department)
• Traffic Information providers
• Public-private transport agencies
• Trade association
• National Association for Telematics for Transport and Safety
• Consultancies in the field of Transport Telematics
• Press agencies
How to get information from the MOSCA web

http://www.idsia.ch/mosca

- Project Presentation
- MOSCA Brochure
- MOSCA Newsletters
- User Forum Workshops Minutes
- MOSCA Final report

Technical Secretariat: info@fitconsulting.it