TROP
transport optimisation and planning for small haulage companies

The challenge

The haulage industry in Europe is characterised by large numbers of small and medium sized businesses, some of them micro-businesses with only a single vehicle. Larger companies are able to exploit Information and Communications Technology to improve the efficiency of their fleets. The ICT tools allow them to aggregate loads to ensure that each vehicle is as full as possible for as high a proportion as possible of the time it is on the road. They can also exploit economies of scale and use sophisticated route planning tools to get the maximum productive mileage from their vehicles. As a result they can offer lower prices than smaller players.

At present small local firms can remain competitive by providing quicker response times or more personalised service, but ultimately they need to improve their effciency to levels close to those achieved by major players. To do this they need tools which will allow them to monitor their vehicles, optimise individual journeys, and ensure that each journey contains as full a load as possible. Such tools would be too expensive for an individual one or two vehicle business and would probably only be of limited value because individual businesses do not have sufficient resources to optimise. To remain competitive, smaller players will have to work together to create 'virtual' fleets large enough to justify the cost of and make effective use of advanced planning tools.

However many small haulage companies value their independence and are reluctant to take part in any collaboration that might limit their freedom to run the businesses in the way that they want. Any shared planning and scheduling system must not only be easily accessible and manageable by such companies. It must also be seen as a service and not a manager.

The technical solution

The IST project TROP[1] has developed a system which allows individual small haulage companies to participate in a 'virtual fleet' and achieve the economies of scale usually associated with much larger operators.

At the core of the system[2] is the TROP manager, which is based on Virtual Factory technology and consists of a Planner and the Work Flow Manager. As the names suggest, the Planner plans the work of the Virtual Fleet whereas the Work Flow Manager synchronises the overall behaviour, interacting with monitoring devices on board the individual vehicles. This is supported by a database containing information about the resources currently on offer the various operators, missions in progress, orders from customers etc. A map server and cartography manager produce images showing the current location of all the vehicles.

Communication with the individual companies is via a LINUX based web server. This provides them with a user-friendly, browser-based interface to the system, which allows them to offer capacity to the virtual fleet, accept orders for specific missions and view maps showing the current status of the fleet. The system offers them independent control of their businesses, because they can choose whether to accept offers of work from the system or accept orders received by conventional channels such as phone or fax.

Communications with individual vehicles use mobile telephony, in particular the Short Message Service (SMS). Some vehicles may also have a GPS location device or route planner. This allows the system to identify the exact position of a vehicle at any time and plan the most efficient route for the driver. If the vehicle does not have these more sophisticated on-board devices, the driver can still receive SMS messages about, for example, the next pick-up or drop-off .

[1] The project is led by the Italian company Democenter. It involves an number of other Italian companies and associates in Spain and Hungary

[2] A much fuller technical description of the system can be downloaded from the project website http://www.democenter.it/trop/

The results

The system was tested with a group of small haulage companies in and around the town of Sassulo in the Emilia Romagna region of Italy. In this part of Italy small companies, many with only one or two vehicles, own about 55% of the locally registered Heavy Goods Vehicles. A major local industry is the production of ceramic tiles, which are sold throughout Europe. Many of these companies are SMEs that specialise in manufacturing a particular type of tile. Efficient distribution therefore involves combining part loads from several manufacturers of different types of tile into a single load that might contain individual deliveries to several wholesalers in a particular region. The haulage companies involved in the trial specialise in serving the tile industry and obtain most of their business from it.

During the four months of the trial, the companies involved found that the amount of empty space in an individual mission fell by a factor of 3. They also reported that the average time taken to complete a mission fell by about 27%. Almost all of the phone calls that they normally made to drivers about current and future missions wee replaced by less expensive text messages automatically generated by the system. However a continuous, on-line update on the status of the fleet was thought to be less valuable because of the cost of the text messages needed to generate it.

On the whole, the small haulage companies preferred the TROP system to other services for allocating freight to available vehicles because it offered a ‘per-use’ charge rather than a monthly or annual fee. It offered them a significant increase in productivity and made it possible for them to compete with larger players.

The TROP system was designed to meet the requirements of small haulage companies serving tile manufacturers in the Sassulo area of Italy. However associate members of the project in Spain and Hungary have examined the system and have concluded that it could meet, or be easily adapted to the requirements of co-operatives or industry associations of haulage companies in those countries.

Conclusions

TROP has shown how technologies borrowed from ‘Virtual Factories’ could help small haulage companies compete with larger players. Such companies value their independence and are very reluctant to take part in any co-operative or collaborative scheme that might compromise that independence. TROP allows them to take part in such a scheme by offering resources to the system and accepting jobs from it in the same way as they would do with an individual customer.

A commercial product based on the TROP prototype could be of groups of small haulage contractors in many parts of Europe. It could be operated by either an industry association or a co-operative representing a regional group of such companies.