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## **BESTUFS II**

### **Best Urban Freight Solutions II**

Co-ordination Action

Priority 1.6.2 Sustainable Surface Transport

## **D 1.1 BESTUFS Policy and Research Recommendations I**

### **Urban Consolidation Centres, Last Mile Solutions**

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# 1 Introduction BESTUFS

The EC established the Co-ordination action (CA) on BEST Urban Freight Solutions II (BESTUFS) as the follow up initiative to the Thematic Network (TN) BEST Urban Freight Solutions carried out from the year 2000 to 2003. BESTUFS started in 2004 with a duration of 4 years. BESTUFS aims to maintain and expand an open European network between urban freight experts, user groups/associations, ongoing projects, the relevant European Commission Directorates and representatives of national, regional and local transport administrations and transport operators in order to identify, describe and disseminate best practices, success criteria and bottlenecks of City Logistics solutions. The concept of a Co-ordination Action thereby seeks to obtain the co-operation of experts and projects with already existing or just emerging experiences and expertise, and the collection and raw analysis of existing project results from national and European projects - rather than starting new research activities.

To reach the above objective, the results of national, European and international projects and investigations about the urban transportation of goods are considered, and the expertise and knowledge of the different stakeholders in urban goods transportation is obtained. The main sources for this deliverable focus on the expertise and knowledge of CA participants by collecting and working up the views and contributions of the different individuals or groups in the BESTUFS workshops and from the material collections in work package 2. For the duration of the BESTUFS Co-ordination Action recommendations will be described each year as a public deliverable.

## **Thematic focus**

The thematic workshops are organised in BESTUFS in year 1 focused on the following themes

- “Approaches to urban consolidation: concepts and experiences” (addressed in a workshop on 13/14 January 2005 in London, including a site visit of the consolidation centre approaches at London Heathrow airport)
- “Last mile solutions” (addressed in a workshop on 21/22 April 2005 in Nuremberg including a site visit of the freight village Nuremberg and the DHL Parcel Hub in Nuremberg Feucht).

## 2 Urban Consolidation Centres

A workshop entitled “Approaches to Urban Consolidation: Concepts and Experiences” took place in London on 13<sup>th</sup> and 14<sup>th</sup> January 2005. Eleven presentations were made during the two days that provided the 64 participants with the opportunity to hear about the latest developments and research into urban consolidation operations. Approximately half the speakers were from the UK where there have been significant developments in urban consolidation centre (UCC) schemes in recent years. Other speakers were from Austria, France, Germany, Hungary, and the Netherlands.

### Recent developments in Urban Consolidation Centres in the UK

Several speakers made presentations about developments in urban consolidation schemes and trials currently taking place in the UK. Schemes currently operating include: the Heathrow Airport Retail Consolidation Centre, the Heathrow Airport Construction Consolidation Centre, the Broadmead Consolidation Centre (which serves a retail area in Bristol) and the Meadowhall Consolidation Centre which serves a major shopping centre in Sheffield. These schemes are dissimilar to many previous urban consolidation experiments and operations that have taken place elsewhere in the EU as:

- they are operated by a single, major logistics operator (who is responsible for running the centre and making the final deliveries, and in addition, also provides a range of value-added services), and
- companies have developed and implemented the consolidation centre schemes (the centre operator, landlords, companies receiving goods and their suppliers). Public sector authorities (national and local government) have been supportive of the schemes but have not instigated them). By comparison, many previous consolidation schemes in the EU have been public-sector led.

### Experiences of Urban Consolidation operations in the rest of the EU

Urban consolidation centre (UCC) experiences in Germany, France, Hungary and the Netherlands were reviewed. The factors that have made consolidation centre scheme success difficult were discussed, especially in terms of France and Germany. Much of this difficulty has been related to the costs of setting up and operating such centres, who is expected to meet these costs, and who organises the successful establishment of the centre and recruits customers to use it. The current strategies for urban logistics and consolidation being developed in these countries were also discussed.

### Research into Urban Consolidation in the EU

The workshop provided the opportunity for participants to hear about the latest research into UCCs taking place in the EU. This included a project taking place in the UK to identify the potential for the development of urban freight consolidation centres that have as their principal objective the alleviation of local environmental and traffic concerns in urban areas (which is being funded by the UK Department for Transport), as well as a rail-based project carried out at the Cargo Centre in Graz, Austria.

### Background to UCC research and pilot schemes

UCCs have been researched and trialled in many European countries including France, Germany, Italy, the Netherlands, Sweden, Switzerland and the UK. UCC research and pilot schemes have also taken place in Canada, Japan and the USA. In addition, some UCC schemes have become operational on a permanent basis. Examples include La Rochelle in France, Kassel in Germany, Tenjin in Japan, and Heathrow in the UK.

Prior to the 1990s, UCC research was generally more active in the UK than elsewhere in Europe. Several county towns (Camberley, Winchester, Chichester, Chester, Aberdeen and Worcester) together with the industrial towns of Barnsley, Bradford, Hull, and the London Borough of Hammersmith all undertook studies. However, these did not proceed beyond the investigation stage. These studies tended to focus on transshipment arrangements in which the loads of large goods vehicles would be loaded into small vehicles for final delivery in the urban area.

During the 1990s, there was increasing interest in the UCC concept in France and Germany, the Netherlands and Switzerland where numerous pieces of research were undertaken. This led to operational UCCs being set up (especially in Germany which were usually referred to as “City Logistik” schemes). However, many of these UCC schemes, especially in Germany, have since closed. Of those schemes that are no longer operating the major difficulties encountered were lower than required goods throughput volumes, and consignee (end-user) dissatisfaction with service levels.

Since 2000 there has been another period of interest in UCCs. Much of the work carried out has taken the form of trials and operational schemes and has been led by commercial enterprises who, perhaps following the path established by the major grocery retailers, recognised the benefit of controlling the logistics movements that affected their operations. For example, in the UK, it has been BAA (the British Airport Authority which has two projects at Heathrow), Meadowhall (in Sheffield), Bluewater (in Kent) and Broadmead (in Bristol) together with Exel as the logistics service provider that has driven the recent development of UCC trials and operational schemes. In Italy UCC schemes have been established in Padova, Ferrara and Vicenza.

Financing arrangements vary between UCC schemes. Some UCCs have been dependent on public funding either from central, regional or local government. This is the case, for example, in Amsterdam and Monaco with the Municipalities contributing towards the cost. Some UCC schemes have received funding from EU projects (such as La Rochelle, Nuremberg and Broadmead in Bristol). Meanwhile, other UCC schemes have been funded through a mix of financial support from commercial partners and contributions from receivers using the scheme (for example the Heathrow retail consolidation centre). Some schemes are striving to demonstrate that they can operate on a commercial basis without the need for subsidy (such as Meadowhall in Sheffield), while other schemes apparently operated on this basis from the outset (for example Freiburg, and Kassel). Other schemes have been funded by incorporating the UCC into the project contract (e.g. the Hammerby construction consolidation centre in Stockholm). In several UCC schemes it appears that companies receiving goods from the UCC are expected to pay something for this service, and this income meets at least part of the total operating costs. In one scheme (Tenjin in Japan) the logistics companies dropping goods at the UCC pay to do so.

## **3 Conclusions on UCCs**

### **3.1 Definitions of urban consolidation centres**

The term “urban consolidation centres” has several different meanings, and different terminology has been used over time and between countries. The fact that definitions are often vague or ambiguous makes classification difficult. However it is perhaps appropriate to view the consolidation centre concept as a range of potential applications along a spectrum dependent upon the split of involvement (or control) of the public and private sectors, with the range of terms used to refer to the consolidation centre concept including:

- public distribution depot
- central goods sorting point
- urban transshipment centre
- shared-user urban transshipment depot
- freight platforms
- cooperative delivery system
- consolidation centre (sometimes specific, e.g. retail, construction)
- urban distribution centre
- city logistics (or city logistik) schemes
- logistics centre

- pick-up drop-off location
- offsite logistics support concept

In the UK in the 1970s and 1980s, and in much of the rest of the EU to the present day, “urban consolidation centres/transshipment centres” (and similar public sector driven initiatives) tended to focus on the break-bulk activities at an urban level on a communal, shared-user basis, with much attention devoted to the use of small vehicles for the urban distribution.

In contrast, since the late-1990s, especially in the UK, urban consolidation centres have often been seen to be more flexible and involve break-bulk, transshipment and groupage, often with a focus on maximising vehicle loads and with a far greater role for the private sector.

In addition, it is often difficult to identify the boundary between UCCs and other similar schemes, such as express parcels hubs, neighbourhood collection points for home deliveries, intermodal terminals, and traditional retailer distribution centres.

In today’s terms, a UCC is best described as a logistics facility that is situated in relatively close proximity to the geographic area that it serves be that a city centre, an entire town or a specific site (e.g. shopping centre), from which consolidated deliveries are carried out within that area. A range of other value-added logistics and retail services can also be provided at the UCC. Logistics companies with deliveries scheduled for the urban area or site are able to transfer their loads at the UCC and thereby avoid entering the congested area. The UCC operator sorts and consolidates the loads from a number of logistics companies and delivers them, sometimes using environmentally friendly vehicles, to an agreed delivery pattern.

## 3.2 Classification of UCCs

Three distinct categories of UCC can be identified in the EU:

1. **Special project UCCs:** these are UCCs that are used for non-retail purposes, for example construction material UCCs in Heathrow and Stockholm. This type of UCC may well serve a single site. However, such UCCs could potentially operate over any given geographical scale of the urban area. This type of UCC may well operate for a given period of time while the specific activity linked to the UCC takes place.
2. **UCCs on single sites with one landlord:** examples include UCCs at airports and shopping centres (e.g. Heathrow retail UCC, and Meadowhall shopping centre). These UCCs differ from other retail UCCs in the following ways: i) these sites are built as a single development so the UCC can potentially be designed into the planning of the site, ii) the landlord has the potential to insist that tenants use the UCC, iii) the unloading points at the final destination tend to be located off-street in a specially designed delivery area with access via a single route, iv) the UCC operation can potentially be made self-financing through rent structures and handling charges.
3. **UCCs serving a town/city:** examples include many German city logistics schemes, La Rochelle in France, and Broadmead (in Bristol, UK). These UCC schemes can vary in terms of:
  - the geographical area they serve (which can either be large or small. For instance such schemes can, serve a small district such as a narrow, historic centre of an urban area, a specific retail area, or a larger, more diverse geographical area up to an entire town/city).
  - the number of companies operating the UCC scheme (which can be a single company (e.g. La Rochelle, or several companies (e.g. German city logistics schemes).

Each of these three types of UCC can offer either relatively basic consolidation services or can offer a wider range of value-added logistics activities such as stockholding facilities, ticketing and pricing, goods return and waste collection services. Similarly, each of the three types of UCC could also potentially offer community collection and delivery point facilities (for other consumer and business products), and home delivery operations could also be operated from the UCC.

### **3.3 Advantages and disadvantages of UCCs**

The main advantages of UCC include:

- environmental and social benefits resulting from more efficient and less intrusive transport operations within urban areas
- better planning and implementation of logistics operation, with opportunity to introduce new information systems at same time as consolidation centre
- better inventory control, product availability and customer service
- can facilitate a switch from push to pull logistics through better control and visibility of the supply chain
- potential to link in with wider policy and regulatory initiatives
- theoretical cost benefits from contracting out “last mile”
- public relations benefits for participants
- potential to allow better use of resources at delivery locations
- specific transport advantages
- opportunity for carrying out value-added activities

The key disadvantages of UCCs are:

- potentially high set up costs (and sometimes high operating costs)
- much urban freight is already consolidated at the intra-company level or by parcels carriers, so limited benefits (or even negative consequences) for trying to channel these flows through a consolidation centre. The potential scope for UCCs may therefore be limited
- difficult for a single centre to be able to handle the wide range of goods moving in and out of an urban area, for example due to different handling and storage requirements
- most studies report an increase in delivery costs due to an additional stage in supply chain which imposes a cost (and often a time) penalty, though this clearly depends on how well the centre is integrated into the supply chain and the extent to which all costs and benefits are considered
- a single consolidation centre for an urban area is unlikely to be attractive for many suppliers’ flows due to the degree of diversion required from normal route (and may therefore negate transport savings for onward distribution)
- lack of enforcement of regulations for vehicles not included in the consolidation scheme
- organisational and contractual problems often limit effectiveness
- potential to create monopolistic situations, thus eliminating competition and perhaps leading to legal issues
- loss of the direct interface between suppliers and customers

### **3.4 Impacts of UCCs on transport operations**

The use of a consolidation centre can potentially result in substantial transport benefits, though clearly these benefits are dependent on the level of uptake and the nature of the scheme. The main transport benefits that can result include:

- reductions in the number of vehicle trips

- reductions in the number of vehicle kilometres
- better vehicle and driver utilisation for suppliers as a result of quicker turnarounds (and a potential reduction in the number of drop locations) and for deliveries through easier access to loading and unloading facilities at drop locations
- improvements in volume/weight utilisation rates for vehicles on deliveries from the centre (and potentially for inward flows from suppliers too), thereby reducing the unit costs of transportation for the final delivery stage
- fewer vehicles required within the area served by the consolidation centre
- the ability to separate trunk movements from local deliveries, making the use of alternative modes and vehicle types more feasible (e.g. environmentally friendly vehicles such as bikes or electric vans within the urban area, and rail for trunk movements into the consolidation centre)
- ease of access for suppliers to drop-off goods, reducing the time spent driving to the delivery address and accessing the point of delivery by the driver, who may only have a small quantity or a single item to deliver in any case
- opportunities for revenue earning return loads

While one of the key reasons for considering the implementation of a consolidation centre is the potential to reduce transport impacts within the area of operation, there have been relatively few attempts to quantify the actual transport impacts. Several studies have claimed that vehicle trips and/or vehicle kilometres have been reduced by 30 to 80 per cent for those flows that switch to using a consolidation centre. As a result of generally low uptake, though, the wider reductions in freight movements within the study areas seems to be 1 per cent or less, and some schemes report no measurable change in overall transport activity.

### **3.5 Impacts on other supply chain activities**

UCCs can impact on wider supply chain activities than just transport operations.

One potential additional use for a UCC is stockholding, subject to available capacity and appropriate storage conditions for the products involved. In the main, only short-term storage tends to be envisaged, providing a useful local buffer stock that can be called off quickly when needed, thus reducing delivery lead times and improving product availability and customer service. Inventory monitoring and information collection and analysis, linked to in-store systems, can also be provided. This can increase the visibility of the supply chain, again leading to better availability and service levels, as well as reducing loss of stock. Product quality and quantity checking can be carried out upon consignments' arrival at the centre, giving advance notice to the customer of any problems with supplies. Various pre-retailing activities, such as consignment unpacking, preparation of products for display and price labelling, can also be carried out at the consolidation centre to reduce time and space requirements upon delivery.

As a result of the stockholding services that can be offered by a consolidation centre, space at the delivery location can be freed up for other activities that are more productive or profitable, such as retailing floor space or construction areas, which is likely to be particularly beneficial when space is at a premium or expansion is desirable.

If the UCC offers an enhanced delivery service, with more flexible and reliable delivery times, higher product or component availability may be achieved and, ultimately, sales volume or site productivity may be increased. Fewer deliveries to the destination may be required as a result of the load consolidation undertaken at the centre, thereby reducing the disruption and labour requirements associated with receiving multiple deliveries, leading to improvements in staff planning and productivity at delivery locations.

UCCs can also handle of return and recycling product flows, including product returns and the coordination of waste and packaging collection for reuse or recycling, instead of individual customers having to deal with this. As regulations in this area tighten, such coordinated approaches may offer greater benefits over time.

Therefore UCCs may offer the potential to improve the management of the supply chain. If UCCs can be used to improve supply chain management this may lead to reductions in supply chain costs and improvements in service quality, though it is by no means certain that these outcomes will result from the adoption of the concept.

### **3.6 Economic and environmental impacts of UCCs**

UCCs can be used to reduce or eliminate the number of large goods vehicles entering a particular urban area. Conversely, UCCs can be used to reduce or eliminate the number of small goods vehicles entering an urban area. The key issue seems to be that available capacity is used to its maximum, so as to achieve both economic and environmental benefits. From an economic perspective consolidation can help to:

- increase the volume of goods carried on vehicles entering a given urban area, thereby reducing the unit costs of transportation for the final delivery stage
- reduce the number of deliveries that have to be received at a location
- reduce the time spent driving to the delivery address and accessing the point of delivery by the driver

Additionally, retail UCCs in particular can be used to reduce the time it takes to replenish stock and thereby help to reduce out-of-stock situations. They can also perform a range of other activities such as unpacking, preparing products for display, pricing, waste removal, and product returns thereby removing the need for these tasks to be performed in the store.

From an environmental and quality of life perspective, UCCs can help to:

- reduce the number of unsuitable goods vehicles and possibly the total number of vehicles operating in the urban area
- improve the lading factor and empty running of goods vehicles thereby reducing vehicle movements and distance travelled
- reduce the fuel consumed and hence vehicle emissions and noise generation in delivering goods
- offer the opportunity to operate environmentally sensitive vehicles on the final leg of the urban supply chain
- make the area more pedestrian-friendly

However, these potential benefits have to be weighed against the potential costs associated with consolidation that can include:

- capital and operating costs of UCCs
- an additional handling stage in the supply chain
- security, liability and customer service issues associated with additional companies handling goods

### **3.7 Issues in planning UCCs**

The process leading to the establishment of even the most basic UCC trial requires the involvement of many parties – local government representatives, potential UCC operators, trade associations, local logistics companies, police authorities, occupiers of premises in the area to be served to name but a

few – and it is essential that everyone who is likely to have any involvement is part of the discussion and planning process. Without such wide and total involvement the prospects of success are disproportionately diminished as it is only through involvement that commitment is gained.

The location of the UCC in relation to its target market will have important consequences for the traffic and environmental benefits associated with the scheme as well as the commercial benefits of using it. If the UCC is located several miles from the final delivery points this has the advantage that vehicles delivering goods to the area from some distance away would not need to enter into the urban area at all. In addition, the distance over which specially designed environmentally-friendly vehicles were operated could be maximised. However, if small vehicles were used from the UCC, the number of vehicle trips and kilometres may increase. Alternatively, if the UCC was located very close to the area which it serves, this reduces the distance over which environmentally-friendly vehicles from the UCC operate, and hence the environmental benefits of the UCC. There is a clearly a need to carefully balance such issues when deciding upon the location.

Experience in mainland Europe suggests a preference for legally constituted bodies involving all the main players to establish and oversee UCCs, whereas in the UK the approach has been for a commercial organisation to take the sole lead and decide the legal and commercial framework under which it will operate. It would seem that the European approach risks becoming bureaucratic and inflexible whereas the UK approach places responsibility with one organisation that is then responsible for agreeing all the sub-contracts and service level agreements that are required to make the whole process work.

Though the majority of the successful UK schemes are single client site based, the early evidence from Broadmead (in Bristol) would suggest that the same approach is equally applicable to multi-user UCCs where the operator (a logistics service provider) takes overall control and responsibility.

In general terms, it appears that UCCs offer the greatest potential if they meet one or more of the following criteria:

- availability of funding, since there is no strong evidence that any truly self-financing schemes yet exist
- strong public and private sector involvement in encouraging (or forcing) their use through the regulatory framework (e.g. draconian access restrictions for vehicles not utilising the centre)
- significant existing problems within the area to be served (e.g. poor vehicle access, significant traffic congestion, constrained loading/unloading facilities)
- bottom-up pressure from local interests (e.g. retailers in a Street Association)
- resolving logistics problems associated with a site that has a single manager/landlord (e.g. shopping centre)

Many UCCs focus on retail operations. However it is important to be aware of the potential role of UCCs for other sectors including construction, offices, service organisations such as maintenance engineers, hotels and other tourist services and residential homes.

UCCs are likely to be better suited to some types of goods and vehicle movements than others. It is unlikely to be suited to perishable and highly time-sensitive products (such as fresh food and newspapers) and goods with specific distribution and handling requirements. In addition, vehicles that are already carrying full-loads for a single destination will not benefit from having to use a UCC. However in the case of non-perishable goods for delivery to city centre retail premises, using a UCC may well have benefits especially if the centre is designed to handle the wide range of packaging handled by shops (e.g. hanging rails for textiles, boxes, roll cages, and pallets).

From the evidence available, UCCs are most likely to be successful in situations similar to those detailed below:

- Specific and clearly defined geographical areas such as historic town centres with a high incidence of small traders / outlets who are not part of a regional / national business with a dedicated and sophisticated supply chain and who are looking for a competitive edge.

- Town centres that are undergoing a "retailing renaissance" and that have transport infrastructure that would be unable to cope with the resultant increase in freight.
- Historic town centres and districts that are suffering from delivery traffic congestion where there is a common interest in improving the street environment, rather than large town-wide schemes.
- New and large retail or commercial developments (both in and out of town) where there is the opportunity to consolidate all the goods receiving and related activities within a dedicated part of the complex from the outset and as part of the total design. From the developers perspective this also provides the opportunity to maximise the amount of rentable space.
- Major construction sites where for the duration of the building programme an organised and disciplined flow of materials both reduces costs and facilitates an uninterrupted building programme.
- Where there is "spontaneous" bottom up pressure for such a development from a group of potential users who have interests and objectives in common. The common elements could be trading in a defined geographical area or trading in a similar range of products over a wider area and not being part of a national organisation.

### **3.8 The operation of a UCC**

The UCC concept proposed in the UK in the 1970s assumed that all deliveries within the area served by a UCC would be made on small vehicles (<3.5 tonne GVW) so as to exclude HGVs. It is now recognised that there is no benefit, in fact there are environmental and cost penalties, in decanting the contents of a well-laden HGV into a greater number of LGVs.

Whereas the primary focus of a UCC is to consolidate loads on the inbound journey, if the transport operation is to be optimised it is equally important that the return loads to the UCC are as highly utilised as possible. To achieve this, inter-store transfers, unsold stock, waste and damaged material for recycling and orders placed by customers (for subsequent collection by the customer from the more easily accessible UCC) are all possibilities for return loads.

Having additional services at the UCC may both increase revenue and augment the overall use of the UCC and therefore its role within the urban area. The range of such activities can be various: pre-retailing operations such as price ticketing and the removal of excess / outer packaging; the assembly of promotional offers; waste recycling; providing a post-sale collection service for the retailers' customers, and field stores for service engineers being typical examples.

### **3.9 Organisational considerations**

Imposed UCC solutions only seem to be successful if the imposing organisation is able to control or strongly influence all the players. Thus at London Heathrow, BAA (the landlord) has been able to insist that all the retailers in its terminals have to use its dedicated consolidation centre, and has also determined the ground rules under which Exel manages the centre and the freight operation. BAA is clearly in control. A similar approach could be applicable with new major retail developments.

The most likely successful alternative to an imposed approach is going to be the bottom up / "spontaneous" approach. In this scenario the initiative would come from, for example, a street association or the traders in a district or definable locality who wished to improve the retailing environment through controlling the movement of goods vehicles into their locality. Such a group would drive the project by demanding the co-operation of their local authority in terms of traffic regulation and apply pressure to their delivery agents / logistics companies to devise a traffic minimisation scheme that by definition would entail a scheme of consolidation.

### **3.10 Funding and financial matters**

It would seem that in the medium / long term UCCs must be financially successful in their own right and that subsidies are not a viable solution. Although a case might be made for hypothecated funds from other transport related sources such as congestion charging and road pricing being used to support UCC operations. This would certainly need to be the case if environmental improvement were to be the prime / sole reason for establishing a UCC.

What is apparent is that without some initial funding from central or local government to pay for the research work and pilot studies, any form of UCC that is not related to a major new property / commercial development is unlikely to proceed.

In order to establish a successful trial it may be desirable for the participating players to keep the initial cost base low. It is important that the trials be fit-for-purpose but, at the same time, that the investment be kept to a minimum. Rather than build a new centre, part of an existing building (with expansion potential) could be used at the outset.

### **3.11 Awareness of UCCs**

There would appear to be a significant lack of awareness of the opportunities that UCCs might provide if they were to be established in the right manner and in the right situations, and this appears to emanate from a reliance on a set of pre-conceived notions that UCCs mean additional cost and little else. This lack of awareness exists in a wide range of organisations including central governments, local governments, retailers and logistics companies.

In addition there is a commonly held misconception that there is only one model for a UCC - this is not the case. UCCs need to be customised to the requirements of the locality and clients that they serve, and therefore it is regrettable that when, on learning of an unsuccessful scheme, individuals all too readily assume that the concept does not work or is not applicable in their circumstances.

Logistics companies are often resistant to UCC developments as they believe they will add to their costs and reducing their control over, and responsibility for, the products they deliver on behalf of their clients. Retailers are also concerned about the cost implications and whether these costs can be recouped through improved retail efficiency resulting from the UCC scheme or from other supply chain partners. What has to be demonstrated to them is that the additional costs associated with a UCC operation may not have to be borne by the logistics company or retailer, or if they do have to be that there may be significant offsets elsewhere in the operation that can reduce if not eliminate them.

## **4 Recommendations on UCCs**

- When an Urban Consolidation Centre (UCC) is set up it takes time to establish the scheme and sign up users. The gradual build up of goods throughput affects the financial viability and the traffic and environmental impacts of the UCC. BESTUFS recommends to ensure that UCC trials have sufficient support and funding to run for a suitable period of time over which to measure and analyse the results.
- Public funding needs to be made available to pay for the research work and pilot studies for any form of UCC that is not related to a major new property / commercial development. Without this funding such UCC research and trials are unlikely to proceed.
- Publicly-organised UCCs do not have a good track record in terms of implementation and operation. For UCCs to be attractive to companies and to be successful set-up BESTUFS recommends that they should be led and operated by one or several key commercial players that have identified the potential benefits of being involved.

- Prospective UCC operators need to be able to demonstrate their ability and willingness to adopt stock receipt, inspection and control procedures and take responsibility for the “last mile” of a delivery thereby relieving logistics companies delivering goods to the UCC of any concerns they may have in that respect.
- There is clearly a need for awareness raising (including success and failure factors) amongst local authorities retailers and transport operators to enable them to add the UCC concept to their set of possible policy measures for consideration. BESTUFS recommends to actively support this awareness building process. This should be done by developing appropriate instruments (e.g. UCC planning guidelines or tools) as well as training measures for urban freight planners.
- BESTUFS recommends that governments should issue guidance to local authorities as to where consideration should be given to the establishment of UCCs when major development proposals are being considered and when town centres are being restructured.
- The standard objection to UCCs is that they will lead to increased costs in the delivery operation. It is therefore important to discuss the wider implications of such schemes with the road transport industry and retailers, and to demonstrate that, by using such centres, costs in other parts of their operation could be reduced. Such reductions could be achieved through less time being spent on (expensive) town deliveries, shorter journey times and increased vehicle utilisation, and the possibility of night-time deliveries (UCCs could be open when their customers are closed).
- One of the key financial considerations is how to allocate the costs and benefits resulting from a UCC scheme as a whole and not solely the cost impact in one part of the supply chain or a single player. This is not a simple matter and the allocation of costs and benefits needs to be the subject of a more comprehensive and detailed study and ideally one based on a fully measured pilot project. BESTUFS recommends to set up a study that would encompass both the financial costs / benefits along the whole supply chain but also the wider issue of how to handle the environmental costs and benefits.
- When a UCC scheme is being considered there is a need for the detailed measurement of traffic and goods flows in the prospective location(s). This should be followed by a period of consultation about the precise nature of the UCC scheme to be tested, and then an extended pilot that is managed and scrutinised by representatives of all the potential players – the local authority, logistics companies, retailers and other users (at both a local and national level), potential UCC operators, and environmentalists.
- BESTUFS recommends to carry out consistent and thorough evaluation of existing and future UCCs. Strengthening the evaluation methodology used for UCC assessment is important as it helps build a case for the situations in which UCCs are most appropriate. More recent UCCs that have been commercially driven tend to place restrictions on the availability of certain information and data. However, even in these UCC schemes more wide-ranging evaluation should be possible that does not impinge on commercial confidentiality.

## 5 Last mile solutions

A workshop entitled “Last mile solutions: concepts and experiences” took place in Nuremberg on 21/22 April 2005. The subject of e-commerce and e-logistics had already been addressed in a previous BESTUFS workshop in 2000 as well as in a best practice material collection documented in the second BESTUFS Best Practice Handbook. Main conclusions from these preceding initiatives were that only minor research results about e-commerce in urban transport were available and a prediction of the impact of e-commerce on urban transport was rather uncertain due to the instable and dynamic market developments. The theme “last mile solutions” was taken up again at the Nuremberg workshop in order to discuss:

- The latest development and trends in last mile solutions
- The role of technology in improving processes and performance of last mile solutions
- The impact that last mile operations have on urban transport

Overall 11 presentations were given from speakers of different countries. The workshop was attended by 33 participants from across Europe.

### 5.1 Definition of last mile solutions

“Last mile solutions” are the logistical part of the e-fulfilment process within e-Commerce and home delivery relationships. Thus, last mile establishes the link between the (online) ordering process and the physical distribution to a specific delivery point. In contrast to the traditional store based shopping the big challenge of e-commerce is to organise the goods delivery to a special transfer point. Most common practice is to deliver the goods to a home, to a customer collection point or a convenience store. In organising the delivery, several specific characteristics on the delivery performance have to be considered, such as:

- Delivery time (the faster the better)
- Reliability of the delivery (the delivery takes place as announced and matches the ordered goods)
- Flexibility in the delivery (alternative delivery addresses should be possible)
- Overall delivery service quality
- Information provision (time windows, avis of delivery)
- Point of delivery (at door step, pick points, locker boxes or convenience stores)

### 5.2 Approaches to last mile solutions

The approach to last mile solutions is closely connected to the so called customisation of the supply chain following the approach of the Dell computer company since 1984. The two fundamental advantages that Dell has exploited are: cutting out the middleman and going direct to consumers to save costs; but more important, developing a supply chain that allows each consumer to order a personalized computer. Customers are allowed to choose the size of the hard drive, the speed of the processor, the type of input/output device (CD/DVD, zip disk, floppy disk) etc. A large part of the success of Dell is attributable to its shortening of the supply chain. By cutting out retailers, Dell has less inventory spread across the supply chain — hence, less potential for obsolete computers. The Dell approach paid particular attention to the relatively short life span of computers. The transfer of this approach to the food sector with an even shorter life span seemed to be most promising for further exploitation. Here, shortening the supply chain can have a substantial impact on product quality and price.

Benefits of the “customisation” of supply chains for customers as well as for retailers can be described as follows:

Customer benefits	Retailer benefits
<ul style="list-style-type: none"> <li>- 24h availability</li> <li>- less time needed for shopping</li> <li>- more product choices</li> <li>- greater price information and comparison</li> </ul>	<ul style="list-style-type: none"> <li>- Selling without geographical limitations</li> <li>- Cost savings by replacing “brick-and-mortar” stores by a web site</li> <li>- Overall cost saving due to a slimmer supply chain</li> <li>- Real-time pricing (before delivery is made)</li> <li>- Better marketing possibilities</li> </ul>

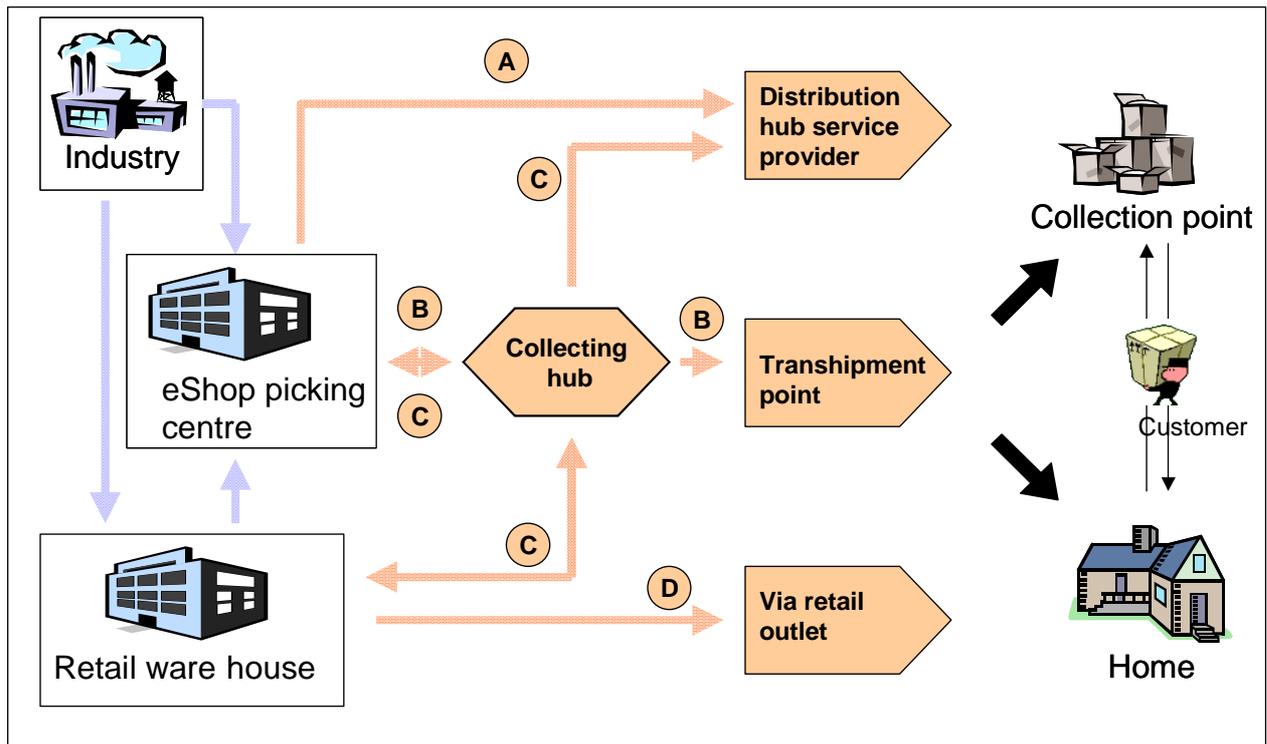
Thus, the physical distribution of the goods to the customer is becoming a critical factor for the success of such a business model. With regard to the logistical handling such e-Commerce transactions have significant implications in terms of:

- Order picking (Picking that is traditionally carried out by the customers in the retail store is now done by the retailer. This means a paradigm change from a collection system to a delivery system).
- New business relationships (Logistics is becoming the main interface between retail and customer that has to organise the delivery, the transfer, customer information as well as return loads)
- New delivery structures (The consignment size decreases from pallets and tons to individual packages and kg).

The relevant processes describing the different last mile approaches can be characterised as follows:

	<b>Last mile options</b>
Distribution channel	Via picking centre / via 3PL network / via cross docking points / via retail outlet
Transport organisation	In-house with own vehicles / external with 3PL
Delivery	At home / Locker boxes / Convenience stores / Other local customer collection points
Information	Avis / time windows / same day
Delivery fee	Non / flat rate / consignment related

The following diagram provides an overview of the most common supply chains in last mile operations.



The starting point for all last mile processes is a retail primary warehouse or a eShop picking centre.

- A. From the eShop picking centre either own vehicles or 3PL network structures and vehicles are used. Most common is a regional transshipment before doing the final delivery leg.
- B. A consolidated trunk tour can start either from an sShop picking centre or from a collection hub. A regional transshipment takes place within the city or close to the city border. Most common is a transshipment from larger trucks to vans for doing the final delivery leg.
- C. Some approaches separate eShop activities and operating of last mile infrastructure. Ordered consignments will be collected from different retailers and e-Shop picking centres in a collecting hub. From there either the final legs to collection points or a further tour split via a regional distribution hub takes place.
- D. Deliveries can also be made via a retail outlet store being delivered from a retail distribution centre. Deliveries are made to the customer either by own vehicles or with the help of 3PL.

Transport operators have a commercial interest in handling the “last mile” efficiently, in order to control costs. New approaches in last mile logistics are following the strategy to provide additional services, e.g. delivery time windows or alternative redelivery strategies. Last mile services by 3<sup>rd</sup> party logistics providers can be found in different forms across Europe. The most common approach is the delivery of standard parcels by postal and parcel services. Overall, these approaches can be characterised by two major streams:

- The cost stream: Improving the supply chain by reducing costs is a major strategy of all large parcel services. Approaches to reduce last mile costs significantly are alternative delivery locations such as customer collection points or locker boxes installed in local places.
- The service quality stream: Mainly e-commerce related home delivery approaches follow a service quality strategy under the assumption that customers are willing to pay more for a better quality, a better service or more convenience in receiving their goods. Examples of this strategy are deliveries providing time windows or deliveries to locker boxes installed at the doorstep.

Apart from the Dell example further e-shops and their supply chain layout can be described as follows:

- The US company Streamline.com can be regarded as pioneer in providing home delivery services using unattended locker boxes. Streamline.com was the first e-grocer offering unattended reception by installing refrigerated reception boxes in the customer's garage. The idea was to offer well-off suburban families a convenient grocery service that also included value-added services such as dry cleaning, film processing, UPS package pick-up, and Vendor Managed Inventory. A weekly delivery of grocery and speciality item was made via a regional warehouses. In 2000 the company left the market.
- The US company Webvan followed a highly ambitious and innovative approach for the delivery of grocery, health & body products and gifts. Starting from a national picking centres to regional picking centres using cross docking methods to smaller vans for doing the final leg. Dry goods, fresh and frozen products could be handled at once using a specialised fleet of vans for delivery. Time windows up to 30 min were provided to the customers. Webvan invested about \$1 billion in high tech infrastructure leading to high fix costs being the main reason for stepping out of the market in 2001.
- The approach of the US company NetGrocer focused on the delivery on non perishable goods using a 3<sup>rd</sup> party operator to carry out the distribution via existing network structures. The company is still present in the market and delivers within the US at standard fees depending on the order value.
- TESCO is the most successful online grocery shop in Europe. The approach relies on a "Brick-to-mortar" concept carrying out the picking and packing within the existing stores and providing a home delivery from there by the next day.
- Waitrose set up an online business for grocery delivery by outsourcing the physical delivery to Ocado. Although the negative experiences in the US, Ocado invested in a central picking centre in Hatfield (North of London) in 2003. Within the Hatfield picking centre the order will be picked and consolidated into standard small containers. The small containers can be grouped on a larger truck and then transported to the different areas and transhipped on smaller vans for delivery. In addition Ocado provides a one hour delivery time slot.
- BiLog is providing a last mile solution for telecommunication and consumable products integrating added value services to the process.
- Amazon provides an e-marketplace for books, video, CDs, DVDs as well as on electronic goods. Distribution for books is made via national distribution centre using 3<sup>rd</sup> party logistics providers.

### **5.3 Last mile logistics**

During the workshop, current examples of last mile operations shown about the PackStation by Deutsche Post and Kiala concluded that:

- The PackStation offers the possibility to have access to the ordered parcel 7 days per week, 24 hours per day for a broad range of products (parcels, spare parts for service technicians, online payments with credit cards, return shipments). Within first studies carried out to survey the behaviour and acceptance of the PackStation customers it turned out that most of the users want to take their shipment on their way to/from work. Concerning the preferred delivery mode most users prefer the home delivery approaches while the awareness and willingness to use these locker boxes is given. However, the actual share of usage in volumes (caused by the limited number of PackStations) is low.

- Kiala provides home delivery services for different far distance retailers or E-commerce shops (only non food). Transport from the retailer warehouse to a pick point are organised and partly providing home deliveries. Two main network are operated: a consumer oriented network and a professional network for time critical deliveries. The customer can select a preferred Kiala store for picking up his delivery. Once the delivery is made he will be informed via SMS or Call Centre. Main innovation in the Kiala approach is that it is a collecting system.

In general it can be stated that both approaches are aiming for cost reduction in the last mile logistics. Surveys carried out into customer satisfaction showed positive results.

Information and communication technology as well as telematics solutions will have an important influence in making last mile processes more efficient. Further presentations on their impact on last mile logistics were given at the workshop providing the following major results:

- In order to improve last mile processes a more accurate transport planning will help to reduce costs and increase service level. Compared with no planning system, the improvement by using a trip planning system on the last mile can result in time savings of 10 to 15%. In addition customers can receive more precise delivery time windows as well as information in the case of changes or deviations. Hence, a more accurate planning will increase the ratio of first attempt delivery and reduce the costs on transport operator side.
- Greater accuracy in planning can also be achieved by taking into account statistical traffic information, e.g. on the congestion and traffic intensity in urban areas. Therefore, it is necessary to invest in data collection and provision infrastructure in order to obtain high quality data. Currently, such information is not available for all cities. Berlin is a well known example in this field implementing a public-private-partnership among the municipality and private companies to provide traffic information to road users and planners. Within traffic canters it is possible to integrate additional data sources, such as floating car data and models that predict the traffic situation based on historical data, weather conditions, events, etc. However, at the European-wide level no homogeneous and consistent picture is available.
- The technology of RFID is promising, as it enables the complete documentation of the physical movement over the whole supply chain on a consignment level. The current challenge is to find out how an integration through the supply chain can be achieved. There are some critical technical problems to solve which cause a slow speed of cargo movements during the loading/unloading processes at the distribution centres. Also the technical equipment (antenna) is rather sensitive to the change in the outside environment. For instance rainy weather will cause difficulties for reading all RF-tags in one pass. Also the radio interference between different antennas and RF-tags can be a problem in reading the tags properly.
- Currently, RFID logistics applications are still in a testing phase. Metro is operating a test centre in the Ruhr area and Capgemini together with SAP and Vanderlande Industries operate a RFID Experience centre in Veghel, The Netherlands. A main barrier for using RFID are still the rather high costs compared to the application of traditional bar codes on products. The prices are expected to decrease considerably in the future.
- With RFID it is possible to add information on the status of transport processes to the data on the tag. Any type of codes can be added to the product information which is written on the tag during production. In particular, data security issues need to be resolved when using RFID tags commonly over the entire supply chain with all the different actors involved.
- At present, a major barrier to the employment of RFID tags is a lack in standardisation of RFID information. Standardisation issues need to be addressed with regard to the processes as well as to the information content. Standardisation is needed at a global level and this is a difficult process. It is therefore expected that a relatively long time period will be needed for full market maturity.

## 6 Conclusions on last mile solutions

### 6.1 Advantages and disadvantages

The expectation of the different actors in e-Commerce are quite challenging. On the one side customers expect lower prices, more convenience and a larger product variety from e-Commerce, while on the other side sellers want to reduce costs and achieve better placement of their products. Some operators incorrectly calculated the costs of e-Commerce activities in the 1990s. The costs were mainly determined by the high infrastructure costs into warehouses and picking centres. The table below shows the advantages and disadvantages that can be described for the different last mile options.

Distribution channel:

	Advantages	Disadvantages
Picking centre	<ul style="list-style-type: none"> <li>- Increase in reliability due to stock transparency</li> <li>- Economies of scale</li> <li>- Efficient management of the processes</li> </ul>	<ul style="list-style-type: none"> <li>- High investment costs in infrastructure and staff</li> <li>- Large volumes necessary to reach a satisfactory use of capacity</li> </ul>
Store picking	<ul style="list-style-type: none"> <li>- Almost no fixed costs (store staff doing the picking)</li> <li>- Local knowledge</li> <li>- More flexible in management</li> <li>- Higher service level (e.g. in delivery time or the provision of perishable groceries)</li> </ul>	<ul style="list-style-type: none"> <li>- Higher complexity in managing store and e-commerce at once</li> <li>- Risk of out of stock situations</li> </ul>

Transport operation

In-house with own vehicles	<ul style="list-style-type: none"> <li>- Complete control over transport chain, e.g. temperature sensitive</li> <li>- Possibility to provide value added services</li> <li>- More flexible dispatching</li> <li>- Important for reputation as. driver represents the company</li> </ul>	<ul style="list-style-type: none"> <li>- Higher costs</li> <li>- Own fleet management structures</li> </ul>
3 <sup>rd</sup> party Fleet	<ul style="list-style-type: none"> <li>- No fixed costs</li> <li>- Better planning in a volatile market</li> </ul>	<ul style="list-style-type: none"> <li>- Less flexibility</li> </ul>

Delivery

At home	<ul style="list-style-type: none"> <li>- Higher service quality</li> </ul>	<ul style="list-style-type: none"> <li>- Customer has to be at home</li> </ul>
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		<ul style="list-style-type: none"> <li>- higher costs due to redelivery when not in home</li> <li>- Qualified drivers with local geographical skills needed</li> <li>- Higher vehicle costs as rather smaller vehicles are employed than larger ones</li> </ul>
Locker box/ convenience store	<ul style="list-style-type: none"> <li>- Consolidation of consignments</li> <li>- Pick up at any time after the delivery</li> </ul>	<ul style="list-style-type: none"> <li>- Infrastructure costs</li> <li>- Risk of non-acceptance by the customers</li> </ul>

**Information**

Avis/ Time windows	<ul style="list-style-type: none"> <li>- No delivery time restrictions</li> <li>- Ensure that customer is at home</li> <li>- More reliable service</li> <li>- Including customer in supply chain planning</li> <li>- Direct customer contact and feedback</li> </ul>	<ul style="list-style-type: none"> <li>- Risk of non-optimal use of capacity</li> <li>- Higher planning effort</li> </ul>
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**6.2 Urban impact**

When e-commerce orders are delivered to customers' homes this can result in reductions in total vehicle trips and vehicle kilometres (taking both goods vehicle and customer trips into account). In a study of grocery shopping in the UK, it was calculated that if 10-20% of total grocery shoppers were to use home shopping, the switch from customer car journeys to multi-drop van deliveries could lead to a 7-16% reduction in vehicle trip numbers (as vans replace car trips) and a 70-80% reduction in vehicle kilometres (for those goods flows to customers using the home shopping service). However, the extent of this total reduction in vehicle activity is dependent on: (i) how well distribution systems are organised, and (ii) whether customers make other non-shopping vehicle trips instead. E-commerce activity does tend to result in increasing goods vehicle (especially van) activity in residential streets and the environmental implications of this require greater consideration.

When e-commerce deliveries are made to customer collection points and locker banks it is still necessary in these cases for customers to make trips to collect their goods. However, depending on the location of these facilities it is often possible for customers to either collect these goods as part of another trip (for example on their way home from work), and also to walk or use public transport rather than necessarily having to use a car.

**6.3 Success and failure factors**

Success and failure factors can be described for e-Commerce as well as for last mile solutions. For e-Commerce and last mile solutions success factors are:

- The examples of previous business models have shown that those companies that are still present in the market have developed from a “traditional” business to an “online” business. Many new e-Commerce companies that developed with a “big bang” completely failed.
- Obviously, existing retailers are strong market players. Within each European country only a few dominant market players exist with extraordinary skills and expertise in investment policies and

infrastructure, branding, specific market know how etc. Building alliances with these player would be advisable for the success of an online business.

- The provision of a high delivery service (fast, reliable, flexible etc.) at a reasonable price is key for the success of an online transaction
- Investment in long term infrastructure should be made carefully, taking into account the customer needs. In the past the predicting of online customers' demand for most of the business models was very inaccurate.
- The approach of sending (standard) packed consignments (non perishable groceries), country/European wide via a primary distribution or picking centre using the network of 3<sup>rd</sup> party operators seems to be a promising approach and which follow many survivors.

Corresponding failure factors are:

- The most crucial failure factor for most e-Commerce companies in the “new economy” was that a positive return on investment could not be achieved. Operating costs were in some cases higher than the value of the order.
- The demand for online activities was not very well understood and predicted. Expectations on the scope, growth and value on online transactions did not correspond to reality.
- The efficiency of the established market players was underestimated. Obviously, the margin expected to be achieved were actually too low to justify the investments needed.

## **7 Recommendations for last mile solutions**

Last mile solutions are still of great relevance for the competitiveness of the European retail industry. Overall cost reductions across the supply chain as well as providing a better service quality are key driving forces. However, even more importantly, there is a large potential for more as yet unexploited solutions representing a further driving force for developing innovative solutions. BESTUFS recommends to set up and support further initiatives on developing last mile solutions. Beside the approaches focussing on technological developments, e.g. e-Drul or RFID related projects and initiatives there is a strong need for further innovative and operational logistical approaches. Moreover, as last mile solutions go beyond the traditional activities of transport operators and forwarders, learning and training activities in these field should be supported, e.g. similar to the Marco Polo Programme. It might be advisable to initiate or open a programme, as the Marco Polo to urban freight dedicated approaches, especially to those activities that have a catalyst function as well as for learning and training actions.

In general it can be stated that e-commerce and last mile solutions do not necessarily result in increasing urban freight and pollution. This depends on context parameters and variables, especially including:

- The number of stops per tour
- The distance between stops
- Distance between depot and first/last customer
- The vehicle/propulsion used
- The customer behaviour and preferences
- The type of product delivered
- The technical planning support

BESTUFS recommends that cities and regions should monitor the developments of last mile solutions closely by taking into account the above mentioned parameters. Cities should play a more active role

in the development and design of last mile solutions contributing with appropriate measures to set up sustainable and innovative solutions.

In fact, e-commerce can result in a reduction in total vehicle trips and vehicle kilometres when the transport activities of the final consumer are taken into account, as many customer shopping trips by car can be replaced by multi-drop goods vehicle deliveries. However, a better understanding of the effects of growth in e-commerce on commercial and passenger travel behaviour is required in terms of how it will affect the existing number and pattern of shopping trips, transport modes used for shopping, and whether the number of trips made for other non-shopping trip purposes are likely to increase. This would provide policymakers with a greater ability to forecast future travel demand and travel patterns in urban areas and their impacts.

Local customer collection points, such as the PackStation or convenience stores are promising approaches to reduce the costs of the last mile operations. In these examples a major success factor is the election of the “right” location for these sites. Other last mile approaches rely on a urban/regional transshipment point that will be carried out either via a depot or from truck to van without using any particular infrastructure. City planners should be aware of last mile transport chains and support the emergence of sustainable and innovative approaches. The role of city planners is to provide operators support in terms of access conditions and infrastructure provision, (e.g. providing loading/transshipment sites or integrate logistical belongings into the planning process for residential or commercial sites).

Last mile processes take place from dedicated picking centres and warehouses as well as regional distribution centres and therefore do not differ that much from other distribution supply chains. In BESTUFS great advantages and synergy effects are expected from integrating last mile infrastructure (distribution centres, transshipment points etc.) in freight villages making use of the advantages and benefits provided by these sites. In the case of global e-Commerce transactions, a link to intermodal infrastructure as well as to airports suggests large synergies that should be exploited.

The main goal for the municipal authority as well as for the operator is to achieve a high degree of consolidation of consignments and to minimise the time taken and distance travelled in making deliveries. Using trip planning software can help to optimise last mile delivery rounds taking into account any delivery time windows agreed with customers. Further innovations in this field with specific reference to last mile solutions in urban areas are needed and should be supported by further research and funding activities. In addition, further efforts should be made to determine how IT and communication systems could be used to provide the customer with more information about the status of their delivery, and thereby reduce the risk of failed deliveries that occur when the customer is not at home to receive their goods.

On a European scale the expertise on the effects of telematic applications on urban transport operations is still low. Some cities have implemented public private partnerships, some have started demonstration projects however solid experiences on a European scale are still rare. Also the full potential of telematics applications in cities through the integration of traffic management systems with urban freight transport systems is presently neither researched nor used. BESTUFS considers telematic applications as one of the major instrument for improving last mile processes and hence to be addressed by further research work in urban areas. BESTUFS recommends the further intensification of the research within this field.

It is also important to consider the needs for standardisation of goods vehicles, equipment and IT systems used in home delivery. This could lead to greater opportunities for companies to consolidate their last mile deliveries and reduce the number of delivery trips required. BESTUFS recommends to support an easier introduction of such standards, e.g. by providing guides on standard technologies used and possible interfaces.