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New challenges for urban consolidation centres: A case study in The Hague

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Abstract

The objective of this research is to advice the Municipality of The Hague whether, if and under which conditions, the implementation of an Urban Consolidation Centre (UCC) is possible and desirable. To determine factors that caused the success or failure of UCCs in practice, a survey of 6 cases in Europe is conducted. The cases were selected because of the similarity of the service area of the UCC and the city centre of The Hague or because of the uniqueness of the UCC. To determine the possible success for a UCC in The Hague four scenarios are evaluated. Two major difficulties with implementing the UCC are the allocation of the costs and benefits and the willingness to cooperate of the transportation companies. Both consignees and transportation companies can benefit financially from using the UCC. The UCC operator, however, incurs the costs. The municipality should play a role in bringing the costs and benefits together.
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Keywords: Urban consolodation center; feasibility study; evaluation

1. Introduction

The urban area of The Hague suffers from the negative effects of goods distribution. These negative effects are noise hindrance, air pollution, safety, congestion and damage to the historical city. These are caused by the large amount of vehicle movement from goods distribution vehicles and the loading and offloading times in the often narrow streets. The Municipality of The Hague tries to reduce vehicle movements and loading and offloading times using several measures. Current measures like restricting the hours shops can be serviced by introducing time-windows, introducing environmental zones and agreements with retailers ('De schone stad') in urban areas have only had limited effects. The benefits of voluntary actions to reduce vehicle movements are not high enough to encourage the private parties (shop owners, senders, shipping agents) to take measures and the obligatory measures do not have the effects they were expected to have (Buck Consultants International, 2008; Emberger, 2004; Lemstra,

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2004). Another option to reduce the negative effects is improving the efficiency of the distribution. This efficiency comes together with higher occupation rate of the load capacity. In that case less vehicles have to enter the main centre. It can also be more efficient to enter the main centre with more, but smaller vehicles. The efficiency of the distribution to businesses in the main centre can be improved in several ways. The efficiency of the supply chain can be improved by improving information flows and increasing transparency, by using the vehicles and load carriers most suitable for the work or by streamlining supply chains.

A way of consolidation is to tranship the goods of different suppliers in one area just before entering the city centre. All cargo to one area in the city, for example a main shopping area, will be put together in one vehicle. This can potentially lead to better occupation rates of the vehicles and thus to less vehicles in the urban area (Govera, 2006; Marcucci and Daniels, 2007). The Municipality of The Hague wants to know whether it is useful to facilitate/initiate an Urban Consolidation Centre (UCC) for The Hague (City Council Motion RIS143046_26-JAN-2007). The use of a UCC can potentially result in substantial transport benefits. The different types of consolidation mentioned above can be combined into better solutions. Amongst others the benefits are (Huschebeck and Allen, 2005): reductions in the number of vehicle trips, reductions in the number of vehicle kilometres, and better utilization rates for vehicles.

In our research it is necessary to determine whether it is possible to establish a viable UCC in The Hague and to identify what the conditions are for such a UCC to be successful. Therefore, we have formulated this as a research objective: "*The objective of this research is to advice the Municipality of The Hague about if and under which conditions the implementation of an Urban Consolidation Centre is possible and desirable.*"

To give this advice research is necessary about the factors that determine the design of a UCC and the factors that influence the success of a UCC. Factors can be e.g. reliability, influence on congestion etc. (Derksen et al., 2007). These factors will determine the feasibility of the UCC. This feasibility depends amongst others on the benefits (for example less vehicle movements) and costs (for example the effort for stakeholders to change their current way of distribution) of the UCC. The central research question in our paper is: *"Under which conditions is the implementation of an Urban Consolidation Centre in the Municipality of the Hague possible and desirable?"*

To meet the research objective, the following research questions will be answered in our paper.

- What successful and unsuccessful Urban Consolidation Centre concepts are there in the Netherlands and abroad?
- What factors influence the success of an Urban Consolidation Centre?
- In what way do these factors exist in the main centre of The Hague?
- What technical and institutional constraints mark down the design space of an Urban Consolidation Centre in The Hague?
- How can the factors of success be influenced by the stakeholders, in particular the Municipality of The Hague?

The following section will provide an overview of the possible UCC concepts that are applicable on the The-Hague case. European reference projects have been chosen because of the similarities with the situation in The Hague, their uniqueness or their obvious success. Based on this exploration important success and failure factors can be identified. The next chapter contains a feasibility study according to the economical model of Feitelson and Salomon (2004). The last chapter lists the main findings and conclusions of our research.

2. Evaluation of European Urban Consolidation Centres

Using literature and evaluation of other European reference projects will give an overview of the possible UCC concepts that are applicable in the The Hague case. Surveys and data collection activities have been undertaken in several countries and cities such as Utrecht, Leiden, Nijmegen, Bristol, Kassel, La Rochelle and Malaga (BESTUFS, 2001ab; Morris et. al., 1999; Schoemaker, 2003; www1, www2). The city distribution centres analysed are all located in Europe. Information can also be found about Asian projects (e.g. Tenjin, Japan), however the hierarchical governmental powers applied to the implementation of these city distribution centres are totally different and therefore not comparable to situation in the Netherlands. For this reason, Asian (Japanese) cases were left out in this research. Much information is derived from practice. The large quantity of research on city distribution centres creates the possibility to identify the success and failure factors regarding the implementation of city distribution

centres both using literature, reference projects and consulting experts. The right balance between scientific literature and information from the practice is pursued.

2.1. Leiden

In 1994 the UCC started as an initiative of the Municipality of Leiden. The UCC was a public-private-partnership (PPP) with the municipality, a consultancy company, a real estate company, a transport company and a re-employment organisation. Transporters could drop-off their freight at the UCC. With 5 electric vehicles bundled freight was transported to the city centre of Leiden or by vehicles owned by transportation companies with distribution license (Schoemaker, 2003; City Ports project, 2005). The electric vehicles were obtained with European Commission funds (Allen et al., 2002). The licensing system issued by the Municipality was a function of several criteria such as: vehicle load, number of deliveries per day, etc. (Browne et al., 2005). The service area was planned to be only the city centre of Leiden. In this area, time windows for delivery were implemented. Due to too few participating shops the service area was extended to the whole city.

The UCC in Leiden failed because of low profitability due to the disappointing number of parcels handled in the distribution centre. The objective was to deliver 500 shipments per week to the city centre. This objective was not met by a long way. At best only 26 addresses in the city centre were supplied via the UCC (Schoemaker, 2003). The Leiden project was stopped in 2000 due to low profitability. The reason for the low profitability was twofold. Shortage of participants as well from the retailers' side. There had been strong opposition from the transportation companies against the UCC because they claimed that the municipality was aiming to create a monopoly in the service of urban distribution of goods. The shortage of retailers participating is hard to explain, however a reason could be found in the efficient way retailers had already organised their distribution. The second reason for the low profitability had to do with the location of the UCC and the choice of distribution vehicles. The UCC was located in Leiderdorp (next to Leiden) and was located far from the highway. This disadvantage was aggravated by the choice to use non-appropriate electric distribution vehicles. The electric vans were only suitable for transport in the city centre zone. They were far too slow for the transport from the UCC to the city centre and vice versa (15 km/h). Due to the shortage of participants at one time the service area was expanded from only the city centre to the whole city. The vehicles, however, were not suitable to cover the size of this new service area.

2.2. Nijmegen

The most recent experience with a city distribution initiative in the Netherlands is '*Binnenstadservice.nl*' in Nijmegen. '*Binnenstadservice.nl*' is a city distribution centre opened in April 2008 as an initiative of two entrepreneurs. The UCC is still in its test phase and started with 20 end-users (shopkeepers). The shopkeepers using the UCC change the delivery address for their suppliers to the address of the UCC. The packages are bundled in the UCC and twice a day the packages are delivered to the shops. At this moment local subsidies pay for the service. Although initially it was thought that subsidies would be needed only during the starting phase, the funding of the second year is not yet completely finished. When the shop-owners want to use the warehousing options of the UCC, or want extra transactions made (value added logistics like making goods ready for the shop), they have to pay for these services.

'*Binnenstadservice.nl*' uses a courier bike and a van to deliver the goods to the shops from the UCC located at a business area near the city centre. A disadvantage of the location is bad connecting infrastructure to near highways. The van runs on natural gas. The service area is the whole city centre of Nijmegen. The results of this pilot project are described in Van Rooijen and Quak (2009). Whether it will be a success should be experienced in the long run. Some pitfalls from the past are foreseen in this project. The provision of subsidies and the offering of value-added services are important elements for success. The most remarkable observation is the fact that the project-leader of this service was a former city manager and a mediator. Providing a way to cope with the different goals and views and continuously monitoring the attitudes of the involved parties seems to work quite successful since the growth of participating shopkeepers has increased from 20 shopkeepers to 98 shopkeepers within a period of a year. Binnenstadservice.nl started services in a second Dutch city, Den Bosch, in 2009.

2.3. Bristol, UK

In 2004 the municipality in Bristol took the initiative to start a UCC (www3). The UCC is operated by a logistic service provider DHL Exel supply. The municipality selected DHL by a public procurement (www2). Currently 63 out of the 300 shops in the *'Broadmead'* shopping centre receive consolidated deliveries from the UCC. A survey among 118 retailers in 2003 helped to establish this target group. The users are medium-size retailers and their goods are non-perishable and not very high value products. Suppliers can deliver their goods 24/7 to the UCC. DHL bundles the goods and delivers them to the shops. DHL guarantees 100% on-time deliveries. More than half of the retailers save over 20 minutes per delivery (www1). Cost-efficiency for DHL is good, because of the funding being fully covered by subsidies from the EC VIVALDI project (www4). The UCC is located 16 km from the service area. This is a 25-minutes trip. The UCC is located close to the highways M4 and M5. Distribution is done with one 9 ton vehicle and one 17.5 ton vehicle. A successful four-month trial was carried out with a 9 tons electric truck. No accompanying measures have been implemented by the municipality. The service area has a surface of approximately 1.5 km^2. The *'Broadmead'* shopping area is currently being expanded and it is expected that the amount of users will increase in the near future (Hapgood, 29-06-2008).

2.4. Kassel, Germany

As an initiative of private transport companies, in Kassel a UCC was set up in 1994. Ten transport companies that carried out deliveries to the city centre of Kassel decided to cooperate (Kohler, 2004). One of the reasons to cooperate was that the transport companies had difficulty with improving their environmental friendly image (www3). Using a UCC their cargo is consolidated and delivered by a single 'neutral' carrier (www3) (Browne et al., 2005). During the first years, the UCC was subsidised by the municipality. In 2005 the results were good. A doubling of the capacity use of the vehicles going in to the city centre reduced the vehicle kilometres in the city centre by 60% (*see Table 1*). Looking at the situation in 2008 the UCC is paid for by the cooperating transportation companies itself. A slow collapse in use can be observed due to the high costs for the transportation companies, now that the subsidy has stopped (Krichel, 08-07-2008). An incentive for the cooperation was the introduction of a pedestrian only zone in the city centre of Kassel. Conventional vehicles of the transport company execute the distribution (Browne et al., 2005; City Ports project, 2005).

Table 1 Results of the UCC in Kassel (City Ports project, 2005)

	Without UCC	With UCC	Difference
Vehicle kilometres inside the city,	6500,	2600,	-60%
Utilisation of vehicle capacity (volume)	40%,	80%,	+100%
Number of trucks per retailer per year	300	260	- 13%

2.5. La Rochelle, France

The Communauté d'Agglomeration de La Rochelle initiated a UCC in La Rochelle in France in 2001. The UCC of La Rochelle serves 1300 businesses. The manager, Transports Genty, is a private company founded by a competitive tender (Van Binsbergen and Visser, 2001; City Ports project, 2005). Around 30% of the deliveries to the city centre are handled by the UCC. This is approximately 450 parcels/day and between 5 and 10 pallets per day. Delivery from the UCC to the inner city costs 3.75 euro/parcel. The distribution is done with electric vehicles (Vermie, 2002). Deliveries from the UCC are made using nine electric vehicles of which two are equipped with dedicated temperature control for the delivery of perishables. Subsidies are provided by the local government for the infrastructure and a fixed amount per package. The time-window management of the municipality encourages transport companies to drop of their goods at the UCC. The city centre has banned vehicles with a loading-capacities higher than 3.5 tons, except during the time window from 6:00am to 7:30am (Commission of the European Communities, 2007b). The service area of the UCC is the medieval city centre of La Rochelle and the UCC is situated 1.5 km South of the city centre (Communauté d Aglomération de la Rochelle, 2004). The UCC is not

financially viable yet, but it is expected to be so in the coming years. The UCC is successful according to most stakeholders and there are 61% less vehicle kilometres with conventional trucks in the city centre (Patier, 2006). Carriers can avoid wasting time in delivering in the city centre and retailers and residents appreciate better traffic and parking conditions and noticed the general improvement of their local environment (Browne et al., 2005; City Ports project, 2005). The success of the La Rochelle UCC is in the first place due to the shared sense of urgency of all stakeholders. The initiator, the municipality, involved important stakeholders in the process at a very early stage. Good participation is presumably also due to the funds provided by the municipality. The (time) savings for the carriers are larger than the costs of using the UCC.

2.6. Malaga, Spain

The UCC in Malaga is a building for cross-docking in the outskirts of the historical centre. The municipality was the initiator promoting the initiative. All stakeholders were questioned and in this way were involved from the beginning. The cross-docking activities are managed by a private urban transport organisation. The UCC basically is a freight car park which transporters can use to tranship goods. Still, cross-docking activities are performed by the same agents that were active in the logistics chain before. The municipality is the owner of the land. A company based on participation of the distributors manages the centre. The municipality also participates in the parking company SMASA who facilitated the construction of the freight car park. This company has the experience and follows the policy established by the Local Authorities. An accompanying measure by the municipality is the establishment of a pedestrian zone where only vehicles coming from the UCC are permitted to enter. For the distribution both electric and conventional vehicles are used. Although the service area was expanded to the whole city, there is low usage of the UCC. Only one third of the capacity is used (Browne et al., 2005; INECO, 2004).

2.7. Important success and failure factors identified relevant for The Hague

The outcomes of this exploration do not point out that the *actor who started the initiative* could be seen as a factor for success or failure. Two out of the three times the initiative to implement a UCC came from the municipality. Only once a carrier initiated a UCC. The initiative in the failed cases also started from the municipality in three of the four cases. The other failing initiative came from shopkeepers. The *number of users*, however, seems to be a most important factor in all success and failure cases. How the *organisation of the UCC* is setup can be as identified as critical factor. The fact that a UCC is privately organised can possibly explain success. *Subsidies* can also be seen as an important factor for success. Two of the three success cases get a structural subsidy, as a local subsidy as well as a EC subsidy. The Kassel UCC received a local subsidy during the first years. The selection of the right *type of distribution vehicle* should meet the unique requirements for the situation and therefore the distribution vehicle has to be determined for every UCC separately. In two cases conventional trucks were used and in one case electric ones.

All unsuccessful UCC's made use of conventional vehicles to distribute the goods to the service area. In three cases also electric vehicles were used in combination with the conventional ones. In La Rochelle the fact that electric vehicles are used created 60% reduction in vehicle kilometres with conventional trucks. However in Leiden the poorly adjustable vehicles were part of the failure.

The *location of a UCC* can determine its success as can be seen in the Leiden case. Also Browne et al. (2005) and the BESTUFS report (Allen et al., 2002) emphasise the importance of choosing a right location. Evaluations of decision making on this issue however reveal that in many cases the result of what was available at the moment (Hesse, 2004; Quak, 2008). From the reviews it is not clear what influence *accompanying measures* have. In one of the successful cases no accompanying measures are taken. In the other two cases, time-windows and a pedestrian zone support the UCC. The unsuccessful cases were all supported by accompanying measures. It can therefore be concluded that accompanying measures are no guarantee for reaching success. Well chosen accompanying measures (e.g. limited access conditions —physical or time related), however, possibly can to a certain extent help to acquire more users for a UCC. Learning from the European practices we can formulate that for the city of the Hague, the number of users, the organisation, the type of vehicle and the location are no guarantees for success however these are important factors for consideration as initial steps for success.

3. Feasibility of the UCC in The Hague

To evaluate the feasibility of a UCC in The Hague firstly the theoretical factors for success of a UCC (Huschebeck and Allen, 2005) and the factors that can be found from the European practice, will be divided in three classes based on the political economical model of Feitelson and Salomon (2004) to be able to handle each factor appropriately. The classes are: technical feasibility, commercial feasibility, and political feasibility.

3.1. Technical feasibility

Technical feasibility consists of characteristics of the service area, the characteristics of the UCC, the type of UCC, the type of distribution vehicles and the location of the UCC.

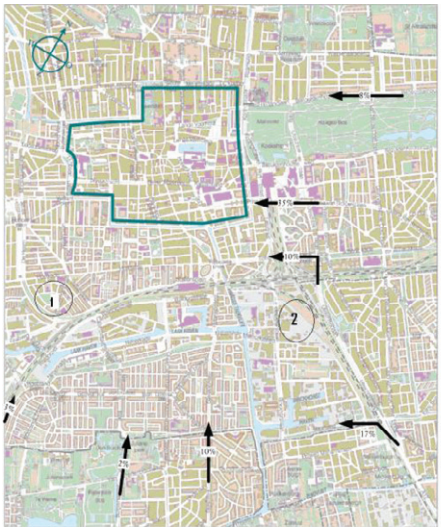

Figure 1 Inbound routes freight vehicles and two possible locations for a UCC

Research has been undertaken for a target group of 531 shops in the city centre of The Hague with branches in fashion, living, electrics, entertainment, books and other retail, all self-employed businesses with less than 1000 m^2 sales surfaces. Vans, light trucks, medium trucks and heavy trucks are distinguished. It is assumed they have a load capacity of respectively 7, 18, 38 and 60 m^3. In our research the use of light or medium electric trucks for distribution are chosen, because using vans will increase the number of vehicles substantially and some load units will not fit in vans. Heavy trucks are excluded since they have a very bad effect on urban distribution problems, such as safety. The vehicles must be able to drive from the UCC to the city-centre and vice versa at normal speed (50 km/h) and must be able to do trips during the whole day, so recharging the batteries can be done at night. Light trucks will have a range of at least 40 km and medium trucks will have a range of at least 30 km. From the data collected by the enquiry of DHV (2008) it is known that the shops in the sample get an average of 5.4 deliveries per week. Multiplying this by the number of shops in the population (target group), it makes 2858 deliveries per week. The average number of deliveries per vehicle in the city centre is 7.2. From this can be concluded that 397 vehicles enter the city centre of The Hague per week for supplying the shops in the target group. A volume of 4653 m^3 goods is brought to the shops in the target group by 397 vehicles per week. The distribution vehicles are assumed to come equally spread over 6 days per week.

Flexibility is an important factor of service. To be able to meet this service aspect it is important to give shops the possibility of receiving goods at the time they want. Initially the opening times of the UCC will be 10 hours per day, 6 days per week. The arrivals of incoming vehicles will spread over the day with a peak between 11:00am and 12:00noon. It is assumed that at the most 75% of the goods that pass the UCC in a day will be in the storage area at the same time, and that goods can be stacked up to 1.5m. Therefore, for consolidation of 100% of the goods for the target group 388m^2 of space is needed purely for storage. Some more surface area is needed for handling the goods.

An important notion from the survey is that often the capacity of the UCC is too large compared to the usage. It is good to be realistic about the use of a UCC. Also Quak (2008) and Hesse (2004) say that one must not be too ambitious about the use of a UCC. When the positive impact of a UCC is proven, the number of other uses can be extended. The suggested type of UCC is an Urban Distribution Centre. The location of the suggested UCC is in the Binckhorst business area (*see Figure 1, location 2*), because the Binckhorst is near to the future inbound routes, it has a good and short connection to the city centre.

3.2. Commercial feasibility

Commercial factors that influence the feasibility of a UCC are the way a UCC is organised and funded. These factors are derived from the earlier analysed European examples. Here we will elaborate on the benefits and costs of a UCC to be able to evaluate the possibilities for a UCC in The Hague on the criterion of positive net benefits. The organisation of a UCC can be in hands of a private organisation, a public organisation or a public private partnership organisation (Browne et al., 2004). From the review we can conclude that the most promising way to organise the UCC is with a private organisation. This means a new stakeholder involved, being the UCC operator. The funding depends on two major factors being the costs and the benefits of the UCC. However, the costs and the benefits are subordinated to a variety of factors. The costs can be divided in initial costs and operating costs. Benefits of a UCC can come from subsidies and from paying users. All the successful UCCs had subsidies. Some received a one-time subsidy while others received structural subsidies. As well as local, national and European Commission subsidies are provided for the different UCCs. These subsidies are for most of the UCCs essential for their continuity. This notion is supported by Browne et al. (2005) who state that structural subsidies almost always necessary. Participating in a European Union project can provide funds by (structural) subsidies. The success of the UCC in Bristol can partly be explained by the fact that it is supported by the EC VILVALDI project (www4).

3.2.1. Benefits

A UCC could cause direct financial benefits for consignees and transportation companies. These financial benefits can be an incentive for usage of the UCC, but can also be used to determine a realistic price for the service the UCC provides. Indirect financial benefits such as extra income for shops due to a more attractive shopping climate are not taken into account in the evaluation of a UCC, because these effects are very uncertain and are long term. For *consignees*, flexibility in the time at which the goods are delivered in the shops can potentially lead to a financial benefit. Consignees benefit from the fact that no personnel have to be in the shops before opening times. In the current situation 23% of the goods are delivered before opening times (DHV, 2008). Deliveries are made on average 1.5 hour before opening time. It is assumed that personnel costs for that 1.5 hours are € 23 (Kuiper, 2006). The benefit per m^3 is 0.23 * € 23 /1.6 = € 3.32. For *transportation companies* benefits will come both from flexibility in planning and from time reduction. Since the transportation companies do not have to take into account time windows they are more flexible in planning. This will probably cause a reduction in transportation costs, although it is hard to calculate the exact extent of the reduction. With regard to time reductions a calculation can be made. When the vehicles of the transportation companies do not have to enter the city centre anymore this will save a lot of time. Our calculation shows that on average delivering the goods to the UCC saves 0.7 hour per roundtrip. An average of 7.2 shops are delivered per roundtrip. This means that 0.10 hour (6 minutes) is saved per delivery. An average delivery is 1.6 m^3, so per m^3, 0.0625 hour is saved. Assuming that an hour costs the transportation company € 112 (Kuiper, 2006), per m^3 € 7.02 euro is saved.

3.2.2. Costs

When the UCC is operated by a private organisation the costs that are presented below are costs for that organisation. Assumptions about the costs are presented below in Table 2. The investment costs that are taken into account in the CBA consist of land, real estate, mobile material and distribution vehicles. To be able to calculate the costs using the specified prices the number of m^2 land for the building has to be calculated, the number of m^2 land around the UCC has to be calculated and the number of units of mobile material and of distribution vehicles has to be calculated. The source data, assumptions and calculations about these numbers are presented in (Kloppers, 2008). The estimations are based on the situation when a UCC tranships between 25,000 and 250,000 m^3 goods per year. A

UCC outside this range need different principles and this CBA is therefore not suitable to evaluate larger or smaller UCCs.

Table 2 Costs specification

Type	Object	€	Per
Land		400	m^2
Real estate	Building	800	m^2
	Other infrastructure	50	m^2
Mobile material		15,000	Unit
Distribution vehicles	Light trucks	110,000	Unit
	Medium trucks	140,000	Unit
Personnel		80,000	person/year
Insurance		0.25	m^3
Energy costs		0.085	Km

The yearly operation costs are partly the depreciation of the real estate, the mobile material and the distribution vehicles. The depreciation term of the real estate is 20 years and of the mobile material and for the distribution vehicles it is 5 years. No residual value is taken into account. The batteries of the distribution vehicles will be worn out after the life span of the distribution vehicles (Van der Kamp, 29-09-2008). Contrary to other real estate a distribution centre has little or no residual value. The maintenance costs are 2.5% of the new value of the mobile material and the distribution vehicles (EPRI, 2004). To obtain a good insight in the costs and benefits four scenarios have been defined:

- Scenario 0: No measures are taken. Actually it is the current situation without the UCC in order to make a comparison with the other scenarios
- Scenario 1: Full participation, light trucks. In scenario 1 all goods for the shops in the target group are delivered to the UCC. From the UCC 17 electric light trucks transport the goods to the shops in the city centre doing roundtrips 10 hours a day to shops. A 100% participation of the target group means that 241,956 m3 goods per year are transhipped in the UCC.
- Scenario 2: Full participation, medium trucks. This Scenario also presumes 100% participating shops in the target group. Difference with the first scenario is that 2 medium trucks are used for distribution.
- Scenario 3: Few participants. In this scenario voluntary participation is assumed. In this case there is 10% participation of the target group. This participation level is chosen because from experiences in other cases 10% seems to be a participation level that can be reached in an initial state without obliging use of the UCC. In scenario 3 light trucks are used for distribution. It is assumed that 10% of the shops in the target group take care of 10% of the goods. This means that the UCC in scenario 3 handles 24,196 m3 goods per year.

A comparison of the scenarios (see Table 3) clearly shows that scenario 2 scores the best on the criteria. A reduction of vehicle kilometres of 8% can be reached when all shops in the target group participate. This will have a positive net benefit and a positive influence on the service levels for the stakeholders.

Table 3 Evaluation of the scenarios

Criteria	Scenario 0: Current situation	Scenario 1: Full participation, light trucks	Scenario 2: Full participation, medium trucks	Scenario 3: Few participants
Vehicle kilometre reduction	0	-2%	-8%	-0.8%
Net benefit	0	-/- € 50,577	€ 118,083	-/- € 220,040
Service	0	++	+	+

Facing the future we will not know which scenario will happen and therefore the CBA is extended showing the costs and benefits of the UCC in € per m3 for different amounts of goods handled per year. Figure 2 shows that when the UCC uses medium trucks, from the point that approximately 150,000 m3 goods per year are trans-shipped in the UCC the benefits are higher than the costs. The 150,000 m3 goods per year means a participation of approximately 60% of the target group shops. Using light trucks that point is presumably also reached but more goods have to be transhipped per year then only that of the target group shops. Due to the characteristics of the input data and assumptions the model is not suitable to calculate costs and benefits in this case. The peaks in the cost lines are there because of the point when one more vehicle is needed or where one more employee is needed. Figure 2 also shows what has to be contributed by a possible financier to operate a UCC with less than 150,000 m3 per year or with light trucks. It can be seen that the one participant more will decrease the costs considerably, until 75,000 m3 goods per year is reached (approximately 30% of the target group shops).

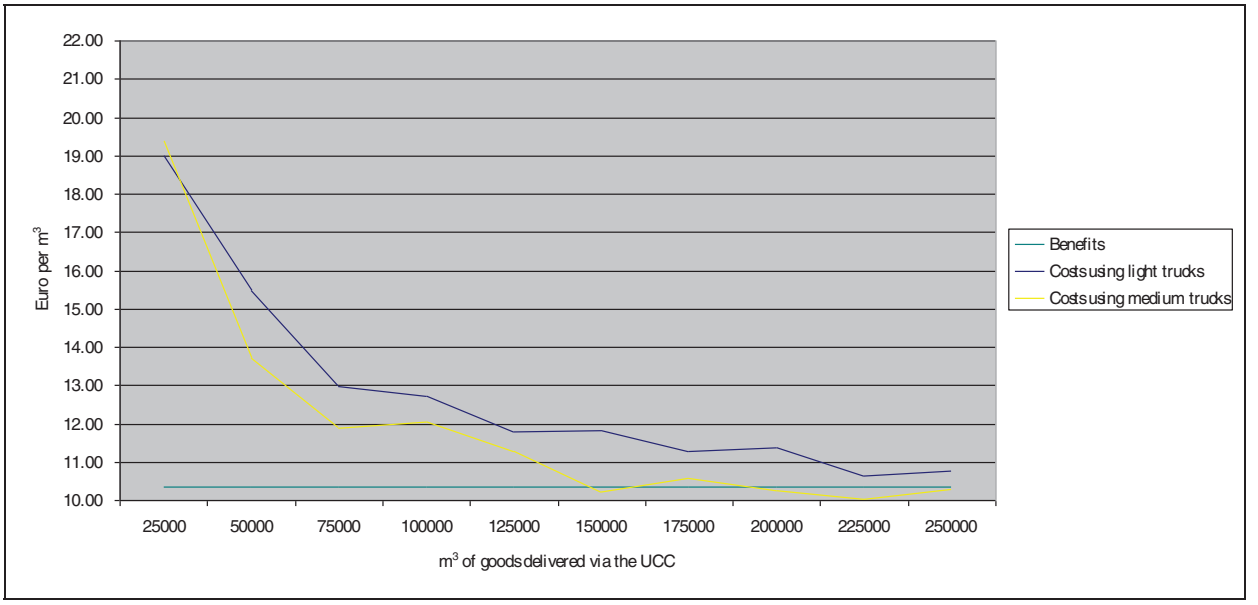

Figure 2 Costs/benefits per m3 for different amounts of goods delivered to the UCC

3.3. Political feasibility

Retailers in The Hague have shown interest in consolidation as a solution for the problems with distribution vehicles. The two major difficulties with implementing the UCC are the allocation of the costs and benefits and the willingness of the transportation companies to cooperate. Both consignees and transportation companies can benefit financially from using the UCC. The UCC operator, however, incurs the costs. The municipality should play a role in bringing costs and benefits together. The problem with the willingness to cooperate in a UCC is that the transportation companies will not simply give away the delivery of the goods to another party, because of reliability issues and the fact that picking up and delivery of the goods is their core business. The information that needs to be shared with the UCC operator is very sensitive due to competition. A solution could be operating the UCC as a cooperative with involvement by a number of different transportation companies. The municipality should take the initiative to organise the first meetings because of the problems with the competitive sensitive information.

4. Conclusion

The survey was a good method to identify factors that influence the success of a UCC. However, limited quantitative data can be found about the UCC cases. In most cases no ex-post evaluation is conducted. This makes it hard to determine to which extent the objectives are reached. The factors that can affect the success or failure of a UCC are one of the results of the UCC survey. These observed success factors largely match the conclusions of the City Port Project report (2005), the BESTUFS handbook (Allen et al., 2002) and the study done by Browne et al. (2005) and Quak (2008). This research shows that with full participation of the shops in the target group a reduction in vehicle kilometres of distribution traffic of 8% can be reached. Browne et al. (2005) assessed the most commonly quantified impacts in ex-ante studies of 17 studied UCC cases.

The performance indicator *vehicle kilometre reduction* was calculated in 7 cases. The calculations were all done in preparation of the implementation. In these cases the predicted reductions in vehicle kilometres of distribution traffic varied between 30-45%. From this could be concluded that the distribution activities in The Hague are fairly efficient (averagely 50% of the load capacity of the distribution vehicles that enter the city centre are filled with goods for the city centre and the average total load capacity of the vehicles is 80% (DHV, 2008). Secondly, the fact that many of the 17 UCCs studied by Browne et al. (2005) have stopped because of the unsatisfactory results indicates that the benefits of the UCCs in some cases were not based on realistic estimates.

In addition to the recommendations for the municipality, further research can be recommended for urban distribution research in general. Firstly, a stated preference study amongst the transportation companies that deliver to the shops in urban areas, can determine the factors that influence the choice of transportation companies to participate in a UCC. Research shows the factors that shopkeepers find important, but the reasons for transportation companies to deliver the goods to the UCC of deliver the goods to the shops itself, only assumptions are made. Secondly, it has to be noted that as expected most of the literature that is available about the practice of urban freight distribution exists of non-scientific papers. Most reports on urban distribution practice are made by engineering companies and local governments. Scientific theory could provide more accurate advice, but evaluations of UCCs are often poorly documented. TNO is currently evaluating the pilot of the UCC in Nijmegen. This study will provide a rich source of information. A large amount of research results will be able to be determined after the pilot starts in The Hague. This will be a windfall for urban distribution knowledge (see Van Rooijen and Quak, 2009).

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Appendix A. Contacts

Table 4 Persons communicated in this study

Name	Company name	Date	Communication
Birgit Hendriks	Binnestadservice.nl	15-05-2008	personal
Vronie van Manen	Bureau Binnenstad (Municipality of The Hague)	16-06-2008	personal
Tim Hapgood	Bristol city council	29-06-2008	email
Magnus Jäderberg	Göteborg city council	03-07-2008	email
Jésus Muñuzuri	Universidad de Sevilla	03-07-2008	email
Peter Krichel	Universität Kassel	08-07-2008	email
Mark Degenkamp	Gemeente Utrecht	06-08-2008	personal
Rainier van der Kamp	Miles Benelux B.V./Allgreenvehicles	29-09-2008	telephone