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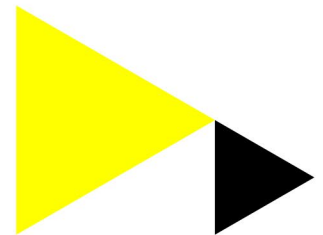
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Public purchasing as game changer in smarter and cleaner urban freight distribution

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Abstract

The facility service departments of public organizations generate many transport movements in cities. In public procurement there is potential for smarter and cleaner urban distribution: public organizations can act as game changer. Recent initiatives across Europe show that more public organizations are acquiring knowledge of the transport volumes resulting from their purchases and the potential for improvement. However, implementation of smarter and cleaner urban distribution concepts through purchase criteria is not yet realized on large scale. For this to realize, a change is needed in the way public organizations make decisions about the selection of suppliers, incoterms, delivery service plans and performance indicators. The analysis of three cases at The University of Amsterdam (UvA) and Amsterdam University of Applied Sciences (AUAS) on consolidating shipments, changing procurement policies and the use of a consolidation center show opportunities for smarter and urban distribution. However, getting to the benefits requires a change in the way purchasers behave on a strategic, tactical and operational level.

Keywords: Urban freight distribution; Public procurement; sustainable purchasing.

1. Introduction

The facility service departments of by public organizations, such as universities, schools and hospitals, generate many transport movements in cities with their demand for office, cleaning and laboratory supplies. Both the product characteristics and the characteristics of the receiving organization, make that these urban transport flows have the potential to be organized in a more sustainable way. Facilitative goods, such as paper and hygiene products are characterized by a high volume, a low value density and are relatively homogenous (Lovell et al., 2006). Other than many small private entrepreneurs, public organizations can benefit directly from sustainable transport as it contributes to their own objectives. For example, hospitals need to be accessible and promote a healthy living. Local governments and educational institutes aim to be a role model in terms of social responsibility.

The attention for smarter and cleaner urban distribution is growing rapidly and also the role and influence of public organizations have been broadly discussed. Often with regard to policy development, regulations and regional planning (e.g. SUGAR, 2011; Witkowski et al., 2014) but more recently also with regard to public procurement (Zunder et al, 2015; Balm et al, 2015). The buying power of public organizations makes them important customers to their suppliers and by using this power they can act as game changer in urban freight distribution. Examples of sustainable initiatives who take this approach can be found in Gothenburg, London, Rotterdam, Amsterdam and Paris (Walker & Brammer, 2009, Moen, 2014, Balm et al., 2015). In these cities small scale projects have been started to analyze the transport movement related to facility services, the implementation of consolidation centers, consolidating shipments upstream in the

supply chain and collaboration with (and between) suppliers. However, implementation of smarter and cleaner urban distribution concept through purchase criteria is not yet realized on large scale. To make optimal use of the influence of public organization in the transition towards sustainable urban freight, a change is needed in the way public purchases make tactical and operational decisions. These decisions relate to the selection of suppliers, agreeing on Incoterms, delivery service plans and ground rules for deliveries (Zunder & Aditjandra, 2015).

This paper focuses on the behavioral challenges and opportunities that are faced when changing public sector deliveries over the long term. We first present a literature study on purchase behavior, in general and with regard to sustainability. Next, we discuss three potential solutions that have been elaborated for the Amsterdam University of Applied Sciences (AUAS) and University of Amsterdam (UvA). With these insights, we give recommendations for further research on public procurement behavior.

2. Literature on green public procurement

Corporate Social Responsibility (CSR) is pursued by an increasing number of companies and public organisations. To further promote the principles, the European Commission has published a strategy on CSR (2011). This strategy includes “enhancing market rewards for CSR”, through public procurement. There has also been an increase in scientific awareness on Green Public Procurement (GPP) since 2011, with an increasing amount of relevant research in the last years (Telgen, Lange, & Schotanus, 2014). In light of corporate social responsibility, GPP should be an essential part of the purchasing process. We therefore discuss the implications of GPP using theory on the purchasing process (Van Weele, 1988). The process of Van Weele includes two components: tactical purchasing and operational purchasing. Each of these two components is divided into sub processes, as illustrated in Figure 1.

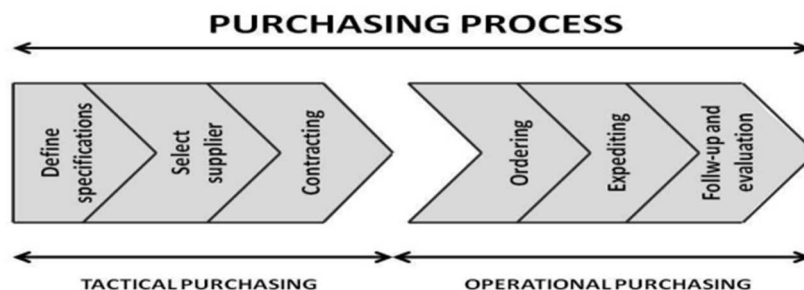


Figure 1: Purchasing process (van Weele, 2010)

Within the tactical purchasing process, decisions must be made to what extent GPP will be taken into account, in relation to quality and price indicators. Next, the criteria and evaluation method used to select the preferred supplier must be made clear (Grandia, 2014). Considering the environmental impact of transport (CO_2 , NO_x and PM_{10}), the physical delivery of goods and services is considered as an important factor in GPP. When transportation is the responsibility of the supplier he will most likely choose the most economical option, which is not always the greenest option (Moen, 2014).

Within the operational purchasing process a key factor of GPP is the behavior of public purchasers. According to Grandia (2014) behavior is critical for the implementation of GPP. Research in the Netherlands shows that GPP remains difficult to apply in practice, because of lack of knowledge and commitment (Grandia, Groeneveld, Kuipers, & Steijn, 2014). To successfully implement GPP, commitment of purchasers for this new way of purchasing is required (Mosgaard,

2014). According to Mosgaard (2014) GPP can be perceived as an organizational competence. It is important that purchasers are stimulated to gain the relevant knowledge but also to turn this knowledge into practice, especially since purchasers perceive green procurement as “something different” from normal purchasing practice. Current purchase decisions are based on customs and standard practices. Solely informing purchasers about GPP ambitions is not sufficient. Clear tools and guidelines are needed to increase understanding and optimize GPP. This is necessary to implement compulsory environmental or additional criteria that comply with the organizational goals. GPP should not be seen as a luxury that is accepted as long as it does not negatively influence price or quality, but as a solution to meet objectives (Mosgaard, 2014).

The decisions of purchasers determine whether the full potential of GPP is used, their behavior is considered to be critical in both tactical and operational purchasing. Previous procurement policies have caused purchasers to become more careful and less likely to partake in GPP (Grandia, Steijn & Kuipers, 2015a). To change the behavior of purchasers, affective commitment is required. Hence, if purchasers perceive the GPP policy as fair and valuable, they will become more committed to implement GPP. Optimized GPP is not achieved through pressure or out of fear for penalties, that way purchasers do not show more GPP behavior (Grandia et. al., 2015a).

To optimize GPP, change agents can be appointed to carry out specific activities, such as advising, facilitating, problem solving or organizing workshops, to remove resistance and assist project teams in progressing towards commitment to implement GPP in their projects (Grandia et al., 2014). While change agents are only one part of the process towards GPP, they can play an important role. A change agent can be appointed within the organization or a professional from outside the organization.

GPP is becoming a more important part of the purchasing process, due to the pressure of municipalities and public organizations to achieve sustainable procurement, for both social and environmental objectives. These objectives should be well defined at a strategic level. When it comes to urban freight, the GPP objectives can relate to air pollution, CO₂, the number of truck movements, or the number of stops at the receivers site. These objectives are not necessarily achieved simultaneously and can even be contradictory. For example, using electric vehicles may reduce air pollution, but as trucks may be smaller it can increase the required number of transport movements. To successfully move from strategy to practice, lead buyers (i.e. tactical level) should therefore have a clear understanding on how to use GPP and a mandate to act in favor of GPP. Next, the most essential, yet difficult, part for the successful implementation of GPP is to change the behavior of purchasers on an operational level. Purchasers need to understand the importance of GPP and should act accordingly to make GPP an integrated part of the purchasing process. Overall can be stated that behavioral aspects play a key role in the success of GPP on both strategic, tactic and operational level (Balm, Ploos van Amstel, Habers, Aditjandra, & Zunder, 2015). We further elaborate on this using three case studies.

3. Case studies

The University of Amsterdam (UvA) and Amsterdam University of Applied Sciences (AUAS) are two academic/educational institutions in Amsterdam, with about 30,000 and 50,000 students respectively. UvA employs about 5,000 and AUAS 3,600 people, in educational, research and staff functions. The institutions work together for most of their central services, such as Facility Services. Facility Services is responsible for all the facilities in and around the campus buildings and aims to contribute to more efficient and sustainable transport to and from the buildings. They have asked the AUAS Research Program Urban Technology to conduct research into the current

situation and possibilities for improvement. The first phase took place in Oct-Dec 2014 (Balm, et al., 2015). Based on the results and discussion with the project's steering committee, three possible solutions were selected for further research: 1) consolidating at the source, 2) change of purchase policies and 3) delivery at a central address. The next paragraphs describe the research done during the second phase between February and June 2015 for each of the three solution directions.

3.1. Consolidating at the source

Consolidating at the source means that various suppliers consolidate the transport of their deliveries upstream in the distribution network, with the aim to reduce transport kilometers, costs and associated pollution. This requires harmonization of planning and transport across suppliers.

For this case we explored the possibilities to consolidate the deliveries either at the location of a supplier and/or with a single transport provider who would carry out the deliveries for different suppliers. Based on the data from 278 fully completed questionnaires of the previous research of UvA-AUAS (Ploos van Amstel, Balm, & Doorman, 2014), we selected a list of potential suppliers. In this selection we used the following criteria: the supplier a) agreed to receive further inquiries from our side; b) has a shipping location outside Amsterdam; c) delivers more than 200 times a year to UvA-AUAS and d) delivers MRO products (Maintenance, Repair, Operations), as these products are characterized by a low delivery risk and a low impact on financial results. These criteria helped to identify suppliers with a significant chance of achieving cleaner urban freight distribution. Based on the criteria, two suppliers were approached: Staples, supplier of office supplies and, CWS, supplier of hygiene products. To initiate the change in urban freight distribution we started conversations to further know and understand the ordering and delivery processes of Staples and CWS. Next, data on volumes and costs were gathered to analyze the potential business case. Both suppliers provided data and actively participated in the discussions. This showed their willingness to contribute to the goals of UvA-AUAS related to cleaner urban freight. However, the independent transport operators contracted by the suppliers were not willing to share their data as it was marked as company private. Instead, we used data from DHL and Deudekom, two logistics service providers who were able to provide us with estimates for the particular situation explored.

The scenario that we analyzed for the business case assumed that the deliveries from CWS to UvA-AUAS were delivered at the location of Staples (weekly) and then consolidated for combined delivery. In the current situation Staples delivered 3,024 a year in 252 days (equal to every business day) and CWS delivered 1,033 times in 161 days. In the scenario all the deliveries to the UvA-AUAS were carried out via Staples. When consolidating via Staples the expected transport kilometers decreased with a maximum of 65%, the total transport costs with 5% and CO₂ emission with a maximum of 43%. The change in emissions is smaller than the change in transport kilometers, because of the expected use of heavier vehicles.

Although these figures seems promising, in the new situation, Staples would apply a service fee for the additional warehouse services. This fee is higher than the potential reduction in transport costs, resulting in an increase in overall costs. It was therefore decided that consolidation at the source was not financially feasible to improve the current situation for the deliveries of CWS and Staples. The proposed changes were not implemented, and hence, calculations could not be based on real-world data. Nevertheless, we have learned about behavioral challenges and opportunities.

If a public purchasing department initiates change, suppliers seem to be willing to anticipate in the change process. A challenge was to get accurate and complete data from all stakeholders, especially from the initial transport operators. For collaboration, a certain transparency level of data

is required. Another factor for success is an agreed cost and benefit allocation between stakeholders. For further research an implemented case is necessary. The conclusion of this practical case is that, it is difficult to actually achieve improved sustainability, as it is difficult to divide the costs and benefits in such a way that all stakeholders are willing to collaborate.

3.2. Changing purchase policies

This case focuses on reducing transport kilometers, costs and pollution by changing purchase policies. We explored the effects of reducing a) the number of suppliers and b) the number of delivery days.

As the AUAS and the UvA are two different organizations they initially had different suppliers for their MRO products. In 2014 the AUAS and the UvA worked together in a tender to jointly select a new supplier for MRO products. Only one supplier was contracted (starting January 2015) for the two public organisations instead of two. The joint tender was won by the already contracted supplier of the UvA. To see what the effects of this tender cooperation were, we have looked at the geographic location of the two suppliers and the amount of deliveries (situation in 2014). Data extracted from the software SAP showed that the supplier of the AUAS had processed over 850 unique orders in 226 days and the supplier of the UvA had processed over 2.100 unique orders in 252 days, in the period from February 2014 till January 2015. This shows that UvA and AUAS were both delivered almost daily. The initial supplier of the AUAS was located in Zwolle, around 115 kilometers from Amsterdam. The initial supplier of the UvA, and the winner of the new tender is located in Almere, at a distance of 35 kilometers from Amsterdam. This meant a reduction of 115 kilometers (single trip) for each delivery, if the deliveries would have been carried out dedicatedly. In that case the joint tender would result in a kilometer reduction of 75%. However, both suppliers use a third party transportation company that combine deliveries for multiple clients. When we assume that 20% of the transport operator's load was delivered to AUAS and UvA and 80% to other stops, it means that there was a decrease in kilometers assigned to UvA-AUAS of 9%.

Next, we explored the potential effects of a change in delivery frequency from daily to weekly. With one fixed delivery day a week the UvA-AUAS can decrease the amount delivery days with 80 percent, from 250 days to 50 days a year. However, this does not necessarily mean a similar reduction in kilometres. When we take the carrier in consideration in our calculations there is even a possibility that the amount of kilometers and/or environmental impact increases. When all the orders from the AUAS and UvA should be delivered together at one day, there is the possibility that the volume does not fit in one van, resulting in an extra van or larger vehicle. In the current situation the amount of packages for the AUAS and UvA is spread over the week, which makes it possible to consolidate with packages for other clients of the supplier.

The current purchasing policies of UvA-AUAS do not contain any guidelines regarding smart and clean transport. The calculations above show that different choices in the tender phase (such as the number of suppliers within a product category or delivery speed/frequency) can have a positive effect on transport kilometers and pollution, and once decided upon the change, it is not very difficult to implement. However, when transport is outsourced to a third party, it is difficult to assess and value the actual impact. This makes it challenging to use sustainability indicators within the tactical purchase process. It will become easier though, once urban freight objectives are well defined at a strategic level.

3.3. *Using a central delivery address*

The third case has explored the possibilities for the use of a central delivery address for the deliveries to UvA-AUAS. The financial feasibility of urban consolidation centers have been extensively discussed in city logistics research projects such as STRAIGHTSOL (2013), SMARTFUSION (2014) and LAMILO (2014). Unlike many small scale pilots, the volume of public organizations may be the key to a viable business case. The main question raised by Facility Services is whether the required activities should be operated in-house, either with existing or new facilities, or outsourced to a city logistics service provider. Therefore, we explored the pros and cons of two potential business model concepts. The first, considers the use of an inventory room at one of the campus sites, which is currently underutilized. The second considers the use of a city logistics service provider who will charge a graduated price for consolidation and transport activities.

The use of an own facility as central delivery address seems feasible as well as reasonable, considering the spare inventory room. Also, there is an advantage as the last mile transport could possibly be combined with the mail distribution activities that take place between locations of UvA-AUAS. However, there is a lack of logistics knowledge to develop, integrate and optimize these activities efficiently. The investment in (human) resources and operations for a central delivery location are considered to be too high for dedicated usage. The potential volume for UvA-AUAS is relatively low, compared to the volume that would make urban consolidation centers efficient for multiple stakeholders.

The advantage of using an existing city hub operator is that the UvA-AUAS can benefit from economies of scale, as from the beginning. The city logistics service provider already operates a warehouse, has the required logistics knowledge and experiences and has a clean vehicle fleet. Next, the costs per delivery are presented beforehand. The key question for this business model is: who should initiate and decide upon the use of a central delivery address? This can be the receiver (UvA-AUAS), the suppliers, or the current transport operators. Next, there are challenges with regard to the identification and redistribution of costs and benefits. With the current incoterm "delivery duty paid", the supplier and receiver will not notice a cost reduction once deliveries are made to the hub address. And although Facility Services of UvA-AUAS is willing to (financially) contribute to sustainable urban freight (as it also improves the livability around the campuses), it seems inevitable that the transport operator and supplier should anyhow be involved in a redistribution of costs and benefits. The transport operator will benefit when it can reduce its transport kilometers and delivery time. The supplier will benefit once the inventory can partly be stored at the hub, leading to cost reductions upstream the supply chain.

The development of a central delivery address requires open discussions with all stakeholders. During the research at UvA-AUAS, multiple stakeholders have shown their willingness and interest to participate in discussions, such as supplier CWS, transport operator DHL, and city hub logistics providers Deudekom, Stadslogistiek and Bubble Post. Next meetings are planned for the third phase of the project, starting in autumn 2015.

4. **Joint analysis for opportunities, challenges and decisions**

The three cases are jointly analyzed in Table 1. The analysis shows the opportunities and challenges for smarter and urban distribution and the decisions to be made at a strategic, tactical and operational level. It also shows the stakeholders that play a key role in each of the solutions. The receiver should take the lead when changing purchase policies. When it comes to consolidating deliveries at the source, the suppliers and their logistics providers are leading.

Implementing a central delivery address requires the involvement of both receiver, supplier and logistics services provider.

	Consolidating deliveries at the source	Change purchase policy	Central delivery address
<i>Stakeholder group(s) with a lead role</i>	• Supplier • Logistis service / transport provider	Receiver	• Receiver • Supplier • Logistics service / transport provider
<i>Opportunity</i>	Suppliers seem to be willing to discuss the possibilities, be transparent, and cooperate.	Use next tender(s) to start with new strategy and include “green and efficient transport” as selection criteria	Synergies on city level when broad city distribution center (with multiple functions) is used. The volume of the public organization can make current UCC initiatives (more) viable.
<i>Challenge</i>	• Transport operators that currently carry out the transport seem to be less willing to cooperate and to share data. They fear a loss of business. • Influence of purchasing organization is limited as agreements already exists between supplier and transport operator.	• To make sure that employees in purchase or procurement functions at a tactic/operational level act in line with the policy. • To incorporate potential side effects for existing transport networks.	• To obtain transparent data required to share costs and benefits and consensus on invoicing tool • Logistics knowledge is required to efficiently use the central delivery address without loss of service.
<i>Strategic decisions</i>	Who should initiate/lead the change? What are the (common) objectives?	How to develop green delivery criteria in tender procedures?	Who should initiate/lead the change? What are the (common) objectives?
<i>Tactic decisions</i>	How the select the appropriate partners? How to redistribute costs and benefits in contracts?	How to assess green delivery criteria of suppliers?	How the select the appropriate partners? How to redistribute costs and benefits in contracts?
<i>Operational decisions</i>	How to make sure that transport data is shared?	How to monitor the criteria in practice?	How to make sure that the hub address is used?

Table 1 Joint analysis on behavioral opportunities, challenges and decisions

At a strategic level objectives and criteria should be defined first, to assess if and how the solution can benefit the stakeholder's goals. For example, while consolidating deliveries (at the source or at a central delivery address) will reduce the number of stops at the receiver's site, it may lead to inefficiencies for the transport operator. Reducing the number of suppliers can be a strategic decision to establish more long term partnerships (versus annual or bi-annual tendering).

At tactical levels, purchasers must have a quantitative understanding of the transport volumes and the related internal and external costs. Collaboration with suppliers is necessary to understand the volumes, the cost to serve and the delivery options (Moes, 2014). Tactical buying decisions relate to the assessment and selection of suppliers and to costs and benefit agreements.

The operational level relates to data acquisition, data sharing and changing daily practices. It is important to monitor the logistics performance of suppliers, for example in terms of costs, time, reliability and environmental indicators. This is valuable for knowledge creation and enables dissemination of best practices that can support changing purchase behavior in the future. It also serves as a valuable input for further research and development in GPP.

5. Conclusion

Green Public Procurement as part of CSR at public organizations is often directed towards the use of sustainable materials and social return. The environmental and social impact (e.g. pollution, congestion, safety issues) caused by the transportation of MRO products is highly neglected. Considering the buying power of public organizations, they could act as game changer in the implementation of urban freight solutions. However, knowledge on how to fulfill this role is lacking. This paper has presented opportunities and challenges regarding the role of public procurement towards cleaner and smarter urban freight, from a behavioral perspective.

In order to make logistics considerations in the purchase process, purchase behavior should be guided by criteria for clean and efficient deliveries. This means first that at a strategic level objectives are well defined. Green transport principles should be adapted in CSR and procurement strategies. This could be supported by national and/or European procurement rules and guidelines. Second, on a tactical level it should become clear how suppliers can be assessed, selected and contracted in relation to the logistics performance and ambitions. Further research is needed for the development of sustainability criteria in tactical decision making, to make 'logistics quality' part of the approach when awarding contracts. At the moment, relevant standardized information regarding these aspects is lacking.

Third, at an operational level, it is essential that there is understanding among purchasers and that they are committed to act upon the green criteria. Further research should focus on changing purchasing decisions by members of public organizations that order on a frequent basis. The research by Zunder et al. (2015) provides a good basis for further research on individual public purchasing behavior. Methods and tools to make the benefits of sustainable purchasing measurable and that increase commitment (both intrinsic and extrinsic) should be explored. Once performance and results can be measured, this will also allow the dissemination of GPP experiences and best practices across organizations. Cost, benefits, effects on service level and transport distances, and risks should be taken into consideration. Next, communication is essential to make sure that the purpose and relevance is known throughout the receiving and delivering organizations. Not only purchasers, but also transport planners and drivers should become willing and committed to act in factor of sustainable urban freight transport.

The three case studies at the UvA-AUAS show that suppliers are willing to adjust to demands relating to efficient and clean transport when delivering MRO-products. They are open to share data and feedback and to discuss about potential improvements. However, changing delivery

processes in practice requires the involvement of transport operators and logistics service providers. This increases the complexity of actual implementation, as it involves redistributions of costs, benefits and responsibilities. Transparency, collaboration and commitment through all purchasing levels and across suppliers and logistics service providers is needed before GPP will result into cleaner and smarter urban freight distribution. This may require new types of collaboration, the involvement of an independent project manager, or public private partnerships. Also, administrative implications for invoicing, legal implications and European procurement rules, should be topics for further research.

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