Supply Problems of Sales Points Performance in City Centres: Results of the DORED Program Survey Research

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Abstract: The paper regards to problems of sales point performance being situated in the centres of big cities in Poland. Problems are investigated with the use of surveys being carried out in 900 sales points according to author’s DORED (DORED—dobre rozwiązania dla dostaw in Polish, good solutions for delivery in English) program performance. The DORED program has been mentioned for the first time in Logistics (a Polish newspaper) in February, 2005. The developed topic has been the pilot project of DORED program. That was in Wroclaw City (Poland), where the regions of Przedmiescie Swidnickie were the first test of method of the DORED program. The mentioned topic has encompassed the city logistic problems, land transportation and movement organization performance in the city centres.

Key words: City logistic, unloading problem, DORED investigations program.

1. Introduction

The constant development of cities will gradually moving away from the center of residential neighborhoods. This can be set to a “budding” of the substance through the formation of small urban district administrative and service centers. This causes a depopulation of inner cities, as for existing residents moving in distant districts to improve the quality of life. Additional temptation is its proximity and easy access by car, shopping centers on the outskirts of cities. This may cause economic collapse in the center and downtown, however, the city is interested in maintaining a good level of trade in all its area, hence the issue of authorization service and trade points in the city center, indirectly generates a passenger flow in public transport and streams of cars aimed at the area. The task is to optimize the logistics operations of urban public transport to meet the communication needs of residents without their own vehicle. City logistics, through traffic engineering to optimize the flow of passenger vehicles, limit the number of vehicles, forcing investment in parking lots at shopping centers, etc.. The problem, not fully optimized, is the provision of trade and industries located in the city center.

A comprehensive look at this issue requires an analysis of elements:
- the geographical location of recipients and senders in the study area;
- profile customers, identification of trade activity;
- types of cargo units used in the supply of a given area;
- the amount and type of cargo;
- access to transport infrastructure, road, rail and water;
- travel routes suppliers.

There are several types of freight traffic in the city center because of its policy to transport:
1. Chaotic. The city does not limit the access time, number and size of trucks entering the test area of the city by giving free access to all operators logistics;
Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research

(2) Orderly. The city, giving free or reduced access for all logistics, organizes freight transport in selected area of the city, through:

- limitation of access time;
- reducing the quantity and size of trucks entering;
- the test area of the city;
- charging for entry;
- designation of places of transshipment;

(3) Organized. The city authorities, in consultation with logistics operators, are organizing an integrated transport system, focusing on:

- minimizing the external costs of transport;
- improve the efficiency of capacity utilization of vehicles;
- optimizing the selection of vehicles;
- optimizing the selection of loading units.

The integrated freight transport in the city may include:

- reducing the amount of logistics operators by imposing environmental requirements for means of transport;
- assigning tasks to free transport tenders on the basis of specialized logistics operators;
- designation of storage and handling of high bandwidth for other means of transport, logistics centers;
- assignment of handling the city center;
- limitation of access time for transport to the city center;
- other.

2. Examples of Organization of Freight Traffic Signs and Landing Sites

The greatest achievements in the organization of traffic vehicles are German cities, which in the early 1990s started dozens of projects under the joint determination of city logistics. At the end of 2003, a few projects in the field of urban logistics were operated. One of the most interesting achievements is the development of methodology for the organization of traffic vehicles, marking the places where they landed.

In Germany, for the determination of the limited-entry zone for trucks and unloading of road signs combinations exist (Figs. 1 and 2).

2.1 Munich (Germany)

In the Bavarian town, an organization of freight traffic was made to meet the designation of landing sites, reducing vehicle weight to 7,000 kg and limiting the maximum time parking to 10 h.

2.2 Freiburg (Germany)

The desire to reduce freight traffic, mainly supply, in Freiburg, has prompted the city to the “round table” with transport operators and consumers goods. It was decided to introduce a comprehensive organization of freight traffic with cars primarily aimed at raising the capacity utilization of vehicles, reducing the number of courses and thereby reducing the external costs of transport [2].

![Fig. 1 Determination of the limited-entry zone in Cologne [1], which marks the place of landing in the German highway code [2].](image_url)
Introducing a system of coordination of road freight vehicles in Freiburg has brought tangible results [2]:
- reduction of monthly rides vehicles by 38%;
- reducing the number of vehicles in the center by 51%;
- the reduced number of car journeys in the city center by 73%;
- the reduced time vehicles stopping in pedestrian zones by 48%;
- the increased use of vehicles from 45% to 75%;
- the increased average weight of a single car load of 122%.

2.3 Copenhagen (Denmark)

In the capital of Denmark, in order to minimize the external costs of road transport, during February 1, 2002 to October 31, 2003, the requirements for goods vehicles for entering into the city center (Fig. 3) [2] were introduced:
1. utilization of capacity in at least 60%;
2. limiting vehicle weight between 3,500 kg and 18,000 kg;
3. limiting the length of the vehicle;
4. designated place of transshipment, shown in the map;
5. collection of various fees for admission to a certified center, the criterion is to meet environmental standards for motor vehicle marked with signs:
   - green card: engine manufactured after January 1, 1995, gross vehicle weight between 2,500-18,000 kg, capacity utilization during the 3 months in at least 60%;
   - yellow card: engine manufactured after January 1, 1997, laden mass 3,500 kg, length less than 6 m;
   - red card: for vehicles with a mass between 2,500 kg and 18,000 kg.

Fig. 4 shows the obtained results of transport tasks for the individual branches of trade and distribution by the vehicles incoming into central Copenhagen during the test.

3. The DORED Program

The DORED program is the author’s program which is aimed at limitation and regulation of vans accessing to the centers of cities (DORED—dobre rozwiązania dla dostaw in Polish, good solutions for delivery in English).

The mentioned program is linked to methodology and results from Denmark and Germany, based on observation of city movement performance problems caused by delivery-vans transportation processes and sales claims on economic activity performance conditions.

The issue of the program is to work out the method of organization of vans movement being performed in the chosen regions and places of Wroclaw City to supply sales points. The optimization criterion is to minimize the influence of supply transportation processes on the natural environment.

In order to analyze the profile of short and long transport supply in the inner city of Wroclaw, a
Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research

Fig. 3 Limited entry zone of vehicles in central Copenhagen with marked landing places (arrows) and the symbol of landing zone (road sign) [2].

Fig. 4 The division of transport tasks for the individual branches of trade and distribution of a sample entry of vehicles in central Copenhagen during the test [2]: (a) types of carrying cargo; (b) types of cards.

A questionnaire has been developed. On the basis of the field research, the supplying of the goods in the downtown was examined. It contains 15 questions among other things, concerning:

- ownership of unloading place (enter its dimensions);
- staging points of delivery van vehicles (in the absence of their place of landing);
- type of delivery van;
- the frequency and volume of supplies (indicating the type of load);
- how and time to carry out deliveries;
- holding of the unit hopper;
- actual and declared commercial vehicle parking distance from the point of commercial;
- seasons of supply;
Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research

- quantities of suppliers;
- places where suppliers import goods.

The economic activity performance in Polish cities requires reconciliation of limitations and bans imposed by city council and road operators.

The DORED program’s survey research has been performed since 2004 and has included the problems and difficulties of sales points supply processes performance. Till now, the research has been carried out in 900 sales points being situated in six cities: Wroclaw, Gdansk, Kępno, Opole, Jelenia Góra and in Torquay (UK) [3-7, 9, 10, 12-17, 19].

The survey quantity being conducted at that time is given below:
- Gdansk: 64 in 2006;
- Jelenia Góra: 54 in 2011;
- Kępno: 50 in 2011;
- Opole: 54 in 2006/2007;
- Torquay (UK): 70 in 2007;

Moreover, dozens of sales points have been surveyed in Krakow with the use of opinion poll being prepared by the author. The obtained results have been presented on the III Mobility Forum being organized as a part of Cavitas Caravel II project realization. The III Mobility Forum was held on September 17, 2007 and took place in the Portretowa Hall of Krakow City Hall.

4. Problems of Supply Performance in City Centres

Based on the investigated opinion polls, the following conclusions were formulated describing the main supply performance problems.

For 100% investigated sales points, 87% have not got their own place of goods unloading (Figs. 5 and 6). Thus, they unload their deliveries usually on the street (21% of responds) or from the front of the shop (37% of responds), only few responds that they unload their goods using back-up facilities (20% of responds).

The declared distance of delivery van from unloading place is different for various respondents (Fig. 7). Near 50% of them have given the answer that their delivery vans stop up to 5 m from the unloading place. The rest answers have came between 5 m to above 20 m.

The respondents have also been asked, if they had had any unloading facilities. As a result, only 12 % of sales points have any unloading facility, 11% of the answers have regarded to self-dumps board, and 1% have been devoted to those responds, who have the loader cranes.

There has also been a question about the hoisting and hauling equipments used to support unloading operations performance. From the obtained answers, about 72% of respondents do not use any support facilities in this area. The rest of respondents use two or four-wheeled trolleys (24% of responds), and other material handling equipments, including forklifts and pallet trucks (30% of responds).

The survey results for the question presented above influence the unloading time (Fig. 8). Most of respondents (58%) have answered that the unloading time lasts no longer than 15 min. However, if the municipal roads administration determines the allowed time for stopping up to 15 min, the sales points owners claim that this is too short for them. This problem results flippantly from the use from the

![Diagram](image)

**Fig. 5** Answers for question “Do you have your private loading/unloading place for your deliveries?”.
Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research

Fig. 6  Answers for question “Where is your unloading place for delivery?” (read from the top to the right, from 12:00 am like clockwork).

Fig. 7  Answers for question “How far does your delivery van stop from the point of unloading?”.

unloading time and perceiving it only as a time necessary to unload the goods from the delivery vehicle. Though, the unloading time should also be perceived as a time necessary to shelf-stacking and price evaluation. Similar problems have been described in Logistics in February, 2005, where the research carried out for DORED program performance has been characterized in 2004.
Interviewees have complained of the problems connected with supply processes performance. Usually, the claims have regarded to absolute entrance forbidding (no thoroughfare), stopping forbidding (no standing), parking forbidding (no parking) and timely restrictions of supply performance possibility. In many cases, it has been postulated to establish free of charge unloading places zone.

Based on first results obtained from research carried out in 2004 to 2005, the proposition of road sign for unloading place has been formulated. The mentioned proposition has been investigated in Logistics in February 2006 [5].

The propositions of road sign for unloading place given in Figs. 9 and 10 have been presented to respondents (opinion polls have been carried out in 150 of sales points). The survey results are presented in Fig. 11.

About 82% of the respondents have chosen Version 1 as the best solution for unloading place’s road sign. They submit that this solution unequivocally pointed out that the supply delivery is unloaded from the van.
This road sign, according to the majority of respondents, is more readable and better presents the specification of supply processes being performed in their sales points. However, most of the interviewees would like the unloading places to be situated near their sales points.

The respondents have also been asked if they would agree to make their unloading place available for other users. 82% of the respondents would agree and 59% of them would make their unloading place available for up to five other users. 13% of the respondents would agree only if the quantity of users is less or equals to four, 6% of the respondents would share their unloading place with up to three users and only 4% of the respondents suggest the number of unloading place users up to six. The rest of interviewees have not answered to this question.

Moreover, the respondents have also been asked if they would agree to accommodate their delivery timetable to the other users’ delivery time. From the obtained answers, about 49% of respondents would agree to reschedule their timetable. Only 13% of
respondents strongly have denied to do this. Other interviewees have not answered to this question.

During the survey research carried out in one of the large cities, the interviewees have told the surveyor the following situation. Few sales points have come to terms with jointly hiring a one parking place for unloading their deliveries. They have informed the city council about this initiative and asked for charging them with a license fee (one parking charge should be equally divided on every user). However, the city council has charged every user with full license fee, because the existing law does not give the possibility to proceed differently.

Taking into account the mentioned problem, there should be pointed out that the existing act on commune self-government and other road regulations gives the possibility of self-government unit to define the individual charges for supporting the civil initiatives performance.

5. Example for Wroclaw City

City of Wroclaw is a growing urban center in Lower Silesia in Poland, creating links with the cities surrounding agglomeration. Population in 2009 residing in the city is 632,081 people. The city is 293 km² in total, including:

- arable land: 129 km²;
- built-up area: 114 km²;
- building floor area: 29 km²;
- recreation areas: 17km²;
- forests and woodlands: 16.7 km²;
- industrial buildings: 16 km²;
- water: 10.0 km².

Wroclaw agglomeration involving municipalities around the city of Wroclaw has a total area of 3,372 km². Approximately 1 million inhabitants live here, and 3 million in all of Lower Silesia.

From June 1, 2008, a zone of limited access for heavy goods vehicles over 9 t in gross weight [18] was established (Fig. 12).

Until August 31, 2008, companies having their headquarters or bases of equipment in the area, as well as carriers operating these companies and buildings located in the zone, had the right to enter the area outside the designated hours.

From October 1, 2008, the rules of the access for heavy goods vehicles with a maximum permissible laden weight of over 9 t have been changed.

![Fig. 12 Map of restricted access zones for vehicles over 9 t in Wroclaw [18].](image_url)
Supply Problems of Sales Points Performance in City Centers:
Results of the DORED Program Survey Research
The entrance to the zone of heavy vehicles with a maximum permissible laden weight of over 9 t can only use a designated corridor on these inlet streets:
- Bardzka;
- Krzywoustego;
- Grabiszyńska;
- Strzegomska;
- Legnicka;
- Popowicka.

The following limits were formulated at this time:
1. Trucks with gross weight < 9 t of ≥ 12 t. The
Time clock is allowed to enter the zone of heavy vehicles with a maximum mass of more than 9 t and not exceeding 12 t, with a proven destination located in the zone above the designated corridors, in accordance with applicable labeling;
2. Trucks with gross weight > 12 t. They are allowed to enter the zone of heavy vehicles with a maximum mass exceeding 12 t in hours: 4:00 to 6:00, 9:00 to 13:00 and 19:00 to 22:00, set above the corridors, in accordance with existing road markings.

Restrictions on entry to vehicles weighing more than 9 t to a designated area along with the designated corridors, illustrated by the attached map (Fig. 12).

The zone may enter unlimited public transport vehicles and trucks with gross weight up to 9 t.

In addition, 24 h entry is allowed to vehicles with a maximum mass exceeding 12 t supply to hospitals and palliative care facilities, carrying materials and equipment necessary to save human life and health, as well as special vehicles bearing municipal services related to:
1. cleaning the city and the export of domestic refuse, solid and liquid;
2. water supply and receiving treatment;
3. supply of electricity, gas, heat;
4. performance of work related to emergency repairs.

Throughout the day, the transit trucks (less than 18 t in gross weight) may use the roads forming the zone boundaries in Wroclaw, in according with the road marking (including the current detours associated with the ongoing road works in the city). All roads are properly marked.

The entrance to the interior zone is possible only through the designated streets:
- Popowicka;
- Legnicka;
- Strzegomska;
- Grabiszyńska;
- Bardzka;
- Krzywoustego.

The driver entering the area should have a document clearly stating the purpose of entry (road card, a copy of the order from the customer or trustee, etc.).

In the first half of 2008 by Wroclaw, during the day there are moving about 13,000 of trucks, of which it only accounted for 20% of transit. The rest were trucks deliveries a commodity in the city.

In November 2009, after the introduction of June 1, 2008, the tonnage of the zone bounded by Wroclaw moved over 10,000 trucks. Researching the main inspectorate of road transport showed that every third truck was overloaded.

The capital of Lower Silesia in the old town, bounded by a moat town, operates partly orderly movement of commercial vehicles (Fig. 13).

The organization of freight traffic is to:
- limit the size of vehicles: permissible mass of 3.5 t;
- limit the access time on the streets through the area: in the hour 6:00-9:00 and 18:00-22:00;
- charge for entry, despite the ban movement: 5 zł\(^1\) per application + 50 gr (for each attachment, e.g., due to weight, dimensions, etc.).

Places of landing vehicles are marked with signs of B-39, D-18a and P-20 supplemented with informational plaques text, respecting the execution of characters involved in municipal police (Fig. 15).

In a DORED program from the year 2005, 127

\(^1\)Polish native money, 1 złoty = 100 groszy.
Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research

points on 243 questionnaires distributed in the central area in Wroclaw City were distributed (Fig. 14, ring around centre).

In 2007, 227 points in Areas 1 and 2 in Fig. 14 were investigated, including the Market Hall 48 points, Area 3 on Fig.14. (Table 1). In the Market Hall, the hours of supplies are in hours 5:00-9:00 on Friday and 5:00-10:00 on Saturday [8].

Fig. 13 Zone restricted access vehicles in the center of Wroclaw [18].

Fig. 14 Graphical representation of the surveyed areas of the center of Wroclaw City in 2005, around 2007 [11].
Supply Problems of Sales Points Performance in City Centers:
Results of the DORED Program Survey Research

Fig. 15  Sign limiting the availability of the test zone.
Source: the author.

Fig. 16  Map of aggregate supply time for the chosen area of research (time is between Monday and Saturday, freight weight shows accumulation of mass of delivery from all measured trade points).

The weekly supply volumes generated for all points of sale—service, held in Wroclaw in the test, are about 170 t. Based on these results, the map of aggregate supply time from one week (Fig. 16) was drawn up. This logistics map of the supply gives a view for the supply in the peak hours on selected days.

Not applicable:
1. Deliveries for the market place in 5-9 hours (on Fridays and Saturdays 5-10)
2. Vehicles with an identifiers or with the single permission
3. Marked cars of the technical service also ambulances and convoys of transports the valuable shipments
4. Vehicles of disabled persons benefiting from the reserved places
of the week.

For the single trade point, it is possible to analyze and compare the amount and frequency of deliveries of supplies for each day of the week (Fig. 17). This allows to estimate the average size of a single delivery in the selected time of day.

The sample locations for suppliers of unloading sites proposed in Ref. [20] for a strict division of the old town in Wroclaw are shown in Fig. 18.

Objectives of the program DORED are presented on May 5, 2004 to assess the municipal authorities of the city of Wroclaw. These authorities in a letter dated from June 2, 2004 have expressed great interest in the program DORED. Since then, the current policies of city management is seen not want to apply the principles of city logistics.

### Table 1  Comparison of survey data from 2005 and 2007.

<table>
<thead>
<tr>
<th>Research studies from</th>
<th>2005</th>
<th>2007</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of points</td>
<td>127</td>
<td>229</td>
<td>356</td>
</tr>
<tr>
<td>Tonnage real(^2) (t)</td>
<td>120.3</td>
<td>169.19</td>
<td>289.49</td>
</tr>
<tr>
<td>Total tonnage(^3) (t)</td>
<td>920.5</td>
<td>1,568</td>
<td>2,488.5</td>
</tr>
<tr>
<td>Number of deliveries per week</td>
<td>548</td>
<td>795</td>
<td>1343</td>
</tr>
<tr>
<td>Capacity utilization rate</td>
<td>13%</td>
<td>10.8%</td>
<td>11.6%</td>
</tr>
<tr>
<td>The actual tonnage for delivery (t)</td>
<td>0.220</td>
<td>0.214</td>
<td>0.215</td>
</tr>
<tr>
<td>The maximum tonnage for delivery (t)</td>
<td>1.68</td>
<td>1.97</td>
<td>1.85</td>
</tr>
<tr>
<td>Number of pieces per week</td>
<td>5,632</td>
<td>9,707</td>
<td>15,339</td>
</tr>
<tr>
<td>The number of cars per week</td>
<td>462</td>
<td>795</td>
<td>1,257</td>
</tr>
</tbody>
</table>

Fig. 17  The frequency and volume of supply in the selected point.

\(^2\)Determined by the weight of cargo transported by delivery vehicle.

\(^3\)Aggregate capacity of delivery vehicles.
6. Conclusions

The presented results of the survey partially are connected with supply processes performance conditions. The carried out survey research allows for recognition of problems which can occur during supply processes being performed in the city centers, by questioning those who are in business, instead of municipal roads administration. The developed example should underline that the city council should listen, and not only to force solutions on citizens.

References


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Supply Problems of Sales Points Performance in City Centers: Results of the DORED Program Survey Research


