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BRING ME: SUSTAINABLE URBAN DELIVERY SERVICE FOR THE CITY OF GRAZ

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Abstract: A large proportion of urban transport results on private shopping. Alternatives to operate the first-/last-mile-logistics for urban shopping in a sustainable manner are often missing. In August 2014 a new, environment friendly and sustainable delivery service for City center of Graz started – named "bring mE". With this service, private shoppers have the opportunity to get their purchases delivered by cargo bicycles. The task of the ITL (Institute of Engineering Logistics) was to ensure a successful implementation of the delivery. For this purpose, the delivery service was evaluated after a period of 9 months and necessary improvement measures were derived. The result of the study shows that individual stores used the service for about 100 times during the period of evaluation. Furthermore, specific purchasing periods (Christmas, Easter) provided the highest usage for the delivery service. The conclusions derived showed the high potentials of the logistic solution.
Keywords: *City Logistics, Last Mile Logistics, Sustainable Logistics*

1. INTRODUCTION

1.1. "bring mE" delivery service

Traffic congestion in urban areas leads to an increasing stress on people and nature. A large part of urban transport accounts on private shopping [1]. Social trends, such as online trade and shopping centers in the city limits, contribute to an increase in traffic and negative environmental consequences of CO2 emissions, fine dust pollution etc. [2].

Part of this problem is a missing offer of alternatives to operate the last-mile-logistics in a sustainable manner. Solutions for sustainable customer delivery services in urban areas are not new, but still form a niche [3]. Most of these services are set by individual stores to their customers and often performed with "normal" combustion engine vehicles. In the City of Graz, with its historic center, it is a general scope to reduce delivery traffic for a long time of period. It is also important to support the traders and trading companies in the center and in total to make the urban city center more attractive for living [4].

In August 2014 a sustainable, user-friendly delivery service started in the City of Graz. The name of the delivery service is "bring mE" *(Figure 1)*. The service aims to private customers in the central urban area to provide sustainable delivery within the meaning of last-mile logistics. The delivery within the city is carried out with eco-friendly vehicles (e-cargo bikes, e-pedelecs) [5], [8].

Figure 1. Official logo of "bring mE" delivery service [6]

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The delivery service was implemented together with municipal, scientific and private partners. Furthermore, the implementation of the project was supported by the international SMARTSET project, co-funded by the Intelligent Energy Europe Program of the European Union [7]. The SMARTSET project developed and showed how freight transport in European cities and regions can be made more energy-efficient and sustainable by a better use of freight terminals *(Figure 2)*.

Figure 2. Partners meeting of project SMARTSET in the City of Graz presenting the sustainable "bring mE" delivery service [8]

Thus, the individual motorized traffic should be reduced within the city center and the opportunity to do shopping activities on foot, by bike or by public means of transport should be given [9]. Therefore multiple benefits are achieved with the services of "bring mE": Ecological delivery with e-vehicles and change of consumer behavior using public transport as well as attractiveness of downtown commerce and the entire urban habitat [10], [11].

1.2. Evaluation of the service

In order to guarantee a successful operation of the delivery service, ITL carried out an accompanying evaluation of the service. The evaluation of the service was funded by the Austrian Research Promotion Agency (FFG). With the evaluation, the concrete needs for a delivery service were collected by customers and shops. Furthermore, the economic development of the service was tested during the test phase. From the findings of the evaluation, improvement measures for the design and execution of the service were derived. The evaluation took place after a 9-month period of customer delivery service.

The content of this paper focuses on the following investigated areas:

- Business model of "bring mE".
- Statistical analysis for the evaluation period.
- Evaluation and improvement measures.

2. BUSINESS MODEL OF "BRING ME" DELIVERY SERVICE

2.1. Objective of service

The service model defined within "bring mE" was conceived in the preliminary project "eCiLo" [5], funded by the Austrian Research Promotion Agency (FFG), and can be described as follows: The delivery service serves the delivery of purchased goods from shop to retail customer (B2C). Deliveries of all kinds and sizes except refrigerated goods are supplied. The pricing of the service depends on the size of the goods and the distance of the delivery. For the simple design of the service allocation, three size categories and two delivery zones are defined.

The service can be ordered in the time window between 8:00 and 17:00. The subsequent collection of the goods in the shop takes place in the period between 17:00 and 18:00 and the delivery takes place in the time window between 18:00 and 21:00. To meet individual customer requirements, two different delivery time windows are available. The first time window extends between 18:00 and 20:00 and the second from 19:00 to 21:00. For an extra charge, delivery outside of these delivery times is possible.

In detail, the process of the delivery service can be described as follows *(Figure 3)*:

1. Service order by customer.
2. Service registration done by shop assistant.
3. Order management online with "bring mE" internet service portal (www.bring-me.at/).
4. Planning of collection and delivery route done by "bring mE" logistics dispatcher.
5. Collecting goods from the shop done by "bring mE" deliverer with cargo bikes.
6. Delivery of goods done by "bring mE" deliverer.

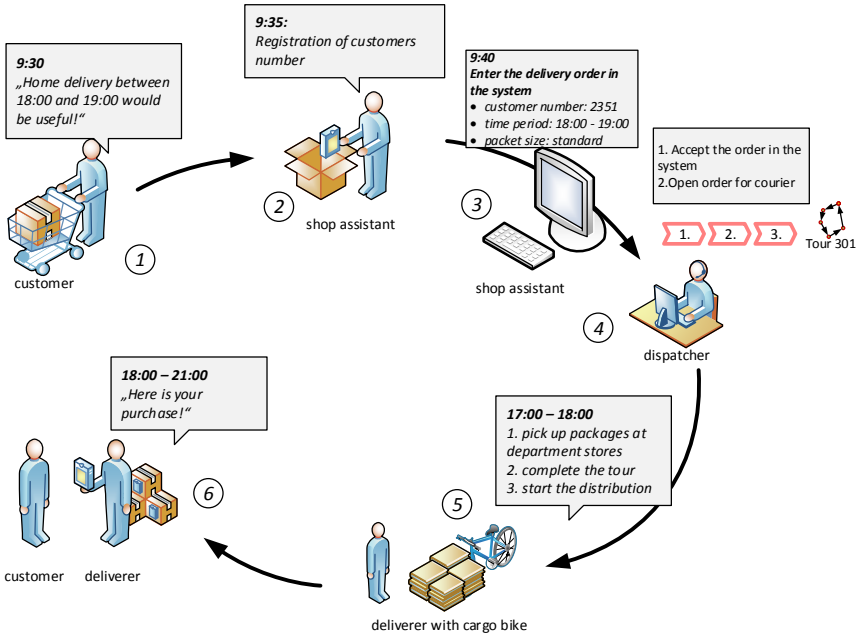

Figure 3. Service model of delivery service of "bring mE"

2.2. Resources and tour planning

The execution of the deliveries is done by messengers of the association "Veloblitz". There are about ten couriers available every day, which carry out the delivery tours. Three different cargo bicycles are available for the couriers. Each cargo bicycle has a loading capacity depending on the package sizes of 6 to 12 packages. The transport of parcels is carried out mostly in direct transport routines without intermediate storage of the goods.

2.3. Partners and pricing

The launch of the service took place in August 2014. The service was initially started with ten shops. The service marketing started especially by website, magazines, posters, folders and stickers *(Figure 4)*.

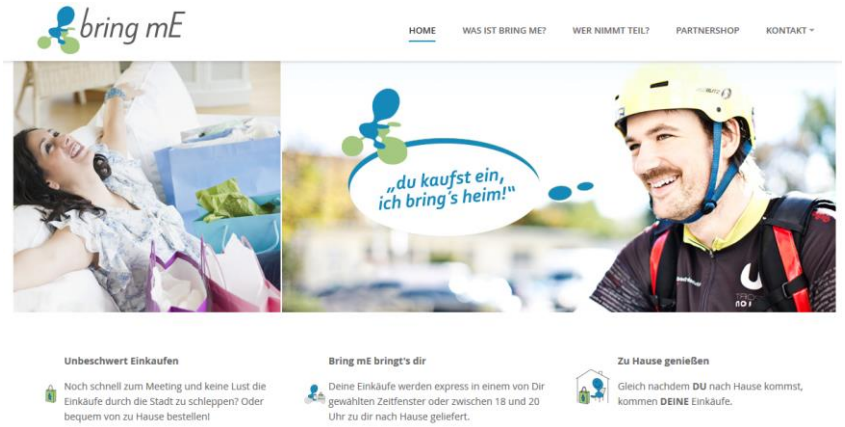

Figure 4. Website of delivery service "bring mE" [6]

The pricing of the service is according to delivery distance and package size. This results in four different price categories, which makes the pricing easy to understand. The service is payed either from the store or the customer. The customer pays for the service on receipt of the package. Delivery takes place throughout the City of Graz *(Figure 5)*.

Figure 5. Definition of delivery areas of "bring mE" within the City of Graz

Delivery zone I comprises the inner city area (districts 1 to 6), the delivery zone II comprises the outer city area (districts 7 to 17).

The following package sizes are defined within the service:

- Small: A4 cards with 32 × 23 × 30 cm / max. 10 kg;
- Medium: packing case with 58 × 35 × 30 cm / max. 20 kg;
- Special format: no restrictions.

All of the ten shops participating in the delivery service are located in the center of Graz: seven shops are located in the first district, three shops are located close to the first district. This simplifies the collection of goods within the pick-up routines between 17:00 and 18:00. Customer acquisition is done exclusively by the shops. The registration card includes name and address of the customers *(Figure 6)*.

Figure 6. Customer registration form

3. STATISTICAL ANALYSIS FOR THE EVALUATION PERIOD

Official start date of delivery service was in August, 2014. The customer and order data were analyzed within the evaluation period from 1st of September, 2014 to 31th of May, 2015 (corresponds to 273 calendar days and approximately 220 shopping days). Data collection took place via personal interviews and database extracts from the delivery service provider.

3.1. Customer development

Within the evaluation period, approximately 130 persons registered at the "bring mE" delivery service. The analysis of the number of new customers after calendar months in the evaluation period *(Figure 7)* shows that most customer registrations took place during the period before Christmas. The maximum number of new customer registrations was therefore for December 2014 (25% of total amount of new customers), the minimum was in April 2015 (4% of total amount of new customers).

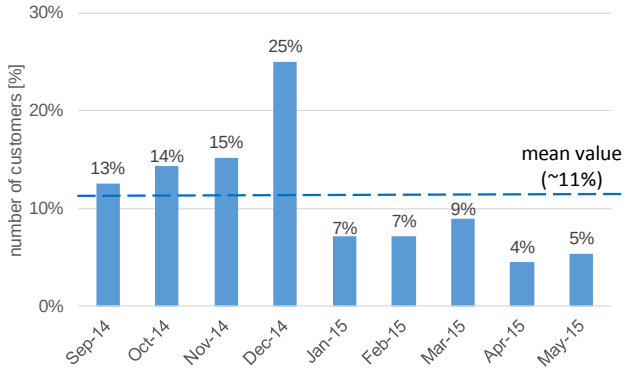

Figure 7. Number of new customers during the period of evaluation (September, 2014 to May, 2015)

3.2. Service Orders

3.2.1. Order volume for calendar months

The analysis of the order volume after calendar months shows that the purchasing period before Christmas (November and December) and Easter (March) provided the highest usage for the delivery service. The maximum of deliveries per month were in December (24% of total amount), and the minimum in April (5% of total amount). In total, the service was ordered about 150 times during the period of evaluation *(Figure 8)*.

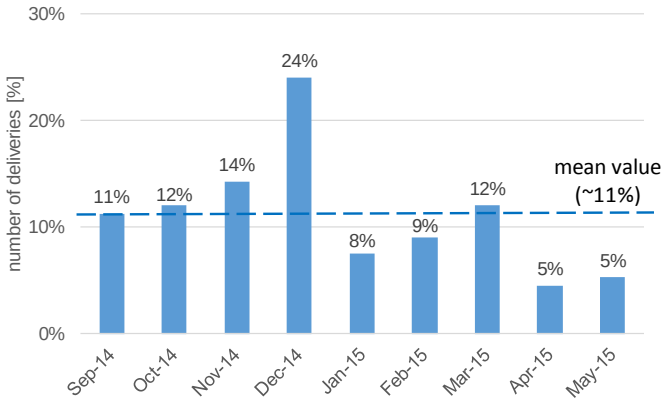

Figure 8. Number of deliveries during the period of evaluation (September, 2014 to May, 2015)

3.2.2. Order volume for weekdays

The evaluation of the order volume by weekday shows that the service is used primarily in the middle of the week (Wednesday, 22% of total amount) and not – as expected – on weekend (Friday or Saturday). In total, orders from Friday and Saturday (weekend shopping) account for 30% of total orders per week *(Figure 9)*.

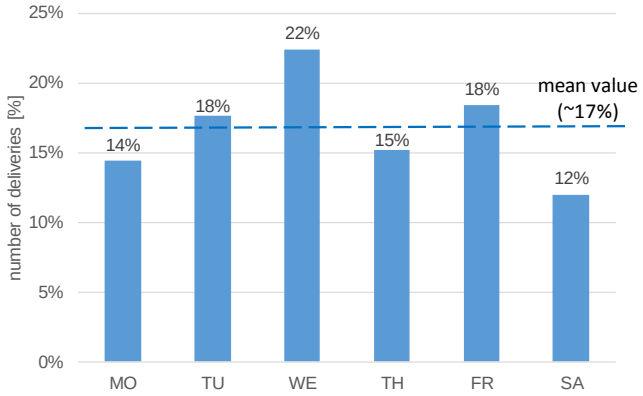

Figure 9. Percentage distribution of deliveries done per weekday (Monday to Saturday)

3.2.3. Order volume according to individual customers

About 13% of all customers used the service several times during the period of evaluation: 10% of the "bring mE"-customers used the service exactly two times and 3% of the customers used the service more than two times *(Figure 10)*. For example, the service was used six times by one specific customer.

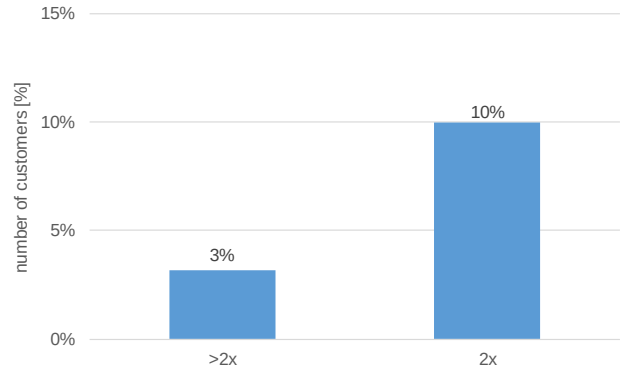

Figure 10. Number of multiple use of the service from individual customers

3.2.4. Order volume by package size

Three different package sizes were defined within the delivery service (see chapter 2.3). The package size within the period of evaluation variates as follows *(Figure 11)*:

- 38% of delivered packages are "small" size;
- 44% of delivered packages are "medium" size;
- 18% of delivered packages are "special" size.

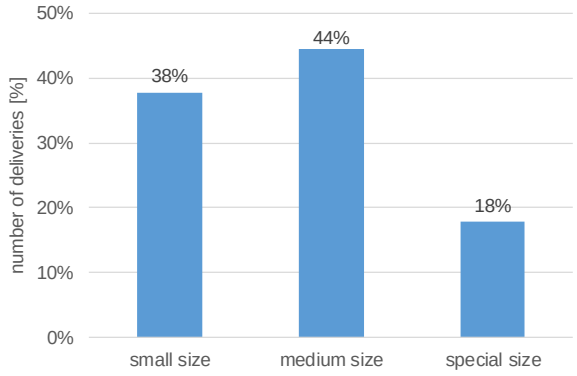

Figure 11. Percentage distribution of package sizes

3.2.5. Order volume by stores

Within the evaluation period the service was primarily used within four out of ten shops. Figure 12 shows the percentage distribution of delivery orders by single stores: One specific store caused 73% of total amount of deliveries.

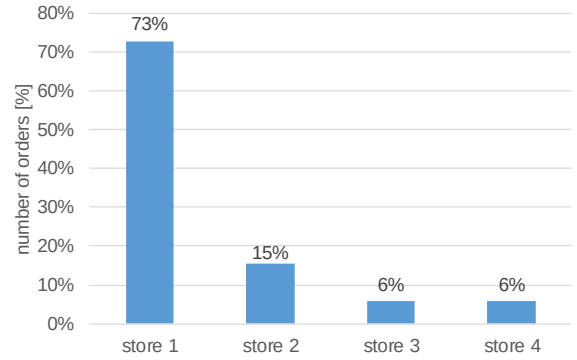

Figure 12. Percentage distribution of delivery orders of individual stores

Sector allocation of the listed stores:

- Store 1: household products store;
- Store 2: book store;
- Store 3: giftware store;
- Store 4: health care supply store.

The example of Store 1 shows, that a high customer demand for the service can be created by appropriate self-initiative of the shops (online advertising, store pays the costs) and depending on the shopping goods (medium size and weight). In many cases, an existing delivery service offered by the shops (e. g. by taxi) can be substituted by the sustainable “bring mE” service without any additional costs.

3.3. Cost absorption and delivery time

3.3.1. Cost absorption

The payment of the service is done either by the stores or the customers. Some stores assume delivery costs, usually depending on the purchase sum. For example, one of the partner stores offers a free delivery for regular clients in the City of Graz. The distribution of cost absorption for the deliveries show the following result *(Figure 13)*:

- 93% of deliveries were paid by stores;
- 7% of deliveries were paid by customers.

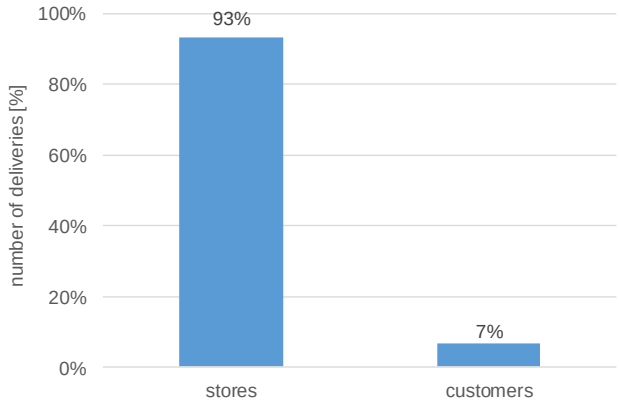

Figure 13. Percentage distribution of cost absorption for the delivery service

3.3.2. Delivery time

The following figure shows the distribution of the delivery time windows preferred by the customers *(Figure 14)*:

- 77% of deliveries were done in the time window between 18:00 and 20:00;
- 21% of deliveries were done in the time window between 19:00 and 21:00;
- 2% of deliveries were done in a separate time window (customer-determined).

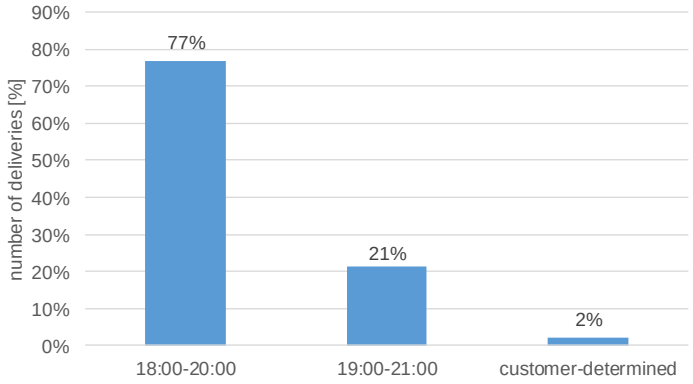

Figure 14. Percentage distribution of used time window for deliveries

4. EVALUATION AND IMPROVEMENT MEASURES

4.1. Current order situation

The low participation of the majority of "bring mE" partner stores (only 4 out of 10 stores used the service within the period of evaluation, see chapter 3.2) is one of the main problems, why the service has a relatively low order frequency. The analysis shows that there is no effect of order growth in the evaluation period despite rising customer stocks.

From the analytic results it is evident, that one single store is the driving force of the existing service within the evaluation period (with 73% of total amount of orders, see chapter 3.2). The extrapolation shows that, in case of a number of twenty stores with a similar request of the delivery service, there is a capability of about 2000 orders during the evaluation period. This would correspond to a weekly volume of approximately 50 orders.

4.2. Network of partners

Existing delivery services in shops, e. g. by taxi, can be optimally replaced by the "bring mE" delivery service. The service is especially interesting for shops located in the pedestrian zone (restricted accessibility by car), which have a medium-sized range of goods in medium price segment (product price about EUR 100). To enlarge their services, stores can offer the customer a cost-free delivery service (about 93% of the orders are paid by the shops, see chapter 3.3), in exchange it increases customer loyalty. For example, one of the stores offers its regular customers a free delivery in the City of Graz.

The shops in which the service is currently offered are selling mainly consumer goods and luxury goods, but fewer convenience products. The consequence is that the individual (at "bring mE" registered) customers enter these shops irregularly, which leads to an irregular use of the service by these costumers.

4.3. Pricing

Stores may expand their business services by offering a sustainable delivery service. The uncomplicated service and pricing structure creates transparency for stores and customers and reduces emotional barriers (too cumbersome, too expensive) when using the service.

The prices for the service appear relatively narrowly from economic point of view (statement from delivery service provider). This is why it is questionable whether the service can be operated profitably in case of insufficient capacity utilization or how the pricing will be defined in the future. Especially for packages of oversize format, it might be useful to define a further classification of prices.

In general, however, the more stops per tour can be realized, the better the utilization of the cargo bikes and the higher the resulting profit margin per stop. The problem which arises in the implementation phase of such services is that due to the missing awareness, no high order volume is to be expected.

4.4. Derivation of specific improvement measures

In order to increase the success of the service, the following improvement measures were defined in cooperation with the project partners, which were implemented within the remaining project term:

- Marketing measures
  - Gain additional partnerships for active participation (especially leading stores in the City of Graz).
  - Extended roll-out of the service driven by the City Management of Graz and initiatives to increase the awareness level of the service.
  - Special service offers for main shopping seasons during the year (e. g. Christmas shopping, Easter shopping).
- Strategic measures
  - Link the service with online shopping portal of the City of Graz.
  - Apply for funding of the service (until level of awareness is reached).
- Organizational measures
  - Simplify online forms, registration cards and order cards.
  - Create the opportunity to offer the service for all stores in the City of Graz through an open-ended Internet portal.

5. SUMMARY

Logistics services for the delivery of essential goods are increasingly developing into successful business models in European cities. These services form an important part in the area of sustainable last mile freight traffic [3]. The demands of the European Union on the reduction of fuel emissions in urban areas [12] can only be achieved by sustainable transport solutions. Here projects for sustainable urban logistics play an important role and are supported more and more from European support programs (like SMARTSET [7], ELTIS [16]) and national funding initiatives (Austrian Climate and Energy Fund [13]).

Meanwhile, the "bring mE" service is operating for over three years. Some measures were implemented for the economic success of the service due to the adaptation recommendations of the ITL. For example, the cost model was adapted to standardize and facilitate the pricing. The City Management of Graz applies the service on its homepage and promotes for example free deliveries in the Christmas business [14]. In addition, the Internet portal of "bring mE" for business registration was expanded and simplified. In the meantime, over 50 partner shops are actively involved in the delivery service and some of them offer a free delivery service as extended customer service. For the City of Graz, the service "bring mE" is a flagship initiative in the field of realizing sustainable urban logistics [8], [15].

The customer and order data were analyzed within the evaluation period from 1st of September, 2014 to 31th of May, 2015 (corresponds to 273 calendar days and approximately 220 shopping days). Additional analyzes (periods) should be added to increase the maturity level of further improvements.

The results of the project show the enormous potential of sustainable logistics solutions in urban areas. At the ITL, this potential has been recognized and we will focus on topics such as e-based logistics, sustainable urban cable cars, etc. in current and future research projects.

Acknowledgments

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