

# Benefit analysis

For Shopping bag cart

[www.pickdelso.com](http://www.pickdelso.com)

7.11.2017

# Introduction

- Analysis concerns a delivery service in which products are delivered to addresses specified by customers, for example, home addresses
- The products are, for example, grocery products
- A customer selects a delivery time window from options informed by a service provider
- **Assumption:** a customer has on each weekday (Mon-Fri) four delivery time windows to be chosen
- A time window starts, for example, 17:00 and ends 19:00 at which time a customer (or somebody) must be ready to receive shopping

# New implementation

- Boxes generally used in the delivery service are replaced with Shopping bag carts
- Capacity of Shopping bag cart is about 500 litres (one Shopping bag cart corresponds approximately with seven 70 litres box)
- Loading of the trunk of a delivery vehicle is getting easier, as well as emptying of the trunk after the delivery cycle
- A sortation stage between picking of products and loading of the trunk is omitted ([www.pickdelso.com/data/documents/Shopping-bag-cart.pdf](http://www.pickdelso.com/data/documents/Shopping-bag-cart.pdf))
- Benefit analysis concerns work of two employees, a picker and a deliver (the picker picks products and the deliver delivers the products to customers)

# Beginning and ending actions

- Beginning actions include loading of a delivery vehicle and driving to a delivery area (the delivery area is, for example, a part of a town)
- **Assumption:** the beginning actions take *half an hour* (the loading 5 min and the driving 25 min)
- Ending actions include moving from a delivery area back to a site where picking of products is performed
- In addition, the ending actions include emptying of the trunk of the delivery vehicle (Shopping bag carts are moved from the trunk to a store for a new picking cycle)
- **Assumption:** the ending actions take *half an hour* (the driving back to the picking site 25 min and emptying of the trunk 5 min )
- The beginning actions and the ending actions take altogether one hour

# Making analysis

- Benefit analysis is based on a calculation model that includes the following assumptions:
  - **service time** (includes the serving of a customer and the driving to the next customer)
  - **day capacity of Shopping bag cart** (number of bags to be delivered with one Shopping bag cart)
  - **investment value** (price of Shopping bag carts)
  - **employee hour cost** (includes a salary and employer payments)
  - **daily time saving** (work time which is saved by using Shopping bag carts)
- Note: realibility of the benefit analysis enhances, if real numbers are available instead of assumptions (all numbers in this analysis are assumptions)

# Times at delivery area

- **Assumption:** serving of one customer takes three minutes  
(the service begins from a parking of a delivery vehicle and ends when the delivery vehicle moves on)
- **Assumption:** travel from a customer to the next customer takes five minutes
- Time needed per a customer is 3 min + 5 min, thus **service time** is *eight minutes*
- According to one assumption the delivery time window is 120 min, thus it is possible to serve *15* customers (120 / 8 = 15)
- **Assumption:** customer orders *three* bags of products
- Capacity need is 45 bags ( $15 \times 3 = 45$ ), i.e. two carts (two Shopping bag carts and their sum capacity, 48 bags, is sufficient for a delivery cycle)

# Time saving in picking

- In the following Shopping bag cart is compared to a cart having drawer shelves (for example, in Great Britain employees use a cart, wherein boxes are arranged to three layers such that four of the six boxes are drawing boxes)
- Shopping bag cart has altogether *12* repositories on its lowest and the second lowest shelf (the volume of repositories corresponds to the volume of the four boxes)
- **Assumption:** on average *ten* products are placed into a bag in a repository
- **Assumption:** opening of a drawer shelf takes *one* second and closing of the drawer shelf takes *one* second
- The time saving for one cart is  $12 \times 10 \times (1 + 1) \text{ s} = 240 \text{ s} = 4 \text{ min}$  (4 min is saved, because the opening and closing of shelves is not needed during the picking)

# Day capacity

- As mentioned, there are *four* time windows in a day
- As mentioned, capacity need is *two* carts in a delivery vehicle  
(in the same time two other carts are used in picking of products, thus the investment comprises altogether four carts)
- Cart includes *18* repositories for bags (one repository per a shopping bag)
- The upmost shelf of the cart is intended for large-sized and light products and/or frozen food (the volume of the uppermost shelf is *six* bags)
- **Assumption:** cart is full including *24* bags of products (it is possible to fill the cart almost each picking cycle, because some of the orders include only one bag)
- Then **day capacity of Shopping bag cart** is  
 $4 \times 2 \times 24 \text{ bags} = 192 \text{ bags}$

# Costs

- **Assumption:** employee's salary (concerning a picker or a deliver) is 2000 €/kk
- **Assumption:** because of employer obligations, the salary is multiplied by 1.5 and therefore the *employee month cost* is 3000 €
- One month includes on average 150 work hours, thus an **employee hour cost** is 20 €/h
- **Assumption** for shopping bag cart costs:
  - one cart costs 1000€
  - with four cart **investment value** is 4000 €

# Daily time saving

- Carts are used daily *four times* in picking, because there are four delivery time windows
- Each time the picking is *eight* minutes faster, because two carts are used in the picking (i.e. four minutes faster, per cart, compared to the cart commonly used in Great Britain)
- Sortation stage, which ends each picking cycle, is not needed when using Shopping bag carts
- **Assumption:** due to the missing sortation stage *six* minutes are saved (three minutes per cart)
- **Assumption:** loading of a delivery vehicle is *one* minute faster and its emptying is *one* minute faster than before
- **Daily time saving** is  $4 \times (8 + 6 + 1 + 1) \text{ min} = 64 \text{ min}$  (i.e. 1.066 h)

# Benefit

- One year comprises 52 weeks, five weekdays per week, thus time saving in year is  $52 \times 5 \times 1,066 \text{ h} = 277,16 \text{ h}$  (this time saving concerns two employees, a picker and a deliver)
- As mentioned, **employee hour cost** is 20 €/h and thus saving in year is 5543€ ( $277,16 \text{ h} \times 20\text{€/h} = 5543\text{€}$ )
- As mentioned, **investment value** (for four Shopping bag carts) is 4000€, thus after one year an effect of the investment is positive  $5543\text{€} - 4000\text{€} = 1543\text{€}$
- After the second year, the effect of the investment is 5543€ positive per year
- After three years, the saving is 12629€

# Remarks

- This analysis can be utilized in new calculations – by changing the assumptions the benefit changes
- These costs are not taken into account in the analysis:
  - costs caused by information system changes
  - training of employees
- These advantages are not taken into account in the analysis:
  - **Shopping bag carts make the work lighter** (there is no need to pile boxes and lift the boxes by hands)
  - **Shopping bag carts make the work more reliable** (a position of each bag remains in a cart from picking to a delivery, thus errors in the delivery are very improbable)