

# Benefit analysis

For semi-automated delivery point

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# Introduction

- Benefit analysis concerns a semi-automated delivery point that includes Takeout wall (In addition to the automaton, i.e. Takeout wall, at least one customer servant serves at the delivery point.)
- **Assumption:** a customer has on weekdays four time windows to be chosen for collecting shoppings (Efficiency of Takeout wall can be increased by increasing the number of time windows per day)
- On rush hours the time windows are shorter, for example, two hours and otherwise the time windows are longer
- A time window starts, for example, 15:00 and ends 17:00 (and within the time window the shopping are expected to collected at the delivery point)

# Making analysis

- Benefit analysis is based on a calculation model and assumption values for the following parameters:
  - **employee year cost** (includes a salary and employer payments)
  - **investment value** (this is a sum of Takeout wall costs)
  - **leasing payment** (leasing is an alternative for owning Takeout wall)
  - **day capacity of Takeout wall** (number of bags to be delivered by Takeout wall)
  - **daily time saving** (work time which is saved by using Takeout wall)
- Note: Reliability of the benefit analysis enhances, if real values are available instead of the assumption values

# Costs

- **Assumption:** employee's salary is about 2000 € per month  
(The employee works at service desk in the delivery point)
- **Assumption:** because of employer obligations, the salary is multiplied by 1.5 and thus the month cost is 3000 € and **employee year cost** is 36000€
- Takeout wall cost estimates are:
  - A wall part, which comprises locker doors for two carts, costs 10000€
  - Each cart costs 1000€
  - With six carts **investment value** is 16000 € (Because there are more carts than parking places at the wall, picking of products can be performed beforehand, if needed.)

# Day capacity

- On weekdays, a customer can choose among *four* time windows (see slide 2)
- *Two* carts at a time are parked at the wall (see slide 4)
- Cart can receive 18 shopping bags on its three lowest shelves
- In addition, the upper shelf of the cart can receive shopping so that the volume of the upper shelf is six shopping bags
- Therefore, the cart can carry  $18 + 6$  shopping bags
- The cart is expected to be full including 24 shopping bags of products
- On weekdays, **day capacity of Takeout wall** is  $4 \times 2 \times 24$ , i.e. 192 shopping bags

# Times

- The following *average times* are needed for calculating **daily time saving** (the all average times are assumptions):
  - 1) serving one customer takes an average one minute (The serving begins with greetings and ends when a customer has got the shopping)
  - 2) there is one minute waiting time between two consecutive customers – this is so-called idle time
  - 3) changing of a cart at Takeout wall takes one minute
  - 4) a cart is more efficient than a present picking cart, which results in one minute time saving
- On the basis of the times 1) – 4) an employee serves within two minutes an average one customer (Note: the times 3) and 4) concern one picking cycle and their effect together is 0 minute)
- Therefore, a **time per customer** is two minutes

# Daily time saving

- Day capacity of Takeout wall is 192 shopping bags (see slide 5)
- Assumption: a customer orders an average three shopping bags of products
- Then Takeout wall can serve daily  $192 / 3 = 64$  customers and the time saving per day is calculated as follows:  
number of customers  $\times$  time per customer
- Therefore, daily time saving is  $64 \times 2 \text{ min} = 128 \text{ min}$ , i.e. 2.13 hours each weekday
- A time coefficient is thus  $2.13 / 7$ , wherein 7 is the length of a workday in hours and the value of time coefficient is 0.30

# Benefit

- If a shop or some other company, which uses Takeout wall, also owns Takeout wall, the benefit is calculated:

$\text{time coefficient} \times \text{employee year cost} - \text{investment value}$

- In the first year there is no benefit because

$$0,30 \times 36000 \text{ €} - 16000 \text{ €} = - 5200 \text{ €}$$

- After the first year  $\text{investment value}$  can omitted from the calculation and the benefit is:  $0,30 \times 36000 \text{ €} = 10800 \text{ €}$

- If Takeout wall is leased, the benefit is calculated:

$\text{time coefficient} \times \text{employee year cost} - \text{leasing payment}$

- Assuming that the leasing payment is 6000 € per year, the saving per year is  $0,30 \times 36000 \text{ €} - 6000 \text{ €} = 4800 \text{ €}$



# Weekend sale

- **Assumption:** a customer has at weekends five time windows to be chosen
- Then Takeout wall can include at weekends  $5 \times 2 \times 24$  i.e. 240 shopping bags
- A customer orders an average three shopping bags, thus Takeout wall serves at weekends  $240 / 3 = 80$  customers
- The number of customers per day is 64 (see slide 7)
- 80 weekend customers can be divided (in this calculation) among five weekdays and therefore the time saving is:  
 $(64 + 80/5) \times 2 \text{ min} = 160 \text{ min}$ , i.e. 2.67 hours
- A **time coefficient W** is  $2.67 / 7$ , wherein 7 is the length of a workday in hours and the value of **time coefficient W** is 0.38

# Benefit with weekend sale

- If a shop or some other company, which uses Takeout wall, also owns Takeout wall, the benefit is calculated:

$\text{time coefficient} \times \text{employee year cost} - \text{investment value}$

- In the first year there is no benefit because  
 $0,38 \times 36000 \text{ €} - 16000 \text{ €} \approx - 2300 \text{ €}$
- After the first year  $\text{investment value}$  can be omitted from the calculation and the benefit is:  $0,38 \times 36000 \text{ €} \approx 13700 \text{ €}$
- If Takeout wall is leased, the benefit is calculated:  
 $\text{time coefficient} \times \text{employee year cost} - \text{leasing payment}$
- If a leasing payment is 6000 € per year, the cost saving per year is  $0,38 \times 36000 \text{ €} - 6000 \text{ €} \approx 7700 \text{ €}$

# Remarks

- This analysis can be utilized in new calculations – the benefit changes by changing the assumption values
- The following costs were not considered in the analysis:
  - costs caused by information system changes
  - training of employees
  - costs caused by possible faults of Takeout wall
  - maintenance costs of Takeout wall
- These advantages were not considered in the analysis:
  - **Takeout wall makes the work lighter** (There is no need to lift shopping bags by hands into lockers of an automaton, which probably decreases sick leaves.)
  - **Takeout wall makes the work more reliable** (A position of each bag remains in a cart, thus errors in Takeout wall delivery are very improbable.)