smartSTORE
A SYSTEM FOR INNOVATIVE LUGGAGE STORAGE SERVICES AT RAILWAY STATIONS

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Each chain is only as strong as its weakest link!!

Customer satisfaction is very important along the whole mobility chain
Passengers have to stay more or less long on the station

• Before train departure
• Changing trains, transfer time

Waiting time …
• has an influence on comfort → modal split
• is felt subjectively!
• has to be reduced (subjectively)!
• Stations are mutating more and more into **shopping and entertainment centres**

• *We do have to care about the basic needs of passengers*

• shopping and entertaining possibilities
  
  ⇔ conflict with luggage
  
  ⇔ its hardly possible to use attractions

→ easy short term luggage deposing is necessary
Some illustrations
shopping – eating/drinking – luggage
Waiting passengers – potential shoppers
If the waiting time is longer than 30min:

- → ~25% prefer shopping
- → ~30% prefer going to a bar or restaurant
Impairments because of luggage

About 40% of all passengers who prefer shopping or visiting a bar or restaurant feel **impaired** because of their **luggage**.

Would you feel impaired because of your today’s luggage when following the planned activities?
Impairemants because of large luggage

60% of passengers with heavy luggage feel impaired while waiting.

Would you feel impaired because of your today's luggage when following the planned activities?
80% wish to have an easy handling luggage storing possibility at the station for shopping etc. without luggage.
Requirements: costs for short term locking

- 1/3 is willing to pay 2€ or more
- 1/3 is willing to pay 1€
- 1/3 is not willing to pay
Requirements: costs for short term locking

- **Inhibition threshold**: between paying anything or paying nothing
  - even 1€ can be too much
  - short term locking (up to two hours) must be offered **for free**
  - benefit because of indirect return

- More passengers **without luggage**
  - more **shopper**
  - more **spent money**
  - more **benefit** for the station operator
Requirements: costs for one day locking

- Only **15%** are **not** willing to pay more than **1€**
- **1/3** is willing to pay **2€**
- **1/3** is willing to pay **2-4€**
Requirements: time need for luggage return

- **25%** are **not** willing to wait longer than 1 min
- **50%** are **willing** to wait between **1 min** and **3 min**
Requirements: time need for luggage return

Problem of luggage return time need:

- **Subjectively** felt time
- Passengers in a **hurry**
- Before **train departure**

→ 1min can feel like 5min

- For technical systems: **Counter** for seconds
• Passengers **do not want** to lift their luggage
  • 2/3 of female passengers want to store **at floor level**
  • 50% of female passengers **are not able** or **do not want** to lift luggage

→ Storing at **floor level** is a **must**!
basic knowledge about luggage size

< 65 cm
< 35 cm
< 85 cm
< 43 cm
< 100 cm
< 30 cm
< 35 cm
Conclusions

Luggage storing in the stations is necessary

- Passengers have the wish of storing luggage, also short term
- Short term locking must be offered for free (long term 2 € to 4 €)
- Handling time not longer than 1 min
- Storing must be as easy as possible
- No lifting of the luggage!
- Size of lockers, extra sized luggage!

- Benifit for railway and station operators
  - more shopper → more benefit for the station operator
  - More satisfied customers
The smartSTORE concept

- is designed as a self service automatic system
- for short term and long term storage of traveler’s luggage
- at railway stations and at hot spots of public transport.

- Targets:
  - Utilization of unused free space in railway stations
  - Increase of safety and comfort for travelers
  - Increase of the attraction of public transport in general.
The smartSTORE system is a concept, both technically and economically researched and tested for feasibility, which can be used not only in the planning of new stations, but also for existing buildings or even in a mobile version.

Through the development and deployment of innovative technologies and service concepts the attractiveness for frequent use shall be enriched for travelers and all other groups of people (including handicapped or disabled persons).
The smartSTORE technology

• is a answer to meet the demands and challenges of modern luggage depot services at railway stations.
• includes a completely new boxing system and a handling robot
• is designed to handle luggage and packages of different sizes
• in an automatic self service installation.

smartSTORE types

• in house: Fixed installation for railway stations and airports
• mobile: Mobile containers for small railway stations, public events like conferences or open air sport events, festivals, …
The smartSTORE concept is developed as research study in a cooperation between three Austrian research partners:

- Upper Austrian University for Applied Sciences
- University for Applied Sciences St. Pölten
- netwiss GesmbH

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User requirements

• Physio-friendly and ergonomic operation
• Baggage check-in and check-out must be possible at waist level (lifting of luggage is uncomfortable and undesirable).
• Barrier-free equipment for people with age-related or technical restrictions (disabled)
• Anthropometric requirements result in:
  • Max. width of gripping area: 140 cm in width.
  • Lifting support of luggage: The height of the check in/out station shall be adaptable to demands of individual bodies.
  • Location of the displays: at a height of 70 cm to 1,125 cm.
Cognitive system demands

• Interactive user interface (touch screen) to carry out all functions for the inputs and release of luggage
  • check in, financial clearing and check out
  • multi-lingual menus using pictograms also for colorblind people.
• User-friendly and logical operating dialogues
  • appropriate to common expectations

Demands for security and comfort

• Height adjustment of check in/check-out station.
• Rounded bearing edges for protection from bruises
• Automatic control of the emptiness of storage boxes after check-out.
• Display of filling weights (with limitation of the maximum weight).
Technical requirements

- **In house installation:**
  - Modular design to be adaptable to many different structural conditions in various railway station buildings and airport terminals.

- **Mobile container:**
  - For flexible use in small stations or for public events.

- **Similar handling and storage technology for both versions:**
  - check in / check out stations
  - handling and storage of differently sized boxes
  - automatic transport and storage equipment (“automatic small parts warehouse”)

- The most effective variant solution found for a 40 'ISO container includes a maximum storage capacity of 80-120 variable sized storage boxes (depending on the degree of filling).
Requirements for the storage boxes:

- Sealed storage boxes to contain:
  - hard shell packages (suitcases, computer bags)
  - soft packages (shopping bags, clothes, flowers, ...)
  - single goods (umbrellas, ...)

- Cleanness:
  - boxes shall be washable

- Target dimensions:
  - size-adaptive boxes (to get optimum use of very limited storage space) for the big cube variety of different sized bags
    - → fix width 60 cm, two depth: 70 / 100cm,
    - → variable height (30 to 60 cm).
Tote boxes with top covers with dynamic height adaption
- stable, without wearing parts
- integrated pulling /pushing grooves for handling in automated warehouse
- Tote Box 1: 1000 x 600 x 300-500 (adjustable)
- Tote Box 2: 750 (800) x 600 x 300-500 (variable)
Storage system with standard AS/RS elements:

- Racking system in sliding drawers principle
  - to store the height adaptive boxes
- Storage and Retrieval system
  - variable height positioning
  - specific load handling device with box grabbers

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Storage system: Top view

- Very condensed construction
  - to utilise minimal space
- Simple warehousing process with cube utilising strategies
  - Automatic space consolidation to gain place for big boxes
  - Specific load handling device with box grabbers
  - High speeder to meet performance expectations
Storage system: check in / check out stations

- Automated conveyor for in and out transfers
- Height adjustable to meet user requirements
- Easy to handle
- Touch screen terminals with user friendly dialogues

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Storage system: Special equipment

- Automated box toper and untoper for the sealing of the boxes

- Automated cleanliness check
  - Optical reference check to identify box pollution (e.g. liquids)
  - Wide angel infra red camera

- Anti terror security check
  - Optional baggage screening and explosive detection
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INNOVATIVE & ECONOMIC

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