

AIR CARGO CONFERENCE

Digitization, what's next – from mobility to aviation

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« Tout le malheur des hommes vient d'une seule chose, qui est de ne savoir pas demeurer en repos, dans une chambre. »



Blaise Pascal

1623 - 1662

“All of humanity's problems stem from man's inability to sit quietly in a room alone.”

THIS TALK'S „FLIGHT PLAN“

- mobility trends
- technology changes behaviour
- current situation baggage
- motivation and vision
- solution approach and added value
- expected challenges
- next steps

Mobility

In the EU:

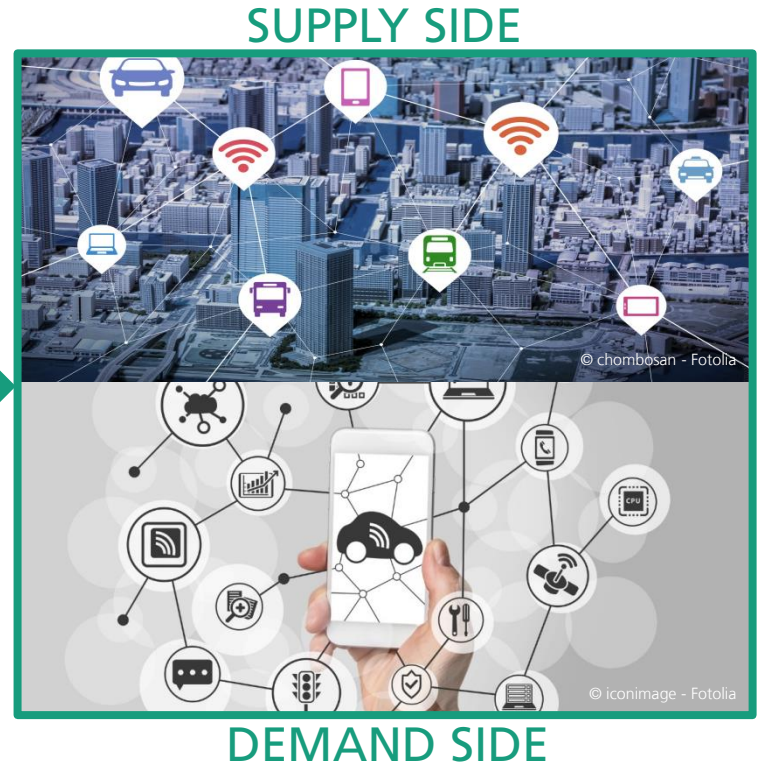
- the car is the most important mode with > 70% of the modal split¹
- .. but our mobility differs a lot by region and by individual²
- mobility, measured as passenger-kilometers, amounts to 6,592 billion pkm¹
- road transport alone causes about 26,000 fatalities per year¹
- 40% of the worst traffic jam hotspots in Europe are in Germany with average duration from 24 to 94 minutes³
- car ownership will decrease - connected mobility, public transport & sharing services will gain market share



Source: ¹[European Union 2016]; ²[MiD 2008 infas, DLR]; ³[INRIX2017]

A changing market ! .. quantity or quality ?

- expected growth of passenger transport volume >10% to 2025¹
- economic costs of congestion and traffic jams by 2025 ca. 200 billion €²
- ~ 60% of the world's population will be living in urban areas by 2025³
- >150 million vehicles will be connected to internet by 2020⁴



Source: ¹[European Commission 2016]; ²[INRIX 2016]; ³[United Nations 2014]; ⁴[IHS 2013]; ⁵[Navigant Research 2014]

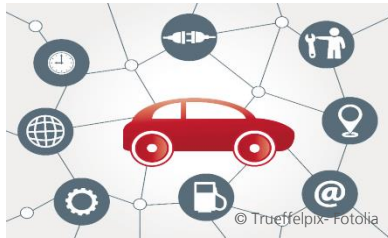
The influence of technology

60 mio. €
AR-market¹



2/3 of us are
smartphone users⁴

48 mio.
vehicles connected
to the internet²



90 % use
smartphones for
information and
ticket services⁶

85% have access to
internet⁵

economic value of
data 300 billion €³



mobile phone
access the internet
drives "shared
mobility" apps and
investments

Source: ¹[Deutsche Bank Research 2015]; ²[Oliver Wyman/Statista 2017]; ³[European Commission 2017];
⁴[eMarketer2014/Statista 2017]; ⁵[Eurostat 2017]; ⁶[SPLENDID RESEARCH/Statista 2017]

Changing travel

- In Germany, France and Great Britain there was a **decrease of driving licence ownership** of 3.5 % on average between 1996 and 2008¹
- The world's **sharing economy** is estimated to grow from 11.9 billion Euros in 2014 to 283.8 billion Euros by 2025²
- Europeans are using the internet > 27 hours per month, more than 3/4 every day³
- > 440 million people worldwide use online booking for travelling⁵

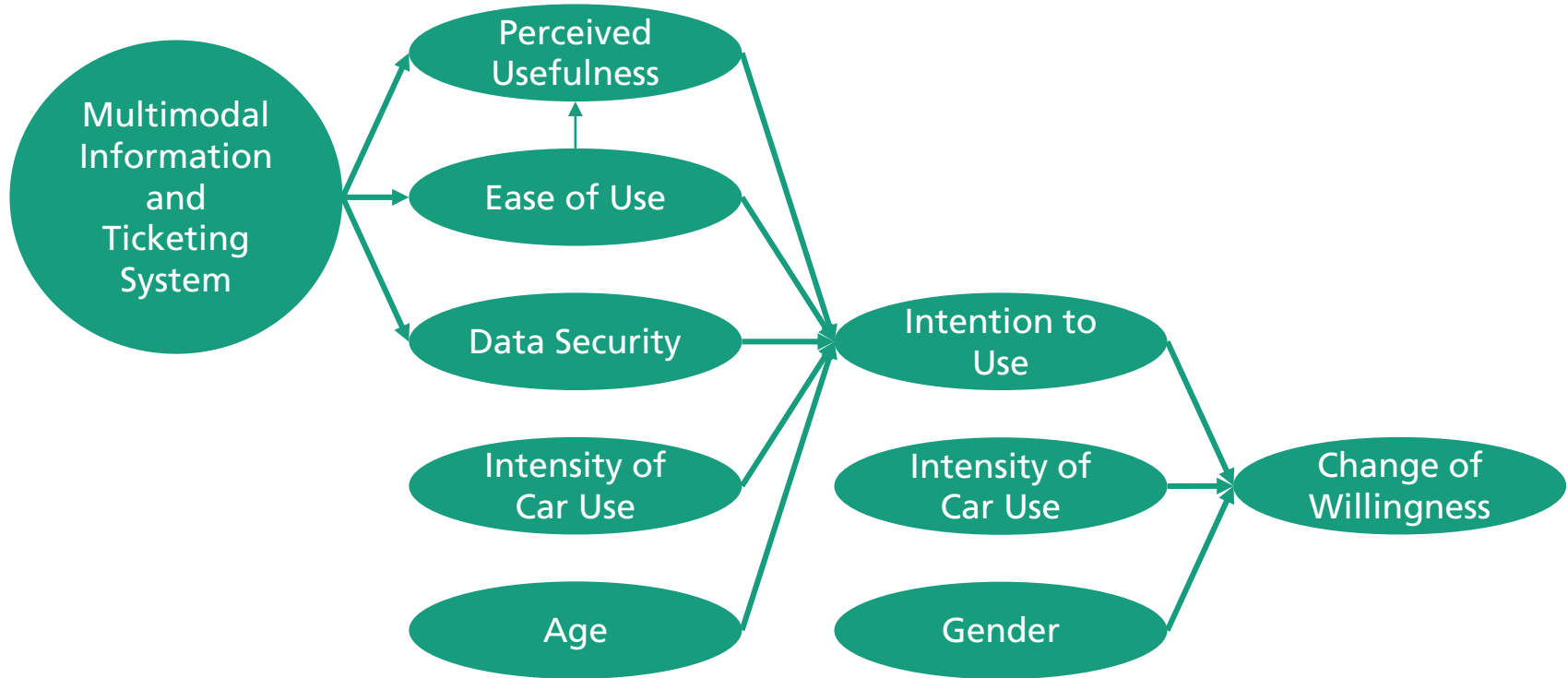
Determinants of modal choice⁴

- Price
- Reliability
- Availability
- Safety
- Journey duration
- Comfort
- Freedom to move around
- Flexibility
- Opportunities for taking luggage

Source: ¹[ifmo 2011]; ²[Brookings Institution India Center 2017]; ³[comScore/ Statista 2017]&[Eurostat 2017]; ⁴[AWT 2014]; ⁵[Statista 2016]

Can technology change behaviour?

empirical evidence – The influence of a multimodal trip companion on modal choice



Technology meets behaviour

Insights from research:

RadAR+ Travel assistency in dynamic environments with augmented reality

Using smart devices for real-time information

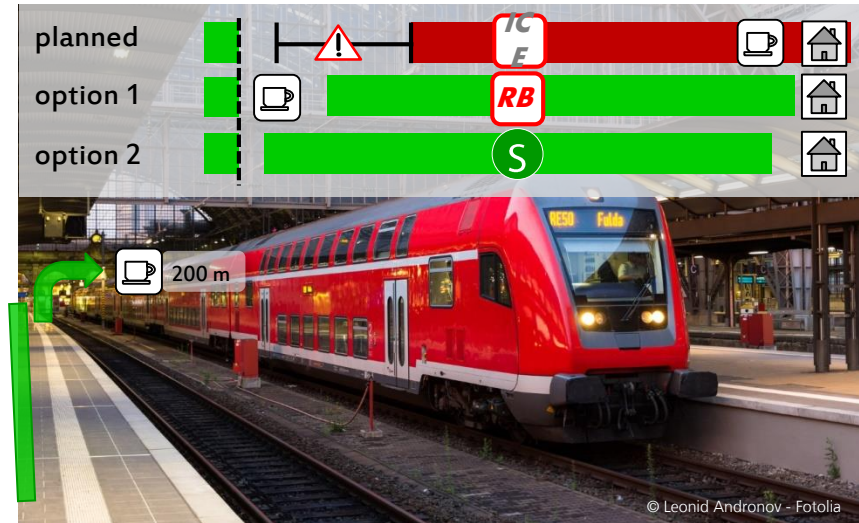
→ adaptive and user-centered

Example Augmented Reality for traveller navigation:

- Delay in planned trip occurs
- Mobility agent suggests alternatives:

Option 1: according to the user habits:
with coffee break

Option 2: earlier arrival time without a
break

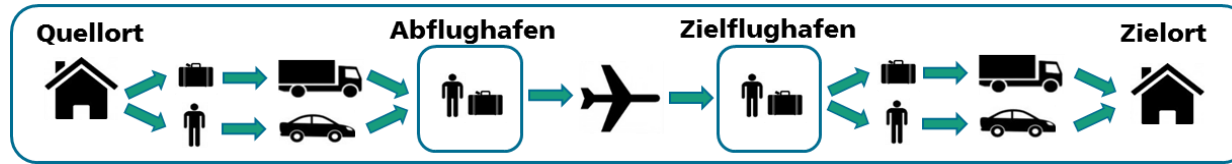


Current situation “types of traveler”

- today's segmentation of travelers is based more and more on psychological criteria (value- and conviction-based behaviors)
 - segmentation is focusing on increasing demand for individual experience with appropriate offers to the travelers
 - demographic change and inclusion of people with disabilities increasingly focused
 - even business travelers and families have increasing demands for comfortable travel
- increasing number of travel types with different price sensitivity for baggage products



Current situation “non-integrated baggage transport”

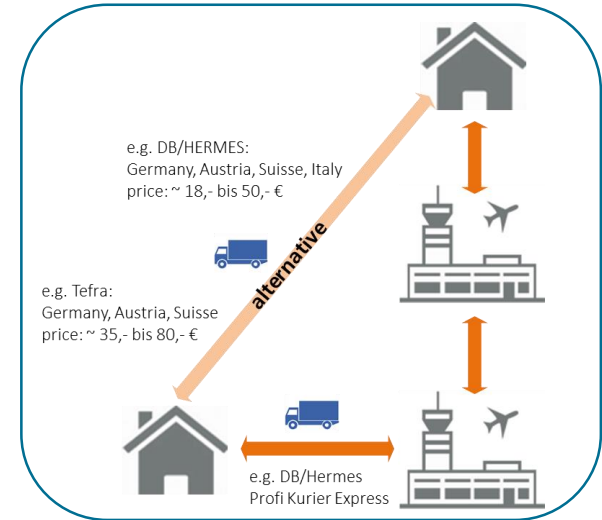


- in Germany > 220 million arriving and departing airline passengers
- organize their baggage transport “pre-and post-processes”
- some ground service provider already offer a separate baggage transport in the pre-and post-process

→ But door-to-door baggage transport is characterized by large number of separate actors

→ isolated IT solutions and low data integration

→ passengers still have to drop-off & pick-up their baggage at airport personally



Current situation “integrated baggage transport”

CAT
CITY AIRPORT TRAIN



British Airways partners with AirPortr to bring the 'bag drop' to the passenger's doorstep



service by Messe München in cooperation with Lufthansa



- single and isolated offers for an integrated baggage transport already exist for departing passengers
- an integrated baggage transport for arriving passengers is not known so far

→ in a few cases, passengers do not have to drop-off their baggage at airport any more

Hamburger  Abendblatt

HAMBURG

Ohne Koffer zum Kreuzfahrtschiff

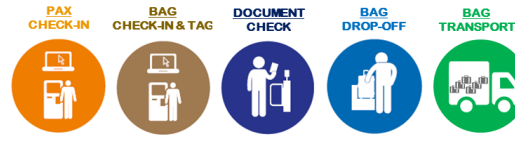
Von Martin Kopp

Gepäck wird schon am Heimatort aufgegeben. Hamburger erforschen Methoden zur automatischen Zustellung

Current situation “common use self services technology”



- airline-independent self-service terminals
- dynamic and flexible use
- reduction of staff, space and costs
- predestined for off-airport solutions
- causes a changed terminal design



Current situation “baggage technology”

display with barcode



Images: Rimowa, FastTrack

barcode & RFID



Images: BAGTAG, Lufthansa, Delta

RFID only



Image: Quantas

tracking & other features



Images: Samsonite, Globatrac, Delsey

- AUTO WEIGHT
- INSTANT BATTERY RELOAD
- ONBOARD DETECTION
- INSIDE LIGHTING SYSTEM
- FLIGHT INFO



- FINGERPRINT ID
- CHECK LOCK
- WEATHER FORECAST
- INSIDE SPEAKER
- TRIP INFO

- identification of baggage by means of paper labels & barcodes is still international standard
- RFID without (digital) barcode in domestic legal frameworks only (e.g. Quantas)
- increased development of digital tags, permanent IDs, different sensor, storage and transmission techniques for baggage

Motivation for “Smart Baggage Services 4.0”

- baggage handling service provider are insufficiently equipped to meet the needs of different travel types
 - more convenient and flexible travelling through unaccompanied and independent baggage transport
- so far incomplete baggage tracking and inadequate process transparency throughout the whole baggage supply chain
 - status of baggage should be known to the passenger and agents at any time
- comfort-, quality losses and additional costs as well as high effort for baggage handling
 - reduction of baggage misshandling rates and individualization of service

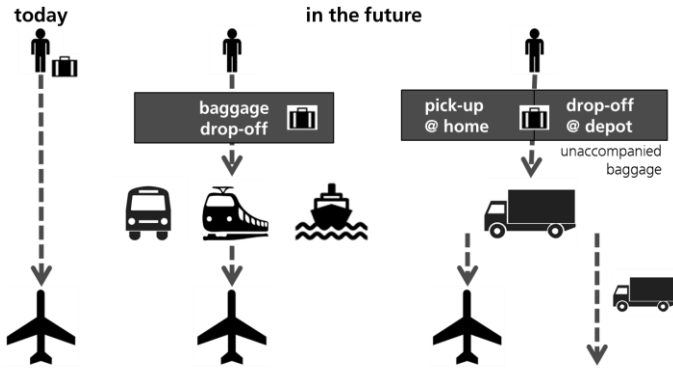
Industry 4.0 - everything becomes autonomous



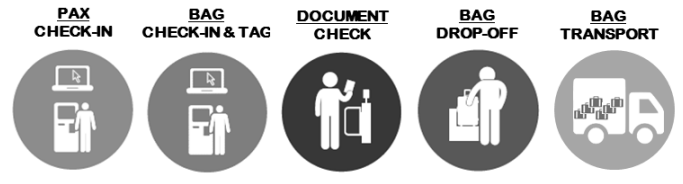
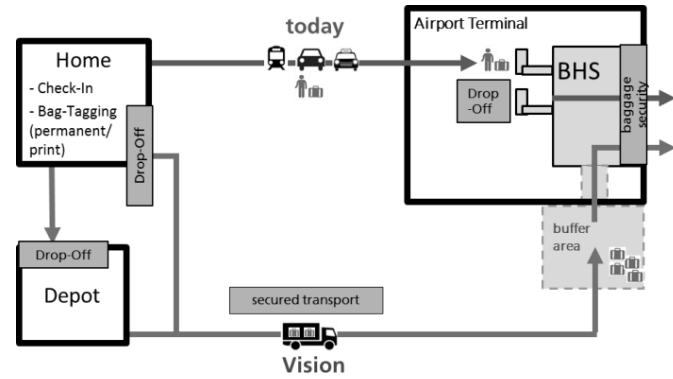
transfer of industry 4.0 principles and technologies to baggage transport



The vision of "Smart Baggage Services 4.0"



support of the service provider, to enable an individualized, integrated and transparent overall door-to-door baggage transport











	PAX CHECK-IN	BAG CHECK-IN & TAG	DOCUMENT CHECK	BAG DROP-OFF	BAG TRANSPORT
off-Airport	✓	✓	✓	✓	✓
@ home	✓	✓	✓	✓	✓

The vision of "Smart Baggage Services 4.0"

introduction of a history record for baggage throughout the whole lifetime regardless of service providers, means of transport, etc.



- ✓  Bag checked in
- ✓  Bag sorted
- ✓  Bag passed security
- ✓  Bag loaded into container
- ✓  Bag reflighted
- ✓  Bag loaded on aircraft
- ✓  Bag offloaded
- ✓  Bag arrived

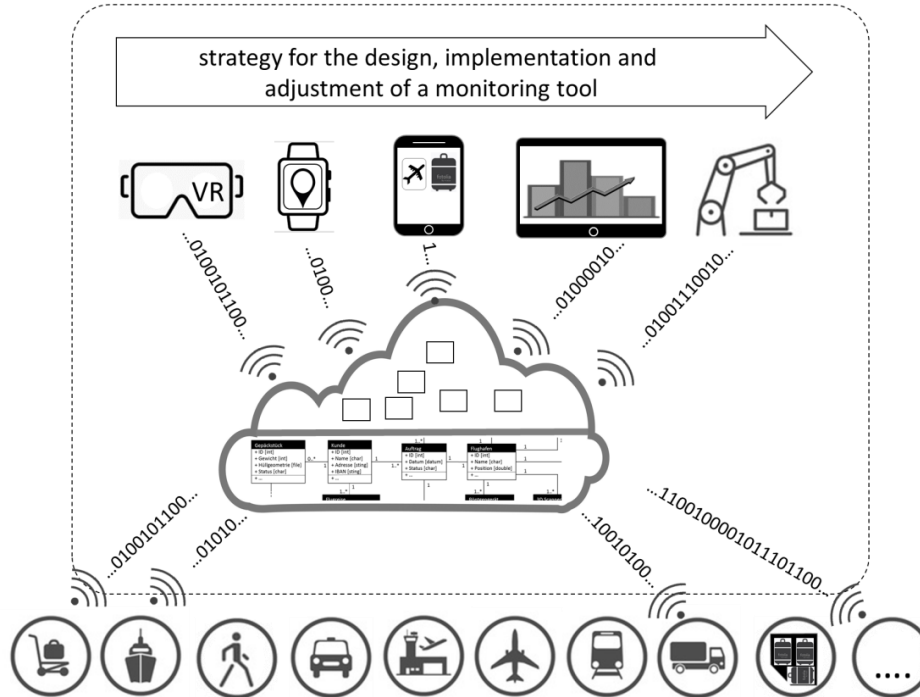
introduction of interaction between travelers and service providers to control baggage-flow before, during and after transport

Our approach: Creating a “digital baggage twin”

- complete **digital image** of the physical baggage
- description of an open and system-wide reference data model
- modeling of all relevant raw data of a piece of baggage from product development to end-of-life:
 - **product development:** e.g. shell geometry, material characteristics
 - **production phase:** e.g. production day, production number, life-time permanent ID
 - **use phase:** e.g. owner registration & change, tracking and location data, source and destination, packing weight, baggage content, security status, travel day, condition/damage, optical footprint
 - **disposal:** e.g. inactivity, disposal date

Our concept is based on a 4-layer architecture

standardized and open modular system for systematic transformation of production and administrative system data



adaption
needs

Smart Baggage Services 4.0 = reporting, monitoring, decision-making, support of autonomous end-to-end baggage supply chain processes (first approaches available)

NEW

standardized data consolidation and processing algorithms

Digital Twin = Open and system-overlapping reference data model

no
development
needs

potential data resources for Smart Baggage Services 4.0 = existing raw data from productive sensor, generator and management systems

Description of the 4-layer architecture

- the lowest layer provides potential "raw data", e.g. from existing sensor systems
→ build on what already exists or is in the phase of development by 3rd party
- for the creation of a digital baggage image, raw data are mirrored in defined cycles into a separate "baggage data space"
→ essential need for development
- the "selection and compression layer" is composed of analysis mechanisms which are constructed according to the modular principle and adapted to individual needs
→ exemplary development of application-related algorithms
- the top layer provides value-added information for the user-interface in the form of context-specific characteristics and key figures, e.g. in a control cockpit
→ exemplary implementation of application-related apps

Added value

for the passenger:

- access to integrated, interactive and transparent door-to-door baggage transport solutions
- improvements in travel comfort, travel time, reliability and costs

for the service provider and airport:

- monitoring of current and prediction of future events
- reduced mishandling rates
- optimized manual and extended robot-supported (un-)loading of ULD

for the airline:

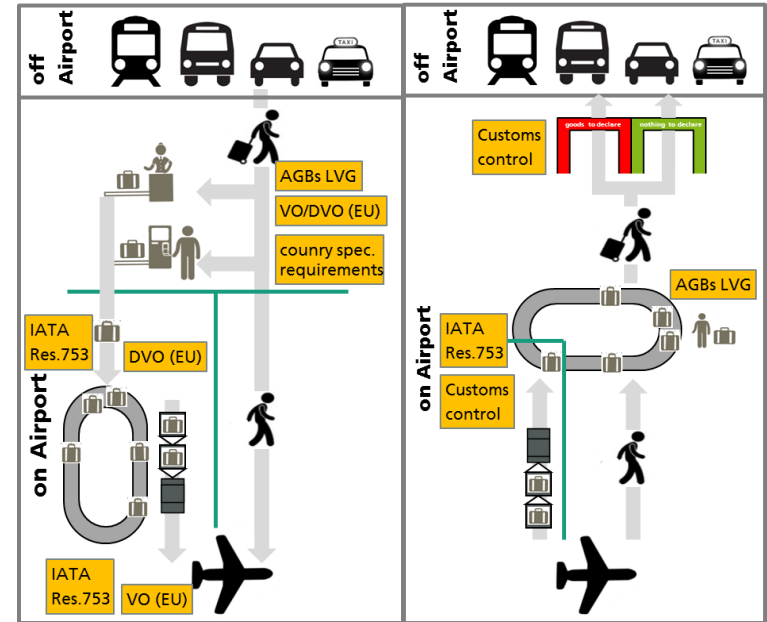
- increased sales through new products and business models
- more accurate ULD load planning, optimized payload and improved fuel management
- improved customer loyalty

for the baggage manufacturer:

- marketing, sales, product development and maintenance based on real baggage usage
- new business models, e.g. baggage leasing based on traveled miles

Expected challenges

- insufficient sensor and management systems
- exchange of information between a variety of independent actors with proprietary IT solutions
- legal restrictions
- official permits, e.g. customs and federal police (e.g. trusted service provider, known traveler)
- data access, data manipulation and data protection
- standardization and market access for service providers



submitted project sketch „Smart Baggage Services 4.0“

research program: Federal Ministry of Transport and Digital Infrastructure (BMVI)
„Digital, data-driven innovations and ideas for mobility 4.0 (mFUND)“

consortium:

SITA

 **Fraunhofer**
IML

 **STUTTGART**
AIRPORT

 **IATA**

associated
partners:

MATERNA
Information & Communications

 **Lufthansa**
BALLUFF

 **TEfra**
Der Gepäckservice

task/goal:

- IT platform to support travelers and service providers to achieve an individualized, integrated and transparent door-to-door baggage handling
- interaction between travelers and service providers to continuously control and adjust the baggage flow

planned results:

- formal description of an IT platform incl. database model for a "digital baggage twin"
- development of a demonstrator including prototype apps and applications
- trials in a test environment that exemplifies a door-to-door baggage supply chain

Thank you for your attention!



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