UIC HIGHSPEED Morocco 2023

HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET

Under the High Patronage of his Majesty King Mohammed VI

Session4.2 Room Karam4
Commercial / Rail competitiveness and traffic modelling

Moderator : Ms. Sylvie HUMBERT
Chief Marketing And International Distribution Officer, SNCF Voyageurs, France

ONCF UIC

Session 4.2
Commercial / Rail competitiveness and traffic modelling
Speaker Lists;

1	2	3	4
			
Ms.Raphaëlle Chapuis	Mr.Joerg Ostwald	Mr.Giovanni Luca Giacco	Ms.Sabina Puławska-Obiedowska
Canada	Switzerland	Italy	Poland

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How to entice travelers to change tack to track

11th WORLD CONGRESS OF HIGH-SPEED RAIL

Marrakech, 7-10 MARCH 2023

Ms. Raphaëlle Chapuis,
Engagement manager
McKinsey&Company, Montreal, Canada
Session4.2 Commercial / Rail competitiveness and traffic modelling

UIC HIGHSPEED
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REGIONS ARE SETTING HIGH EXPECTATIONS FOR RAIL MODAL SHARE AND PLAYERS AROUND THE WORLD ARE TAKING ACTIONS

Making **inter-urban and urban mobility healthy and sustainable** - for instance, by **doubling high-speed** rail traffic and developing extra cycling infrastructure over the next 10 years

- Mobility Strategy – European Union

More than **forty major Dutch companies**, including ABN AMRO, have agreed to target a **50% reduction in their emissions from business travel by 2030.**

- Anders Reizen coalition

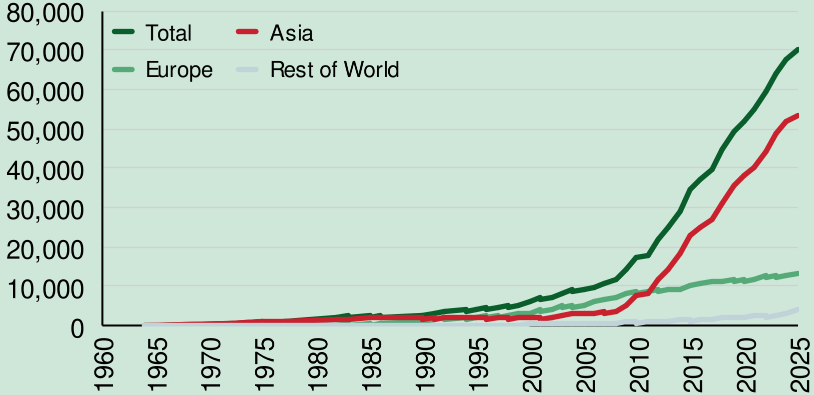
U.S. passenger rail lags behind the rest of the world in reliability, speed, and coverage. […] The legislation positions **rail to play a central role in our transportation and economic future**, investing $66 billion in additional rail funding

- Bipartisan Infra Bill

eurail

children aged 0-11 get a **free Pass** with Eurail

High speed Rail network in the World, km[1]

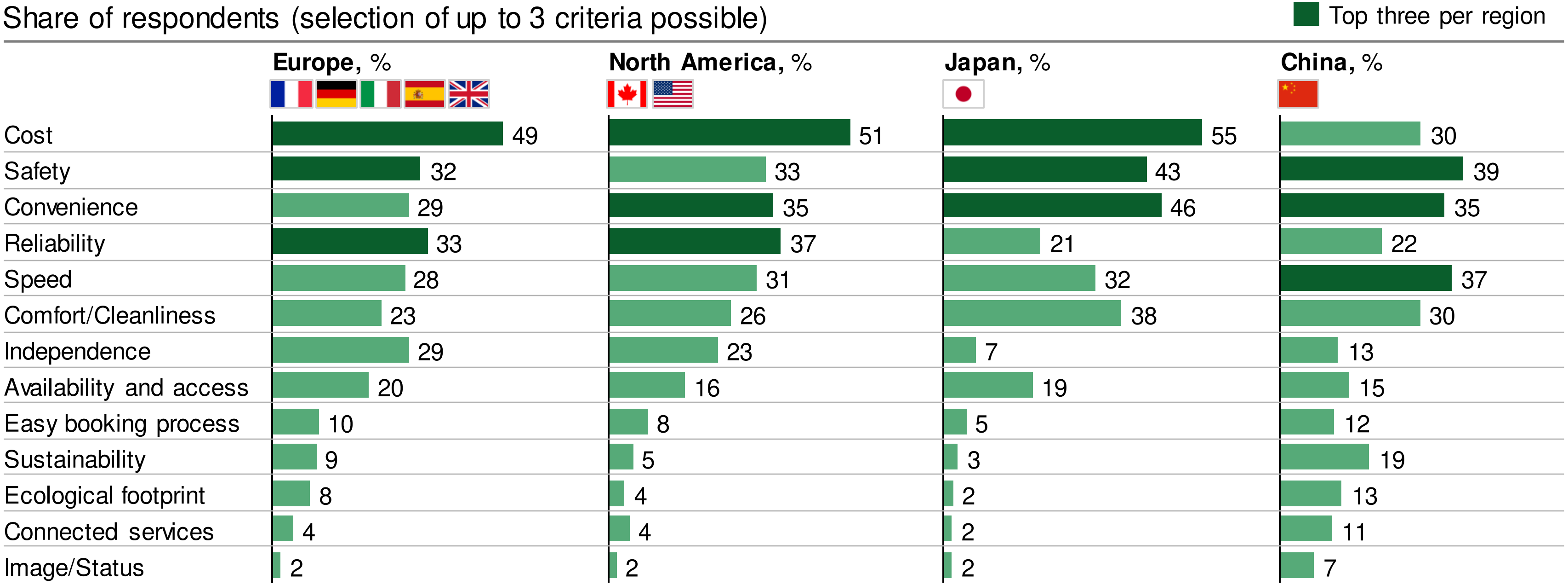


1. UIC high speed lines in the world 2021, update Septermber 2022 - projects in operation and under construction

Source: Press research, UIC, European Union website, ABN AMRO news

WHEN PEOPLE ARE ASKED IN GENERAL, DECISION CRITERIA FOR TRANSPORTATION MODE ARE MANIFOLD

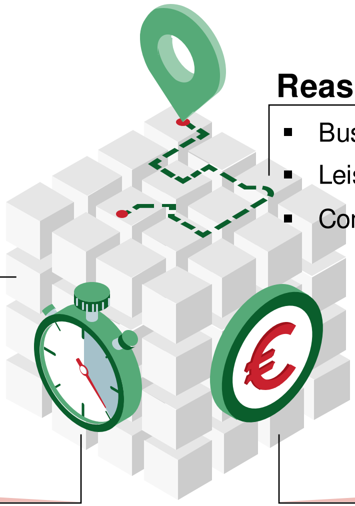
Decision criteria for choice of transportation
Share of respondents (selection of up to 3 criteria possible)



Source: McKinsey – passenger rail conjoint analysis May 2022

TO BETTER UNDERSTAND WHAT WOULD MAKE PEOPLE SHIFT TO RAIL WE LED A CONJOINT ANALYSIS

Understand the actual criteria and trade-offs that impact peoples' decision on taking the train vs. other modes of transport (e.g., car, plane, or bus)



Reasons to travel

- Business
- Leisure
- Commuting

Type of trip

Short, medium, long distance[1]

Travel time

8h — 15 min

Costs

3 € — 480 €

1. Short: ~30 minutes of travel time, costing up to €15 ; Medium: ~2hr30, €20-300 ; Long: ~6hr, €30-500

Source: McKinsey – passenger rail conjoint analysis May 2022

METHODOLOGY

Decision-based approach conjoint experiment

9 countries (North America, Europe, Asia)

~**6,300** respondents

>100,000 hypothetical travel decisions

OUTPUTS

1 | Ponderation of criteria
2 | Modal share variation with price and speed
3 | Achievable modal share

THE CONJOINT ANALYSIS WAS THE OPPORTUNITY TO FORCE PEOPLE TO CHOOSE

Step #1 – General information

- Age group
- Gender
- Country of residency
- # of cars accessible in the household
- Living environment (e.g., dense urban, dense suburban, countryside)
- Living situation (e.g., alone, family with kids, double income no kids)

Step #2 – Typical trips taken throughout the year

Type	Distance	Duration	Transport mode	Participants
Commuting	Short (<1h)	10min	Train	Alone
Visiting friends & family	Medium (1h>T<4h)	20min	Private vehicle	With 1 other person
Vacation	Long (>4h)	…	Rental car	With family incl. children
Business		3h	Bus	With a group
		…	Plane	
		8h	…	

Step #3 – Making a choice for one of the trips

“”

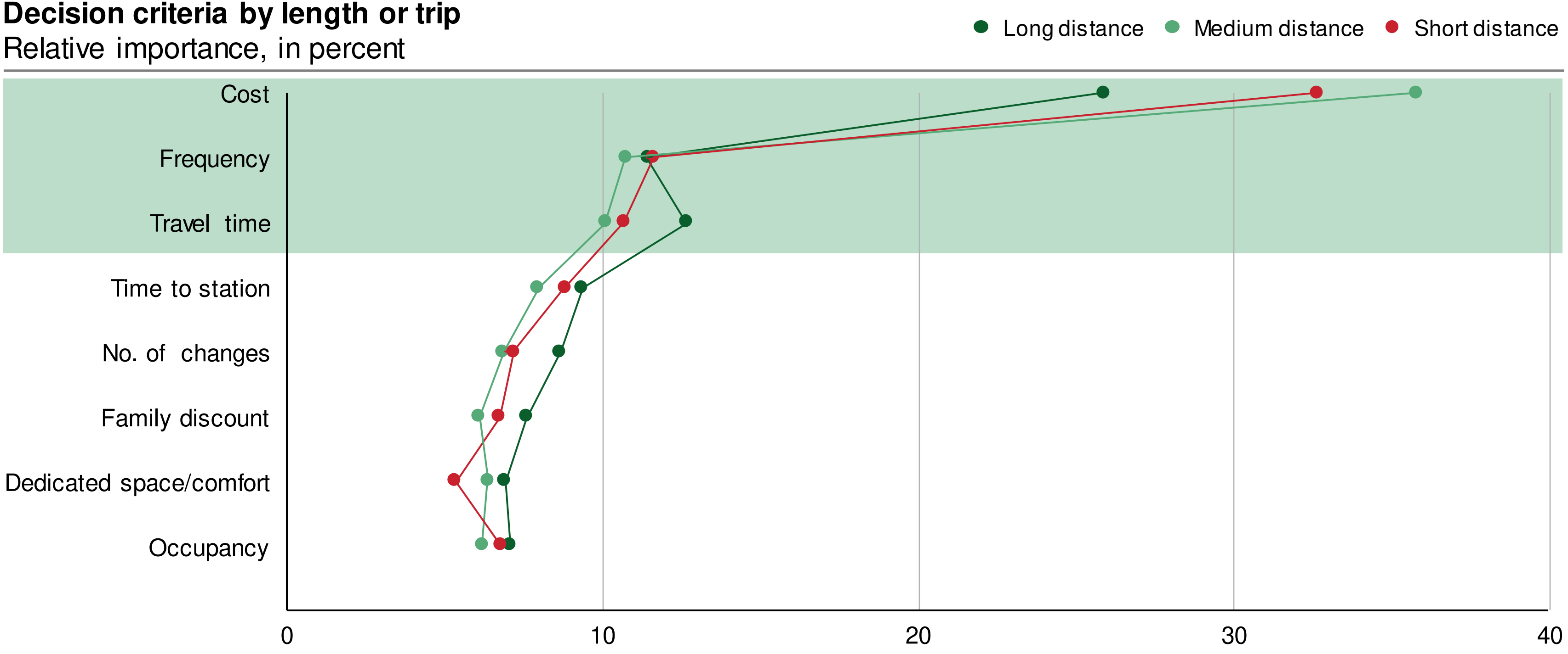
Now imagine that for the same circumstances and the same purpose of your trip, you have different modes of transports to choose from. In the following, we will present you different scenarios. These scenarios **vary regarding e.g. their total costs, the travel time you need as well as the time you might need to get to the station, the frequency of connections, and the respective convenience of the trip**.

Which of the following options below you would you choose taking the same trip next time? Please choose by clicking to one of the options.

Source: McKinsey – passenger rail conjoint analysis May 2022, Eurostat

WHEN PEOPLE ARE FORCED TO CHOOSE, FACING SPECIFIC TRAVEL DECISIONS, COST IS THE MOST IMPORTANT CRITERIA

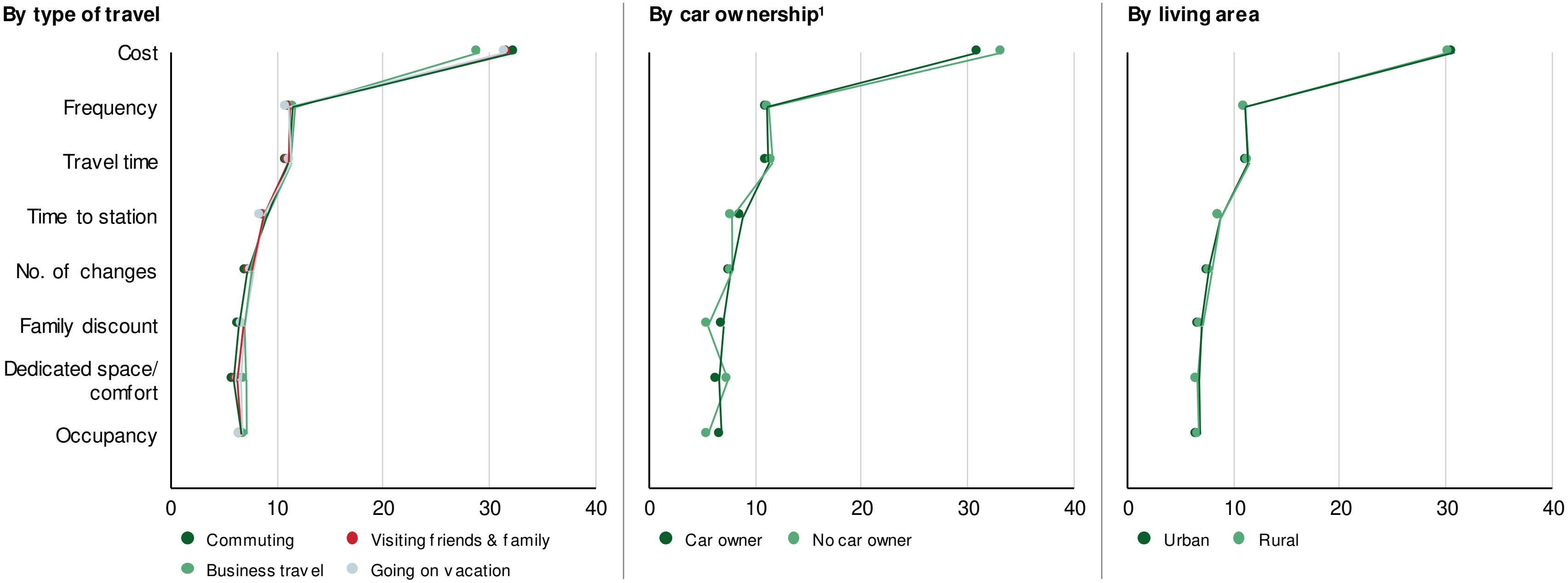
Decision criteria by length or trip
Relative importance, in percent



Source: McKinsey – passenger rail conjoint analysis May 2022

TRAVEL MODE CHOICES SLIGHTLY DIFFER ACCORDING TO CUSTOMER SEGMENTS, AS WELL AS INDIVIDUAL PREFERENCES

Decision criteria towards choice of transportation
Relative importance, in percent



1. Only accounting for medium and long-distance trips

Source: McKinsey – passenger rail conjoint analysis May 2022

THE CONJOINT ANALYSIS SHOWED STRONG CORRELATION OF TRAVEL TIME AND COST WITH RAIL MODAL SHARE

People opting for the train, overall results for EU travelers - long distance
Percent

	Time delta, minutes \ Cost delta, EUR	-90	-60	-30	0	30	60	90
Train faster	80	19%	24%	31%	43%	54%	65%	62%
	60	17%	21%	31%	39%	51%	55%	54%
	40	20%	26%	35%	41%	55%	60%	62%
	20	23%	28%	35%	38%	48%	52%	56%
	0	25%	30%	35%	39%	48%	57%	59%
	-20	22%	23%	28%	34%	40%	49%	54%
Car faster	-40	26%	26%	28%	30%	38%	46%	57%
	-60	23%	23%	24%	31%	38%	45%	61%
	-80	25%	26%	25%	35%	40%	47%	57%
		Car cheaper						Train cheaper

Example for illustration: Cologne to Leipzig

Example for illustration: Paris to Amsterdam

Source: McKinsey – passenger rail conjoint analysis May 2022

TIME IS MONEY: DECREASING TRAVEL TIME IMPROVES VALUE

Example of medium distance in Europe

	34%	37%	41%	41%
~60min = +9ppt	33%	34%	39%	40%
	28%	31%	39%	42%
	25%	28%	37%	38%

~60€ = +13ppt

Source: McKinsey – passenger rail conjoint analysis May 2022

Implication

There is an opportunity to develop **pricing strategies based on:**

- **Performance** relative to other modes
- **Value of time**
- Understanding of **people's willingness to pay**

Additional investments in high-speed infrastructure could be considered

Transport **infrastructure investments** could be considered through the lense of its **potential impact on rail modal share**

WHAT DOES THIS MEAN?

This methodology allows to **understand real drivers for the choice of travel modes** on a granular level and helps decision makers focus

The results across geographies and segments show **cost as the single most important factor**, the **right pricing** will hence be a decisive factor for increasing modal share

There is **a clear correlation between price and speed**: operators, infrastructure managers and policy makers should take that into account for **investment decisions, pricing and subsidizing**

THANK YOU

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Marrakech, 7-10 MARCH 2023

High speed rail and aviation – not always a love story – or is it?

Joerg Ostwald
Head of product, services and events,
SBB Swiss Federal Railways, Switzerland
Session2-4.2 Commercial / Rail competitiveness and traffic modelling

ONCF UIC

My points:

- ❖ Why collaborate
- ❖ Basics for collaboration
- ❖ Possibilities of collaboration

WELCOME ABOARD!

Image / Video sources: City of Zurich, SWISS

WHY COLLABORATE?

Rail directly to the cities

Travel chains

CO_2

Travel time

NO_X

Comfort

Road congestion

Accessibility

Parking facilities

Restrictions for domestic flights e.g. in France

CONNECTION? REPLACEMENT? BOTH!

Image sources: Air France

HIGH SPEED RAIL AND AVIATION CAN BE A LOVE STORY, BUT…

…some points are decisive:

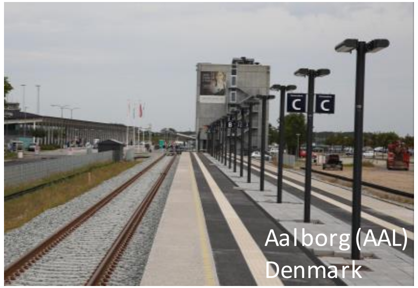
- Distances national and international
- Travel times on rail / network quality
- Speed / Infrastructure
- Station interchanges / Air-rail-links
- Competition
- Hub-structure vs. direct connections
- Sales solutions
- Luggage solutions
- Comfort on rail and at stations
- Reliability of rail services
- Connection guarantee
- Awareness and comprehensibility

vs.

Image sources: Company websites, unless specifically mentioned

PUBLIC TRANSPORT AND TRAIN CONNECTION INFRASTRUCTURE (HSL & Railway stations)


Münster/Osnabrück (FMO)
Germany


Aalborg (AAL)
Denmark

- **Direct connection possibilities** (interchange stations) between public transport / Intercity / High speed services are the base for each further step of cooperation

- **Range is wide**: from a simple bus stop via a single rail track platform, often underground built railway stations to huge transportation hubs in combination with High-Speed network


Frankfurt Main (FRA)
Germany

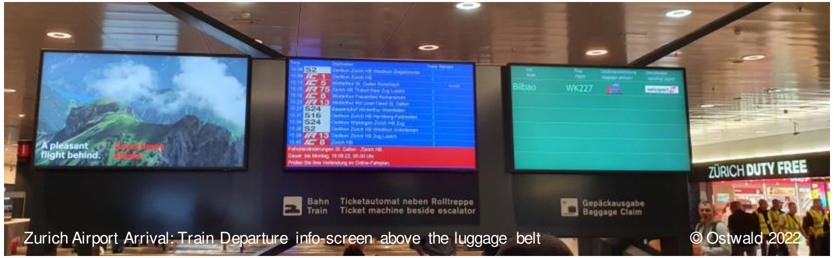

Zurich (ZRH)
Switzerland

Shanghai Hongqiao (SHA)
China


Shanghai Hongqiao (SHA)
China

Image sources: Company websites, unless specifically mentioned
wikipedia.com

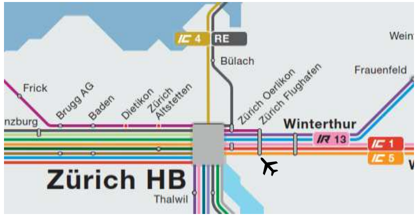
PUBLIC TRANSPORT AND TRAIN CONNECTION TRAINS AND PUBLIC TRANSPORT SYSTEM



Zurich Airport Arrival: Train Departure info-screen above the luggage belt © Ostwald 2022

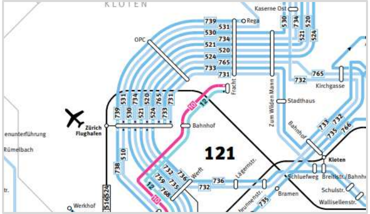
- **Frequency and reliability is all**: Decisive for success of any combination solution is a safe reliability and high frequency of transport service, also and particularly in off-peak-times

- **Implementation**:
  - Integral part
    (timetable, fare, information system) of a regional or national network should be preference:
  - Stand-alone-solutions
    long distances / long travel time by regular services / many stops exclusivity:



6 Long distance train connections

4 Regional trains connections



Ground transport: 11 Buses, 2 Trams


Flytoget Oslo

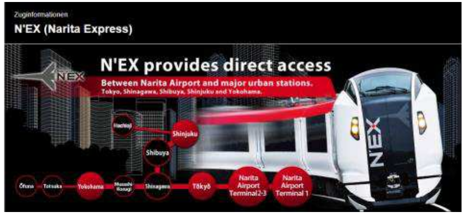


Image sources: Company websites, unless specifically mentioned

POSSIBILITIES OF COOPERATION - OVERVIEW

- *Cooperation opportunities differ according to the customer impact in the purchasing process and during the journey, as well as the depth of the cooperation*

- **Integral solution: Seamless travel**
  - Codeshare Air / Rail directly
  - Codeshare via aggregator
  - Bundling / shopping basket with connection guarantee

- **Combination: Give possibilities**
  - Simple infrastructure links
  - Online distribution & info links
  - Ancillary service
  - Related offers ("Rail & fly")

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- AIR FRANCE Train+Air | SNCF/Thalys

COMBIN

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- Purchas
- Ideally to
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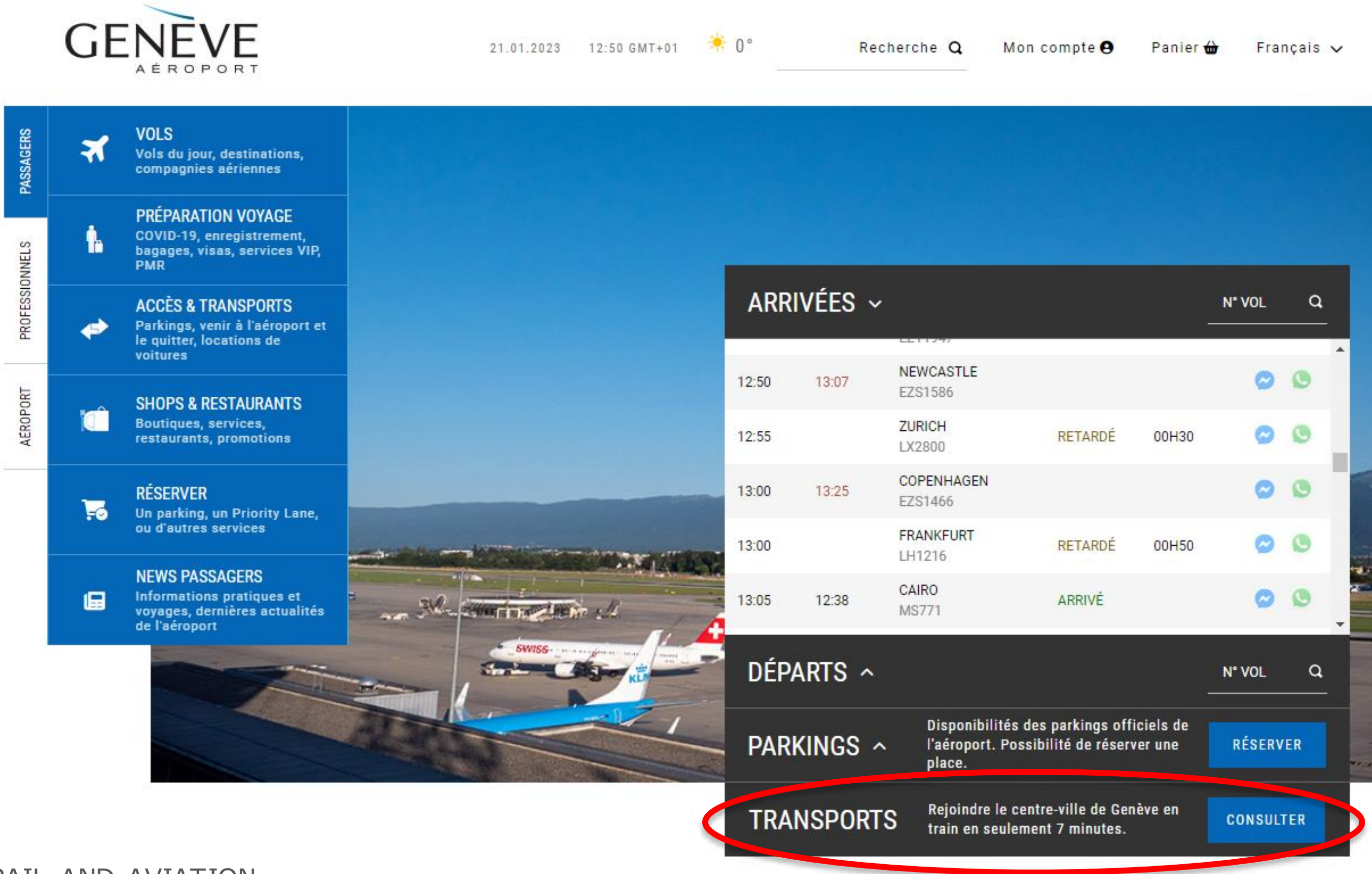
- Interface



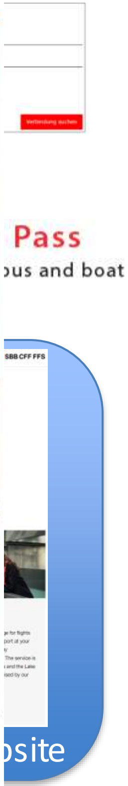


Image sources: Company websites, unless specifically mentioned

INTEGRAL & COMBINATION : MIXED SOLUTIONS

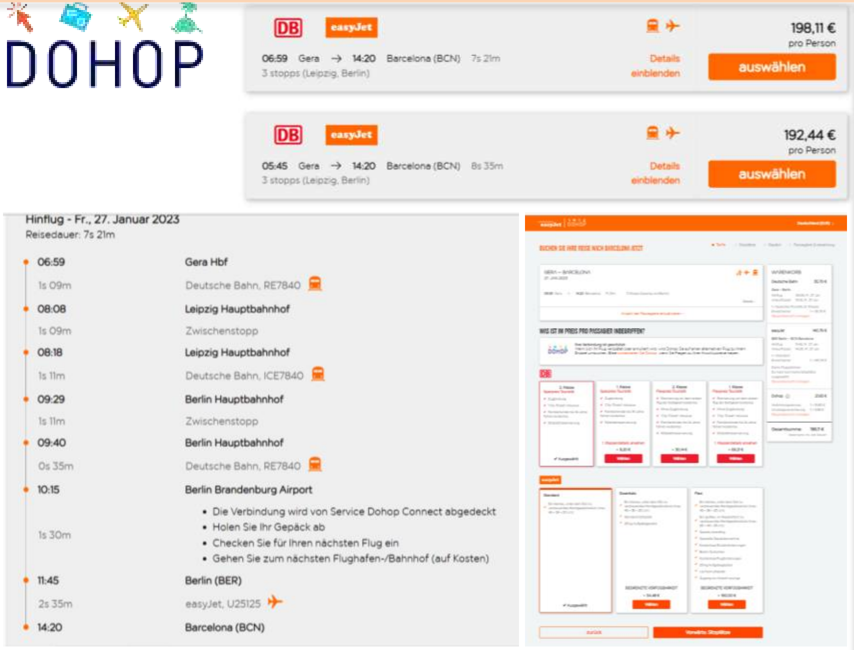
- Need for an intermediate solution
- Aggregators to bundle rail and airline availabilities and prices
- Data exchange via API's
- Payable connection guaranty for "connection service" and "change warranty" if provided and/or secured by extra insurance
- Examples:
  - **Interlining** via Accesrail ("9B"-codeshare)
    Rail&Fly Austria, Renfe & Iberia,
    KLM & Thalys, Delta & SBB CFF FFS
  - Bundling **without interling** via Dohop:
    Easyjet & Deutsche Bahn (BER)
    Vueling & Deutsche Bahn (BER)

European Commission

Multimodal digital mobility services
Consultation period
01 December 2021 - 23 February 2022

9B AccesRail
Your gateway to Air-Rail

DOHOP



CONCLUSION AND OBJECTIVE

- Requirements:
  - Infrastructure (Rail Station at airport)
  - Reliable, high frequent rail offer
  - Customer information bothside air and rail
  - Pricing solutions, API
- Your choice of depth of collaboration:
  - Full integration (airline codeshare)
  - Semi-full integration (aggregator)
  - Bundling without interlining
- Advantages for customer, airlines and railways
- Advantages for climate and resources

- **Objectives:**
  - **Prospect to replace a lot of car movements and short and medium-haul flights by train**

Image sources: Air France

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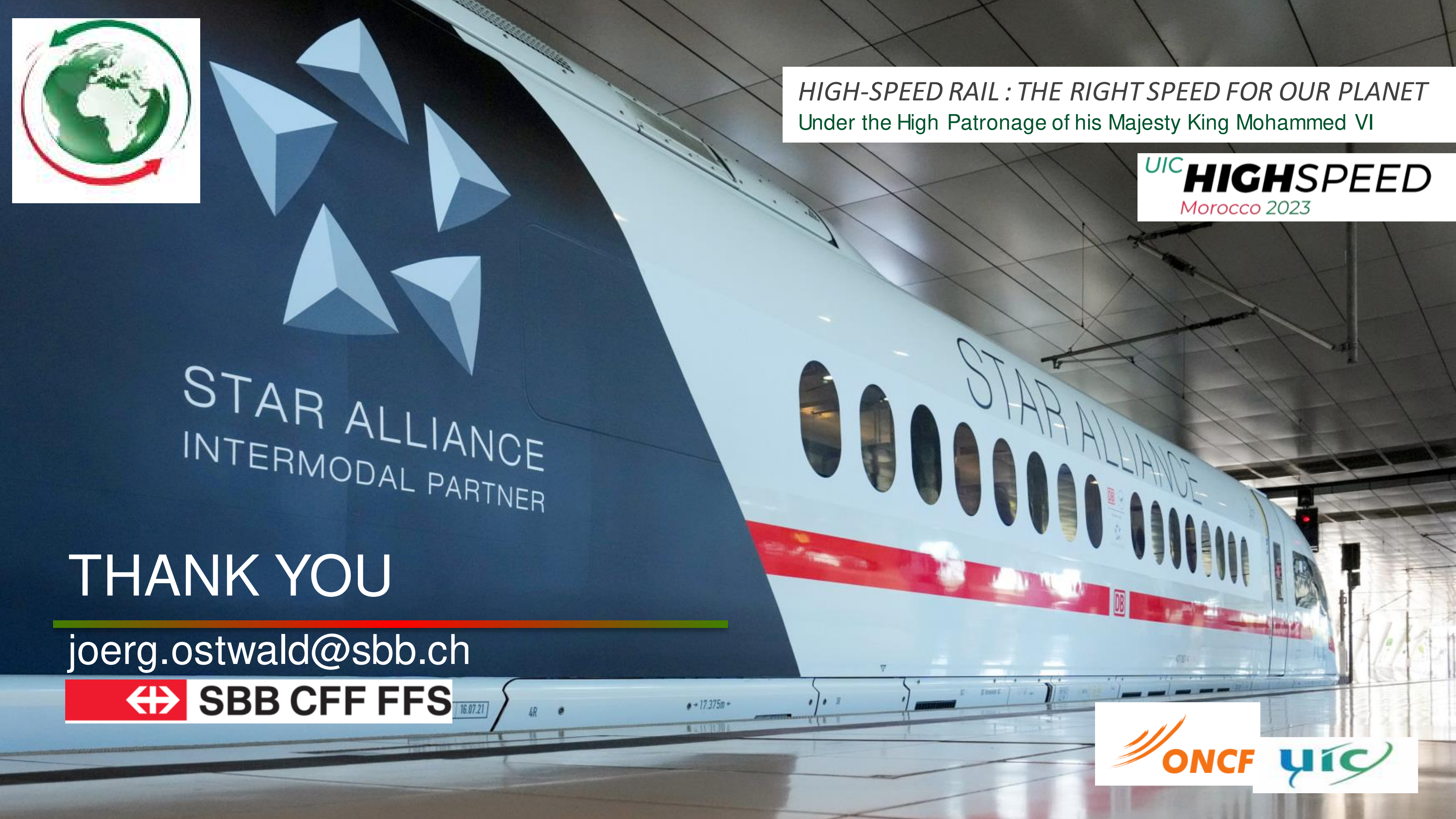

THANK YOU

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COMPLEX INTERMODAL NETWORK OPTIMIZATION

EngD Giovanni Luca Giacco
Trenitalia S.p.A. Timetable Data Manager
Session2 - 4.2 Commercial / Rail competitiveness and traffic modelling

IT community has developed systems, databases and sensors capable of collecting larger amounts of data than we need and we are able to use …

Current Multimodality Concept:

- Big data collections
- Well performing travel search engines
- Data mining instance
- Machine based

What should multimodality be:

- The main outcome of network optimization
- “Cause” and not “Effect” of mobility
- Customer based

Objective:

The improvement of connections between different means of transport synchronizing clocks of stations and multimodal hubs

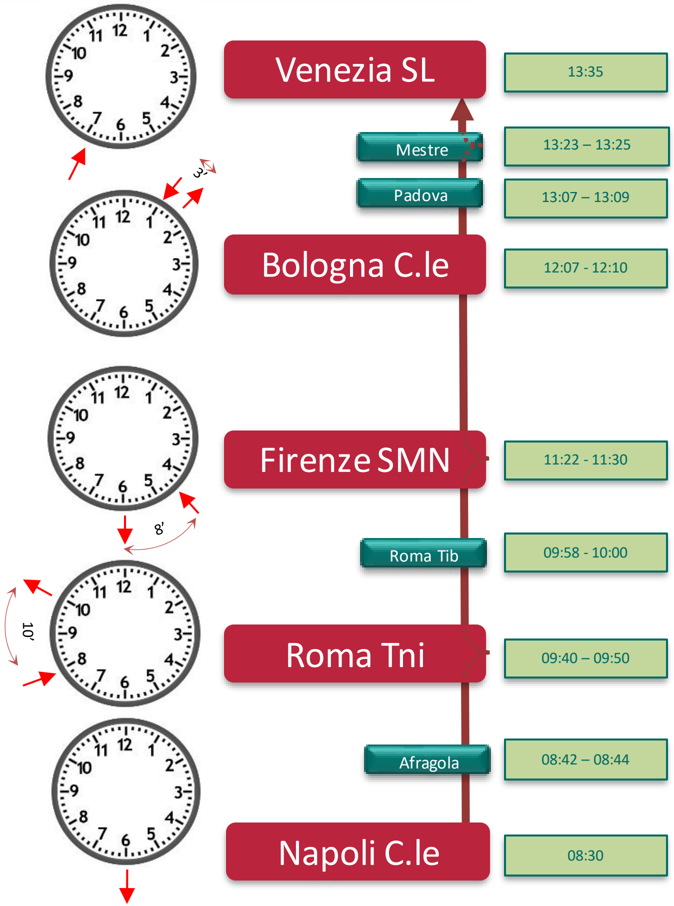
How:

Altering an initial timetable

This project focuses on developing a novel mathematical optimization framework for integrated timetabling problem placing a specific emphasis on the practical commercial condition, minimum connection time and passengers flows as well.

Two dimension approach

First dimension: Transport



Two dimension approach

Second dimension: Station

Station size

Transport modes

- Feeder and fetcher brands
- Bus vs Train

Station topography

- Single level
- Multiple level

Minimum Connection Time can mainly depend on:

Departure/Arrival time

Rolling Stock Length

Two dimension approach

Second dimension: Station

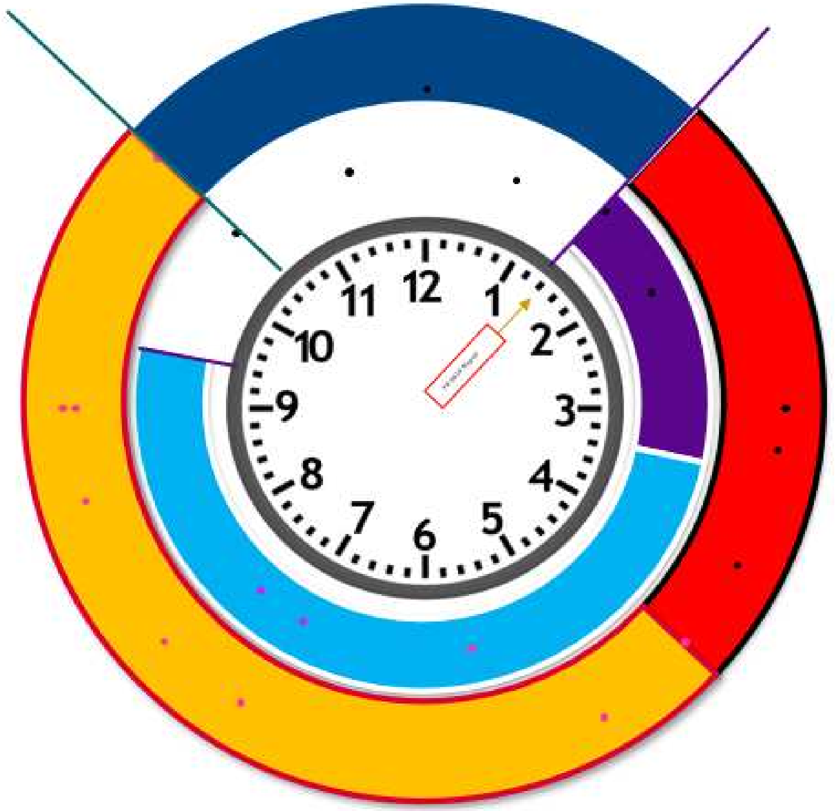
In a given station a transport is connected with all other transports such that:

- all long-distance transports with a departure time belonging to the interval [α, α + 30’], in which α is the minimum connection time (MCT);
- all local transports with a departure time belonging to the interval [β, β + 30’], in which β is the minimum connection time (MCT).

For this reason, all trains departing from a considered station are represented by dots distinguished in two different circular crowns:

- **internal**: representing all short-distance transports where feasible connections are plotted in the turquoise sector;
- **external**: representing all long-distance transports where feasible connections are plotted in the yellow sector.

Only pink dots are considered as **valid connections** while the black ones are not.



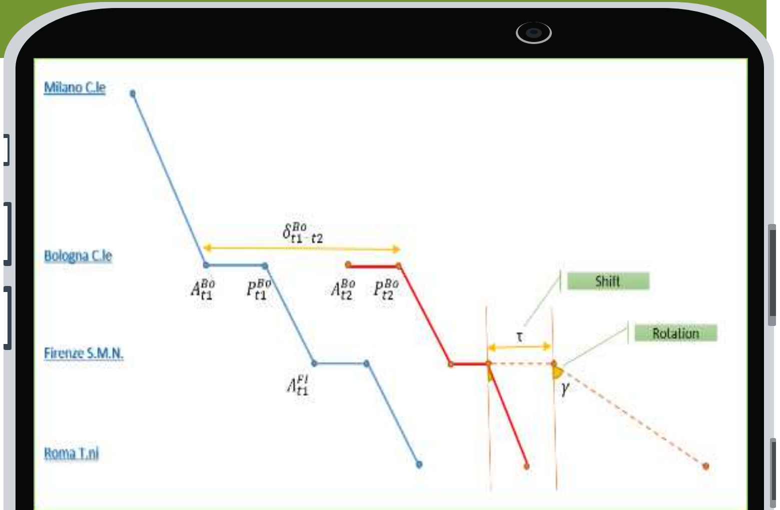
Our Concept

The main developed model is a mixed integer linear programming formulation able to generate optimal connections by alteration of an initial timetable.

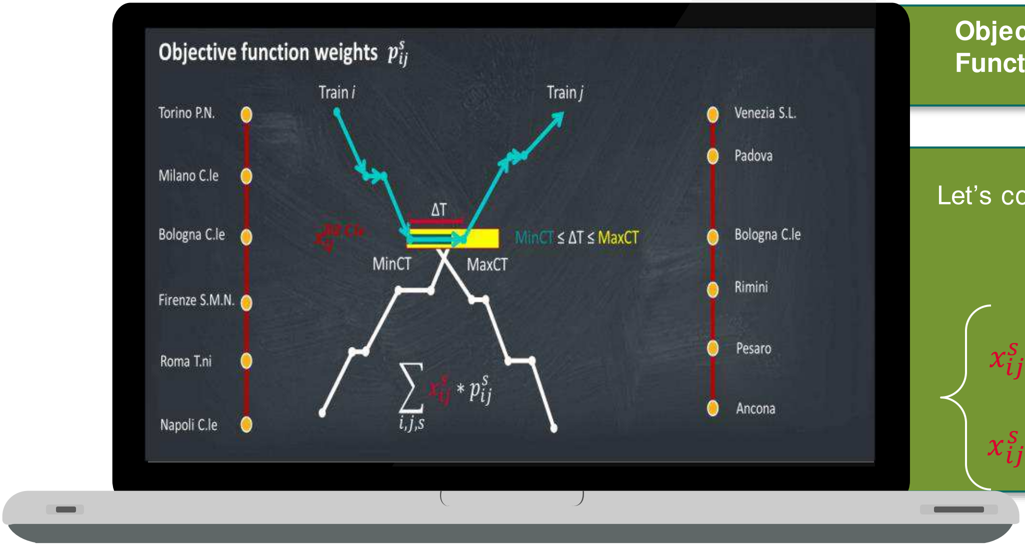
The algorithm is allowed to shift paths (respecting patterned paths) and able to alter a portion of them without relaxing the railway infrastructure' s technical constraints (i.e. maximum speed for each type of rolling stock unit for each line segment).

Alterations allowed:

- Translations
- Rotations
- Waiting time at a station



Main constraints



Objective Function $\sum_{i,j,s} x_{ij}^s * p_{ij}^s$

$$x_{ij}^s \begin{cases} 1 \text{ if the connection is feasible} \\ 0 \text{ if the connection is not feasible} \end{cases}$$

Let's consider a couple of trains i and j

$$\begin{cases} DT_j^s - AT_i^s \geq MCT \\ DT_j^s - AT_i^s \leq MCT + \beta \end{cases}$$

A connection is feasible if and only if:

$$\begin{cases} x_{ij}^s \leq 1 + \dfrac{(\overline{DT}_j^s + t_j^s - \overline{AT}_i^s - t_i^s - MCT)}{1440} \\ x_{ij}^s \leq 1 - \dfrac{(\overline{DT}_j^s + t_j^s - \overline{AT}_i^s - t_i^s - \beta)}{1440} \end{cases}$$

Constraints

$$Inf \leq t_i^s \leq Sup$$

Tested Scenarios

>1.800 passenger's hubs

7.400 transports

Mean of transports	Brand	Number of transports	Percentage
Local train	REGIONALE	6.435	86,67%
Long Distance train	FRECCIARGENTO	58	0,78%
Long Distance train	FRECCIABIANCA	22	0,30%
Long Distance train	FRECCIAROSSA	164	2,21%
Long Distance train	INTERCITY	92	1,24%
BUS	BUS	654	8,81%
	Total	**7.425**	

	Number of transports		
	To be altered	Fixed	Total
Scenario 1	336	0	336
Scenario 2	336	7.089	7.425
Scenario 3	7.425	0	7.425

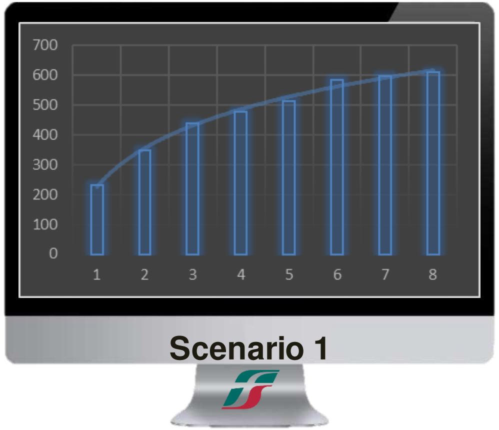
The effectiveness of our approach is validated by the measured improvements of all instances in terms of number of connections added by the solver. By altering a set of paths in the order of only few minutes a significant enhancement of the global network' s connectivity is obtained.

Within each scenario, the number of connections has been remarkably improved compared to the initial timetable.

- Column "**To be altered**" reports the number of transports considered as a variable
- Column "**Fixed**" reports the number of transports not considered as a variable

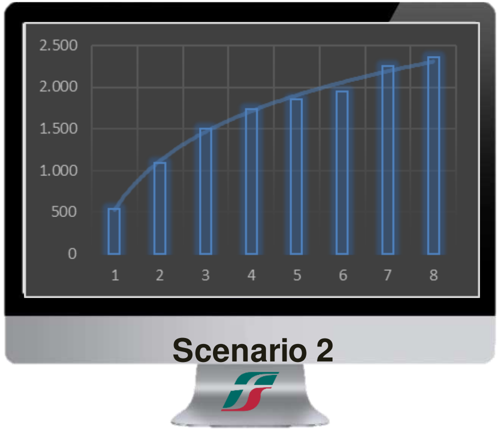
Tested Scenarios

Only long distance network



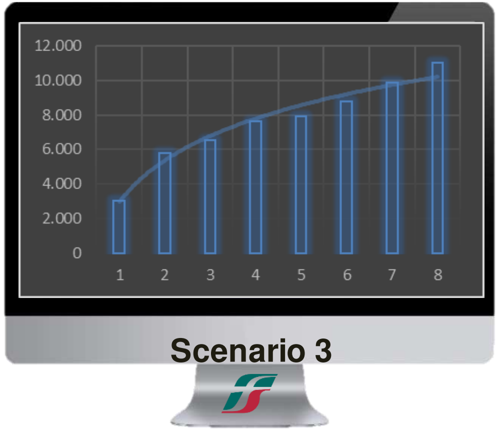
Inf	Sup	New Conn	Initial conn	Improv. %
-1	1	230	4.246	5,4%
-2	2	348	4.246	8,2%
-3	3	437	4.246	10,3%
-4	4	478	4.246	11,3%
-5	5	511	4.246	12,0%
-6	6	582	4.246	13,7%
-7	7	595	4.246	14,0%
-8	8	608	4.246	14,3%

Complete network, only long distance transports alterable



Inf	Sup	New Conn	Initial conn	Improv. %
-1	1	544	124.688	0,4%
-2	2	1.090	124.688	0,9%
-3	3	1.500	124.688	1,2%
-4	4	1.740	124.688	1,4%
-5	5	1.850	124.688	1,5%
-6	6	1.950	124.688	1,6%
-7	7	2.250	124.688	1,8%
-8	8	2.360	124.688	1,9%

Complete network, all transports alterable

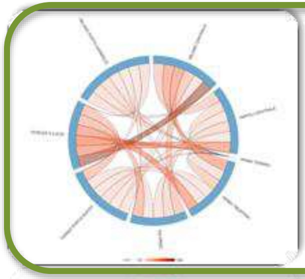


Inf	Sup	New Conn	Initial conn	Improv. %
-1	1	3.020	124.688	2,4%
-2	2	5.820	124.688	4,7%
-3	3	6.560	124.688	5,3%
-4	4	7.650	124.688	6,1%
-5	5	7.900	124.688	6,3%
-6	6	8.780	124.688	7,0%
-7	7	9.870	124.688	7,9%
-8	8	11.030	124.688	8,8%

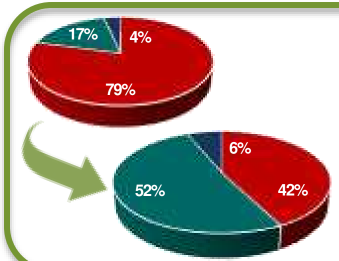
Conclusion

A short list of stations with a huge increase for objective function is observed

Network effect degree enhancement for all main italian High Speed hubs



- Additional travel solutions for all O/D
- Few connections lost after the optimization run



Brand mix influenced by objective function coefficients

Future research

- Real time connections check after paths alterations by infrastructure managers
- Timetable patterns rebalancing
- Novel algorithm to insert or delete paths (optimization of PaP)
- To prove the technical feasibility

THANK YOU

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Method for the modal split modelling in HSR corridors

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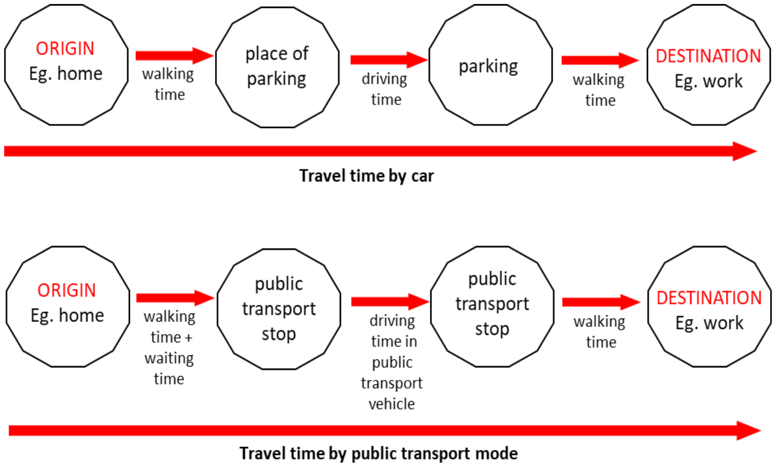
Session2-4.2 Commercial / Rail competitiveness and traffic modelling

Generalized Travel Cost – the concept

- Taking into account not only the travel time (apart from the travel time itself, the time to and from the stop/ airport), also travel costs.
- In order to be able to use the generalized cost of travel functions in modal split modeling, all possible transport modes should be included in the analysis: passenger car, bus, conventional rail and plane.
- The proposed approach enables to take into account the time nuisance of individual stages of the trip by subjective estimation of the actual travel time by the user.



Generalized travel cost – by car

$$K_{jso} = (K_e * L) * W_n + U_{so}$$

where:
K_{jso} – the generalized cost of travel by car [PLN];
K_e – vehicle utilization cost [PLN/km]
L – distance between origin and destination[km];
W_n – vehicle occupancy indicator;
U_{so} – cost equivalent of travel time by car inconvenience, described by the equation:

$$U_{so} = t_{jso} * k$$

where:
U_{so} – cost equivalent of travel time by car inconvenience;
t_{jso} – travel time by car[h];
k – unit cost of travel time [PLN]

Other if data exist

Generalized travel cost – by High Speed Rail

$$K_{jkdp} = K_{kdp} + K_d + U_{kdp}$$

where:
K_{jkdp} – the generalized cost of travel by HSR [PLN];
K_{kdp} – ticket cost [PLN]
K_d – additional cost of travel to train station [PLN]
U_{kdp} – cost equivalent of travel time by HSR inconvenience, described by the equation:

$$U_{kdp} = \left[t_{ddkdp} + t_{jkdp} + t_{odkdp}\right] * k$$

where:
U_{kdp} – cost equivalent of travel time by HSR inconvenience;
t_{ddkdp} – walking time to train station [h];
t_{jkdp} – travel time by HSR [h];
t_{odkdp} – walking time from train station to destination [h];
k – unit cost of travel time [PLN]

Other if data exist

Generalized travel cost – by train

$$K_{jk} = (a * K_1 + b * K_2) + K_d + U_k$$

where:
K_{jk} – the generalized cost of travel by train [PLN];
K_1 – ticket cost in first class [PLN]
K_2 – ticket cost in second class [PLN]
a,b – the share of ticket in total volume;
K_d – additional cost of travel to train station [PLN]
U_k – cost equivalent of travel time by train inconvenience, described by the equation:

$$U_k = \left[t_{ddk} + t_{jk} + t_{odk} \right] * k$$

where:
U_k – cost equivalent of travel time by train inconvenience;
t_{ddk} – walking time to train station [h];
t_{jk} – travel time by train [h];
t_{odk} – walking time from train station to destination [h];
k – unit cost of travel time [PLN]

Other if data exist

Generalized travel cost – by bus

$$K_{ja} = K_a + K_d + U_a$$

where:
K_{ja} – the generalized cost of travel by bus [PLN];
K_a – ticket cost [PLN]
K_d – additional cost of travel to bus station [PLN]
U_a – cost equivalent of travel time by bus inconvenience, described by the equation:

$$U_a = \lfloor t_{dda} + t_{ja} + t_{oda} \rfloor * k$$

where:
U_a – cost equivalent of travel time by bus inconvenience;
t_{dda} – travel time to bus station [h];
t_{ja} – travel time by bus [h];
t_{oda} – walking time from bus station to the destination [h];
k – unit cost of travel time [PLN]

Other if data exist

Generalized travel cost – by airplane

$$K_{js} = K_s + K_d + U_s$$

where:
K_{js} – the generalized cost of travel by airplane [PLN];
K_s – ticket cost [PLN]
K_d – additional cost of travel to airport[PLN]
U_s – cost equivalent of travel time by airplane inconvenience, described by the equation:

$$U_s = \left[t_{dl} + t_l + t_{odl}\right] * k$$

where:
U_s – cost equivalent of travel time by airplane inconvenience;
t_{dl} – travel time to airport [h];
t_j – travel time by airplane [h];
t_{odl} – walking time from airport to the city centre [h];
k – unit cost of travel time [PLN]

Other if data exist

Modal split modelling

- logit model od modal split was used
- the percentage takeover of traffic by High-Speed Railways was determined for all inter-regional connections based on the determined travel costs summed up along sections of transport network.
- the process of calibration of the modal split model parameters consisted in their selection so that in the analyzed transport corridor the currently existing proportion between modes was maintained.
- the function was described by the equation:

$$u_{KDP} = a_i \cdot e^{c_i \cdot \frac{k_{KDP}}{k_i}}$$

where:

u_{KDP} – he percentage takeover of traffic by HSR;

k_{KDP}– generalized travel cost by HSR;

k_i– generalized travel cost by particular transport mode;

a_i, c_i – model paramenters, depending on the transport mode;

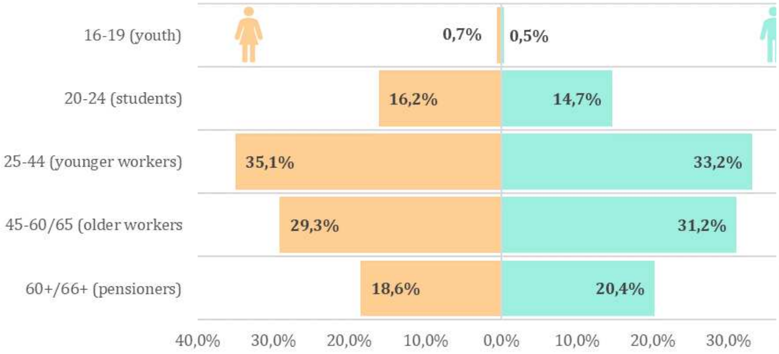
i – transport mode: train, car, airplane, bus.

Survey study

Surveys: conducted in 2019, 9 060 respondents

Purpose: Collecting information for determining the generalized travel cost for the development od Integrated Travel Model for Poland

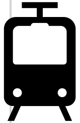
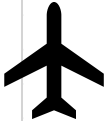
Method: CAPI and CAWI (63%); in field survey (on stations, airports, in trains and at places of service for travelers and gas stations (37%)



	Car	Train	Bus	Airplane
Business trips	39%	28%	21%	11%
Others	22%	50%	8%	20%
In total	28%	42%	13%	17%

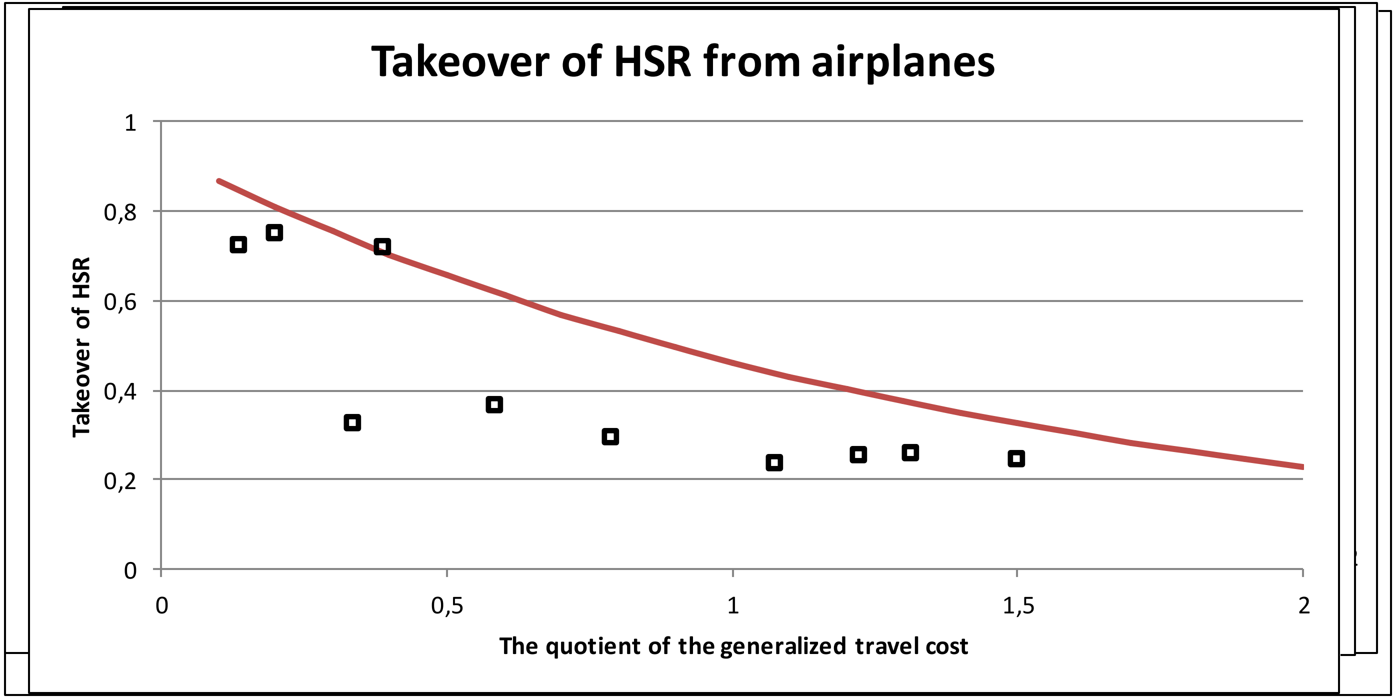
Modal split for travel distance 250-499 km

Results used in modelling process obtained from surveys

	Parameter	Unit	Average Value per 1 passenger	Cost [PLN]
	Average distance	km	304,54	nd
	Travel time to the station	min	23,14	1,20
	The time of buying ticket and waiting tin	min	16,90	nd
	Driving time	min	310,54	54,03
	Travel time from the station	min	23,14	1,20
	Travel in total	**min**	**373,73**	**56,43**
	Average distance	km	321,88	nd
	Travel time to the station	min	24,20	3,32
	Time of buying ticket and waiting time	min	20,01	0,00
	Driving time	min	262,78	82,74
	Travel time from the station	min	24,20	3,32
	Travel in total	**min**	**331,20**	**89,38**
	Average distance	km	344,17	nd
	Travel time to the airport	min	51,44	13,29
	Check-in time before departure	min	52,40	nd
	Flight time	min	92,73	220,39
	Check-in time after arrival	min	27,28	nd
	Travel time from the airport	min	51,44	13,29
	Travel in total	**min**	**275,29**	**246,98**

	Parameter	Unit	Average Value per 1 passenger	Cost [PLN]
	Average distance	km	300,00	nd
	Travel time to the station	min	24,20	3,32
	Time of buying ticket and waiting time	min	20,01	0,00
	Driving time	min	75,00	199,00
	Travel time from the station	min	24,20	3,32
	Travel in total	**min**	**143,42**	**205,64**
	Average distance	km	314,41	nd
	vehicle occupancy indicator	n per v	1,793038	na
	walking time to parking place	min	3,7	na
	Driving time	min	240,34	212,46
	Average parking seeking time	min	9,1	na
	Average parking cost	PLN		3,43
	Travel in total	**min**	**253,14**	**215,89**

Results



SUMMING UP – directions of further research and possible applications

THANK YOU

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