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**HIGHSPEED**

Morocco 2023

*HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET*

Under the High Patronage of his Majesty King Mohammed VI

## Session4.3 Room Karam4

### Commercial / Service quality

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Moderator : Mr. Fabrice SETTA  
Senior Advisor, UIC, France



## Session4.3

### Commercial / Service quality

### Speaker Lists;

1



Ms. Anne  
Bigand

France

2



Mr. Michael  
Bradley

United Kingdom

3



Mr. Tewfik  
BOUARIF

Morocco

4



Mr. WANG  
Jianxiong

China

5



Mr. HAMZA  
OURABAH

Morocco

6



Nacera  
BECHARI

Morocco

7



Ms. Valentina  
Pozzoli

France



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# 11<sup>TH</sup> WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

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## **PASSENGER EXPERIENCE FOR HIGH-SPEED TRAIN** **Delighting travellers to provide a cost-effective service**

Anne BIGAND

Passenger Experience Director, Alstom

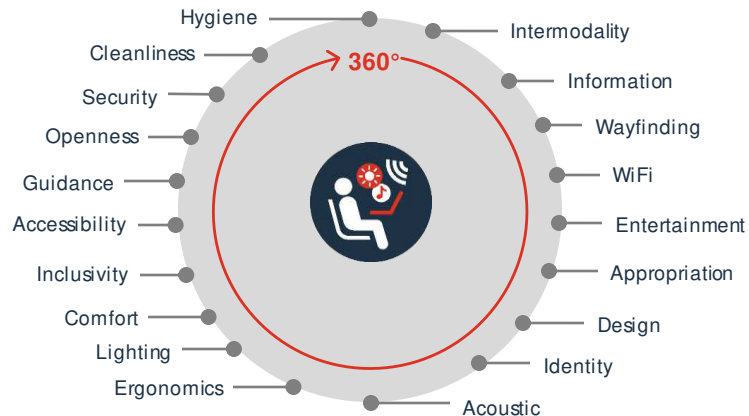
Session3-4.3 Commercial/ Service quality





## WHAT IS PASSENGER EXPERIENCE?

“The **perception of the traveler**  
in interaction with the **products and services**  
**before, during and after the journey**”



SECURITY



EFFICIENCY



CONNECTIVITY



FLUIDITY



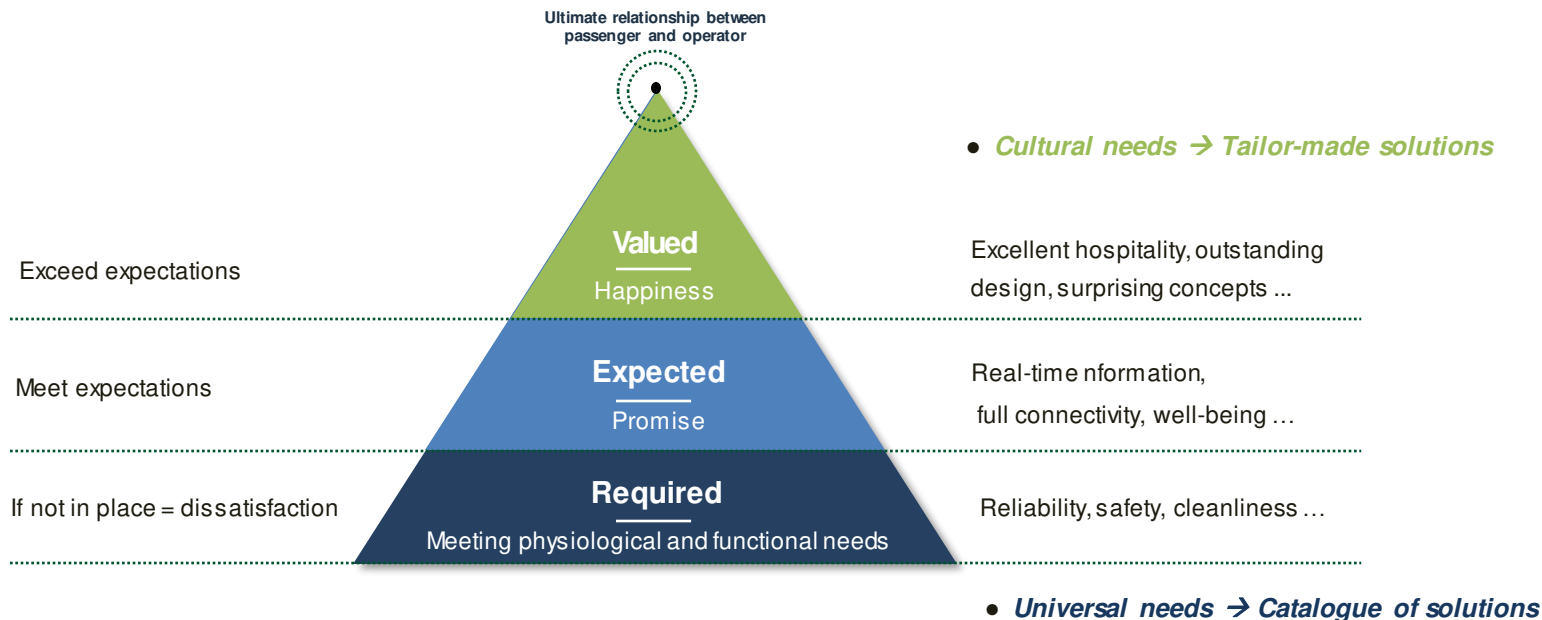
WELL-BEING



CUSTOMISATION



## LEVELS OF EXPECTATION AND MEANS TO MEET THE EXPERIENCE



→ Understand each specific need to offer the most appropriate answer



## FROM STRATEGY TO DELIVERY, EMBRACE A PASSENGER CENTRIC MINDSET

1

**Anticipate** future needs  
New behaviors, social trends



French  
research Institute



Business school



Strategic  
Innovation agency

2

**Innovate** through agile process  
Based on surveys, behaviors analysis



Empathise – Define – Ideate – Prototype – Experiment – Develop

3

**Build partnerships** with major actors  
Customers, PRM associations, start-ups, incubators



Collaboration agreement  
with Once in Spain



Virology and  
health labs

4

**Co-design** thanks to cross-expertise  
Embark all stakeholders



Engineering, Design, Perceived quality, Pax exp, Ergonomics, Eco-conception, Marketing

➔ Always consider passenger's uses beyond technical constraints



## PASSENGER SURVEY WITH LOCAL AGENCY & USERS

Dig deeper into the local expectations and cultural values

### OBSERVE

Detect the habits, behaviors,  
pain points, expectations

### IDENTIFY

Precise needs & improvements  
Build personas & journey maps

### DEFINE

Address each specific need  
Create the most suitable offer

*"I want to be able to see  
my luggage from the  
seat"*

*"There is usually not so  
much privacy when I  
seat"*

*"Sometimes I'm afraid of  
causing too much noise  
with my children"*



➔ Define the most beneficial solution to enhance the overall experience



## THE NEW MOBILITY: ACCELERATING CHANGE DRIVEN BY NEW TECHNOLOGIES

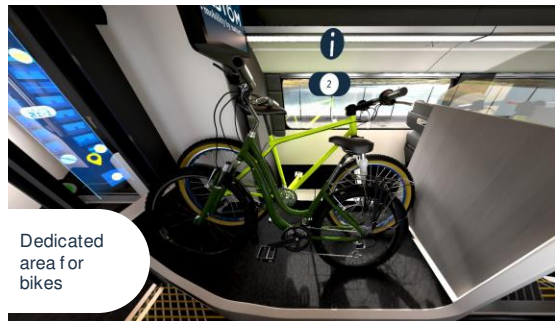


→ Opportunities for **innovations**, **inclusive mobility** and **satisfying experience**





## INCLUSIVITY – HEALTHIER MOBILITY™





## CONNECTIVITY – DIGITAL SERVICES – PROFILING



Seat  
reservation  
system



Free storage  
indication



Pico-  
projection



Seat  
occupancy  
detection



Induction  
charger

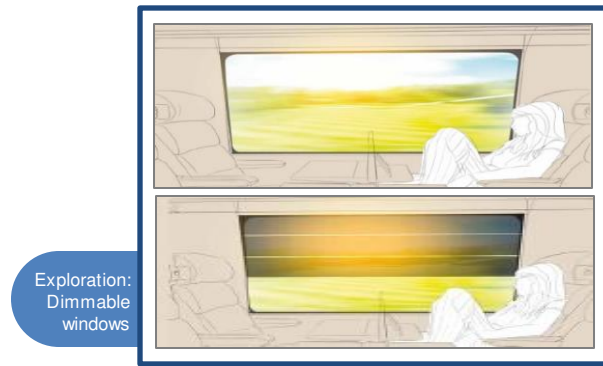
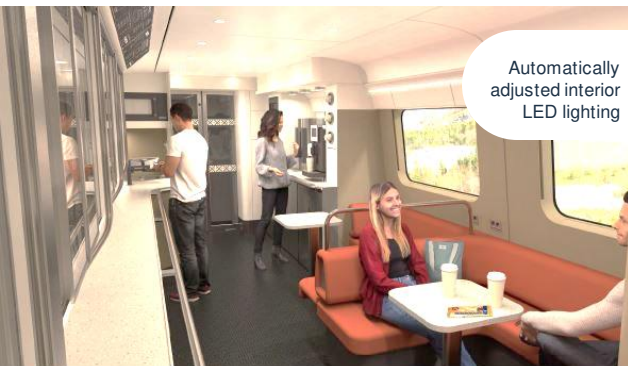
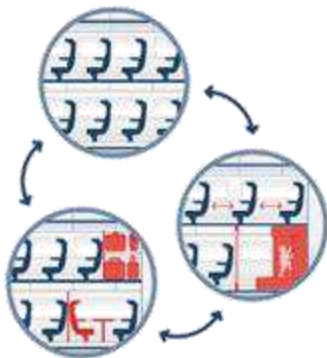


Display on  
platform





## MODULARITY – FLEXIBILITY – SMART TECHNOLOGIES





## HIGH END COMFORT – WELL-BEING



Adapted mezzanine configuration due to operator/passenger needs



Hotel like night travel



Individual facilities



Children area



1st Class Self-service area



## PASSENGERS ARE THE COMMON ASSET OF ALL SKATEHOLDERS

- Understand each other aspirations
- Identify existing needs and anticipate future expectations
- To define the most suitable and beneficial answer

➔ Build a fruitful experience to attract passengers and to generate revenues





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# THANK YOU

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Passenger experience Director  
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[www.alstom.com](http://www.alstom.com)

**ALSTOM**  
• mobility by nature •







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# **Inclusive Passenger Experience**

**An approach to reduce exclusion and deliver an improved customer experience on high-speed rail**

### **Speakers**

#### **Mike Bradley**

Senior Research Associate,  
University of Cambridge, UK

#### **Paul Plummer**

Birmingham Centre for Rail  
Research and Education,  
University of Birmingham

### **Co-Authors**

**Dimantha Gunawardana & Ying Cen Tee**, Hitachi Rail  
**Matteo Zallio, Joy Goodman-Deane & P. John Clarkson**,  
University of Cambridge  
**Robert Morland**, Astutim Limited





## Inclusive Passenger Experience

What is it?

- Using Inclusive Design Tools to quantify the user experience from a human capability perspective

Why?

- To provide quantified evidence to assess and justify improvements in the inclusivity and by extension, the passenger experience of a rail journey

So how does this work?

- Use of the Cambridge Exclusion Calculator to estimate the proportion of a population who cannot achieve a task step, series of task steps or a complete user journey

And that helps because?

- Quantification of the exclusion provides a summative measure by which problems can be prioritised, and the output of the tool is also diagnostic so assessing the impact of potential solutions is relatively simple





This approach can improve the experience

Fewer people are  
frustrated or are excluded

More people  
find it easy



## So how does this work in practice?

A very simple example:

In this scene, how exclusive is looking for and reading the signage for the Trains?

'Trains'





## Using the Cambridge Simulation Glasses in combination with the Exclusion Calculator...

3.5%

EXCLUSION FOR TASK (INCOMPLETE)

- ▶   **Vision**  
100% completed
- ▶  **Hearing**
- ▶  **Thinking**
- ▶  **Dominant hand**
- ▶  **Non-dominant hand**
- ▶  **Mobility**





## Approaching train/carriage...

What do I need to do?

Is this my train?

How long have I got to board it?

Where is my seat/carriage in relation to where I am now? Do I have to run?

### Exclusion Estimates (2025 UK pop. figures):

Train A: **>17.2% (vision, thinking & mobility)**

Train B: **>14.6% (vision & thinking)**

Train C: **>13.9% (vision & thinking)**

Train D: **>15% (vision & thinking)**

- Walking to correct carriage and door is potentially highly exclusionary

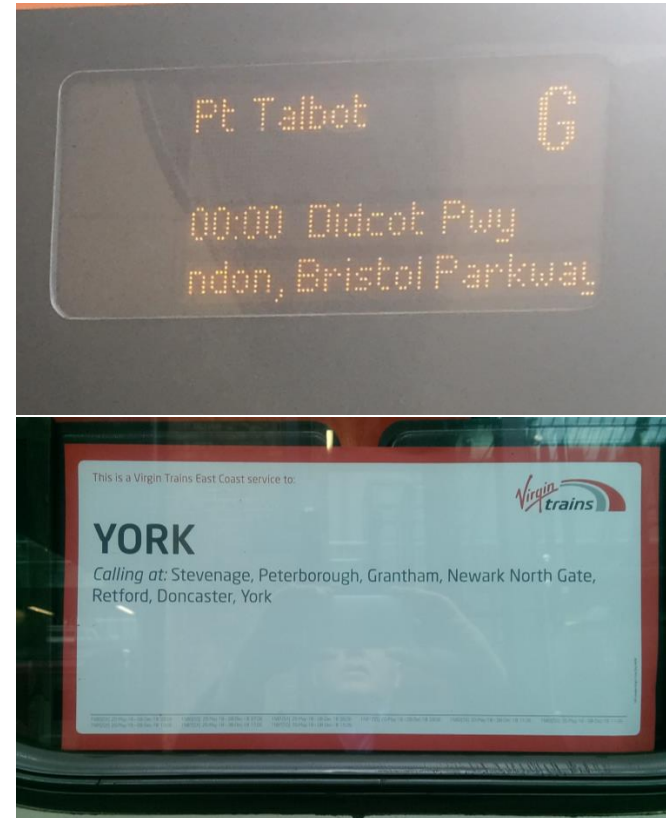
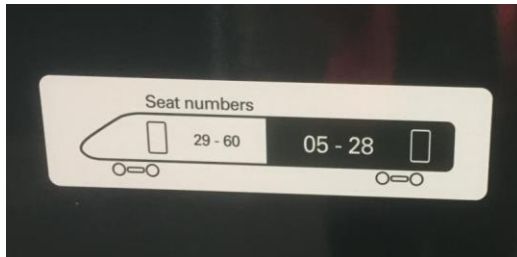


- However provision of good information will help people manage their time and walk directly to the correct carriage

## Approaching train/carriage...

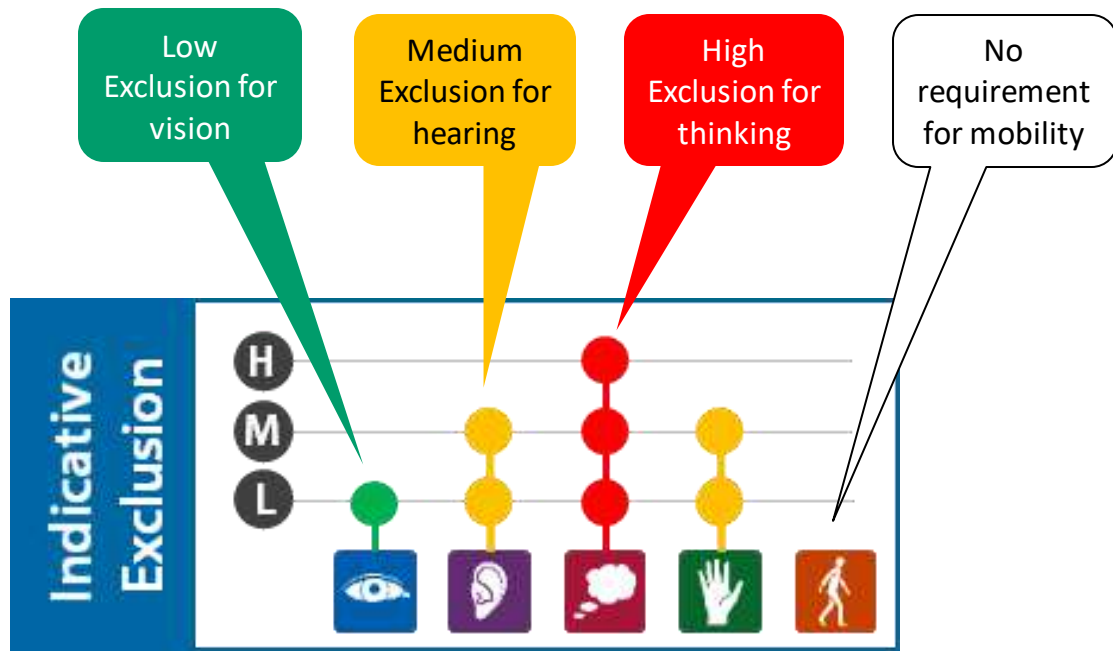
Opportunities for reducing exclusion – consider improving/providing:

- Continuously visible intermediate station information
- Indication of time until doors close for boarding
- Indication of correct carriage and correct door
- Indication of reserved seats location





What about using this approach to make a more inclusive future passenger experience?



Key to Indicative Exclusion Graphic

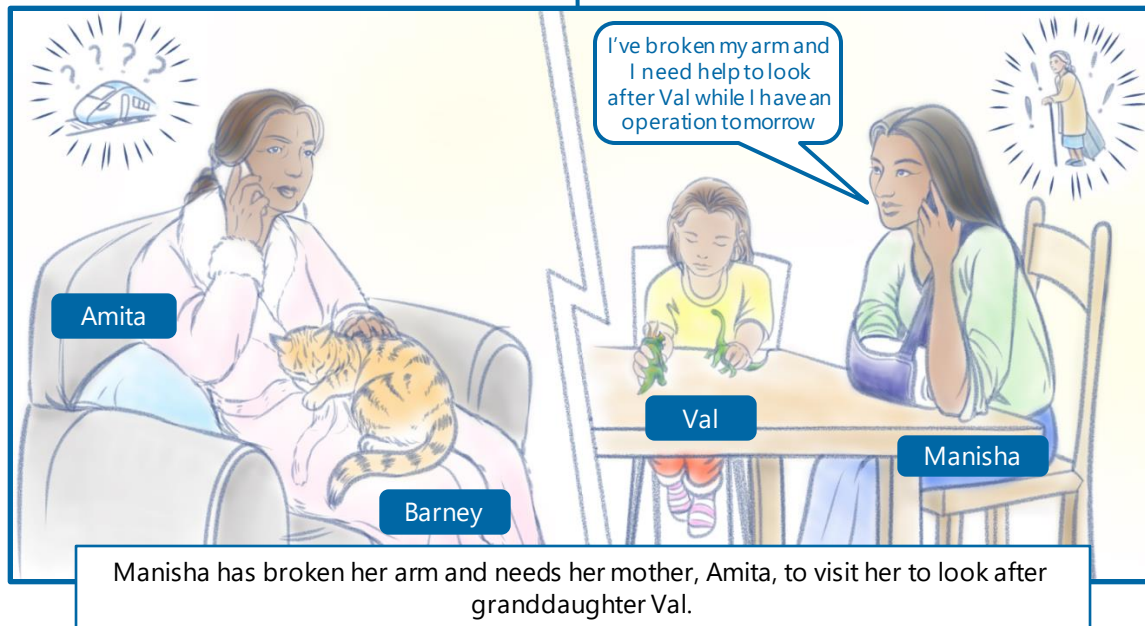
Lumada is Hitachi's advanced digital solutions, services, and technology banner for turning data into insights to drive digital innovation

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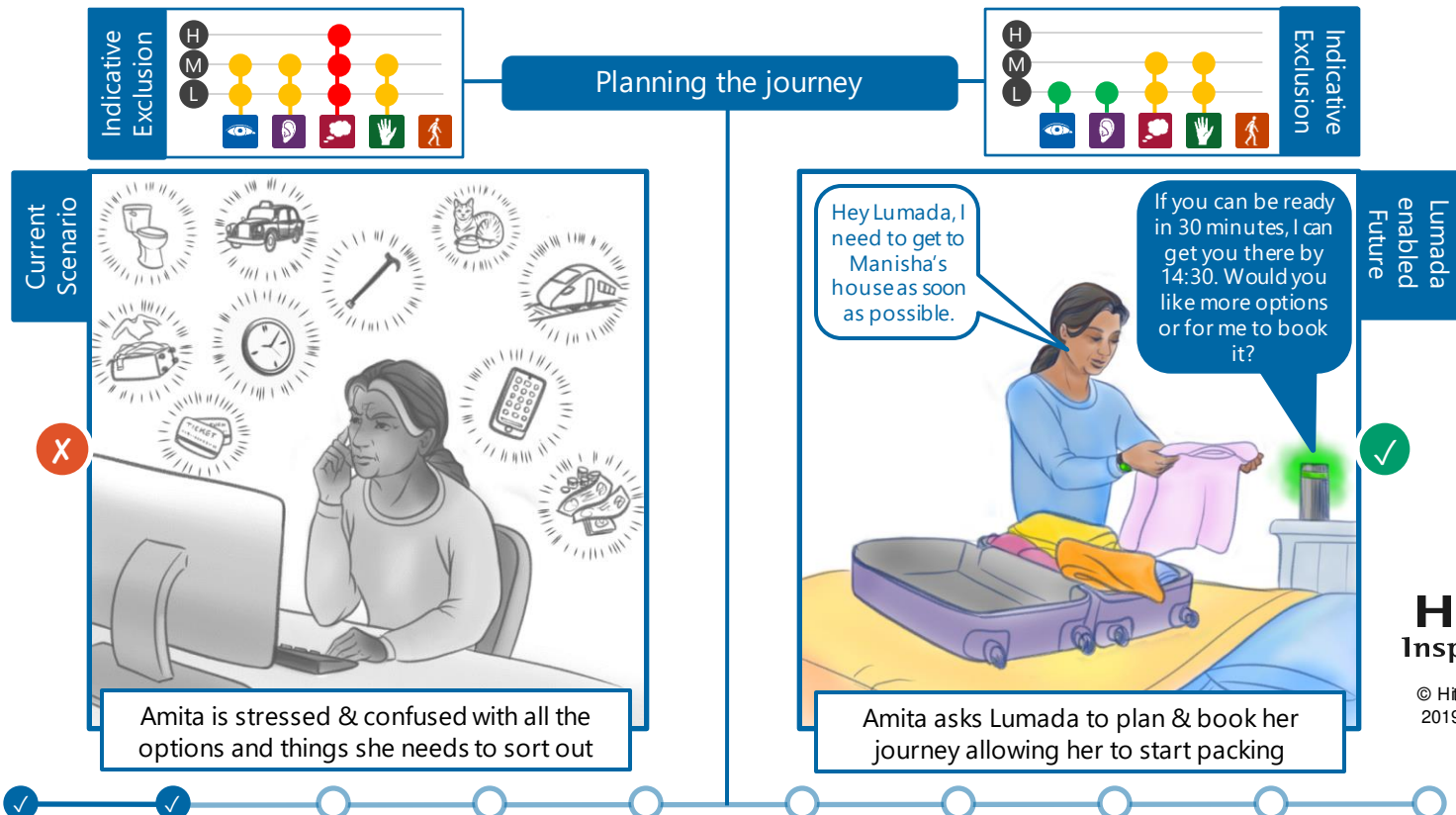
## The Scenario



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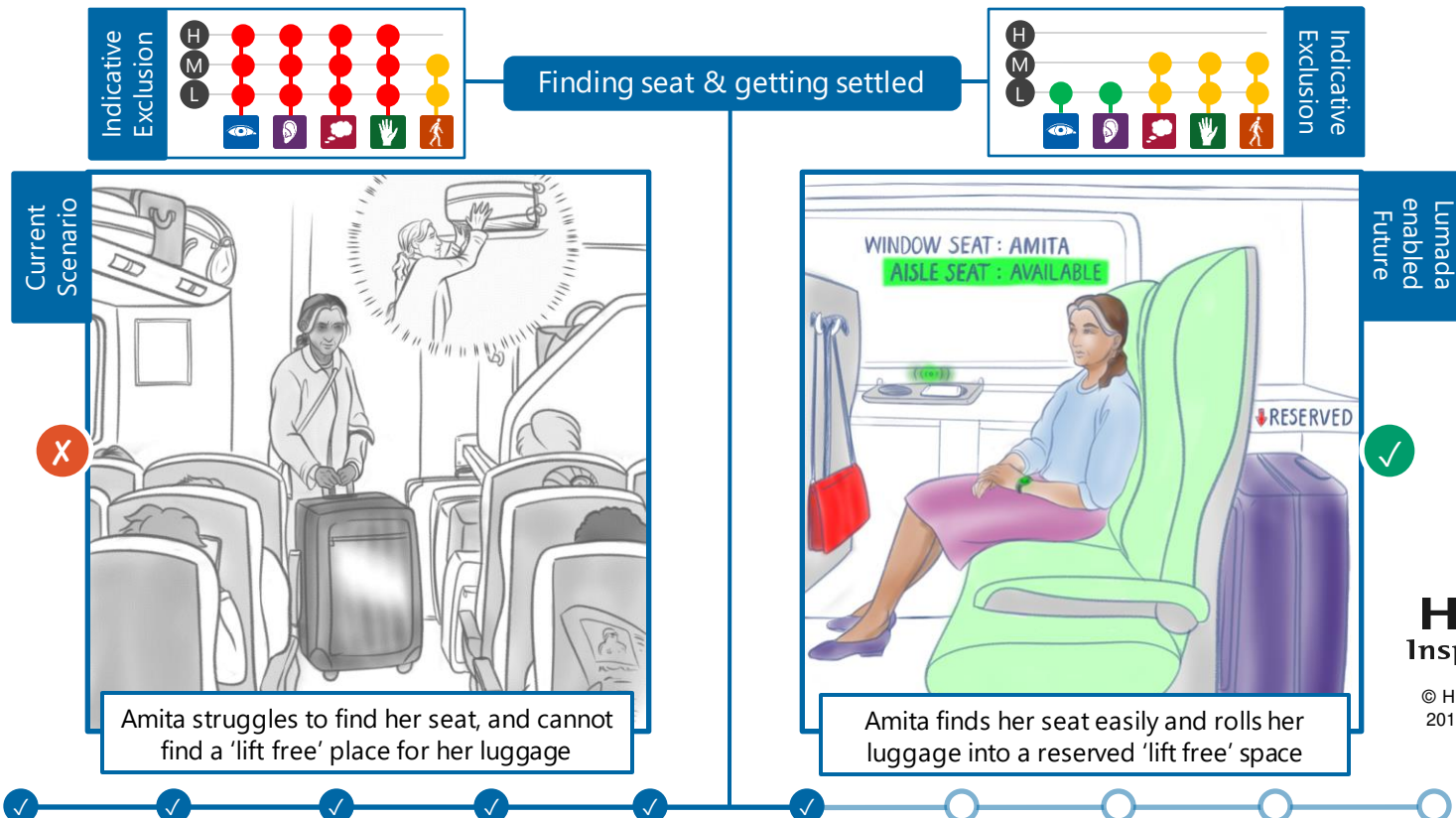




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## Conclusions

- An inclusivity lens is key to customer-focus which is a major challenge for rail
- It is far more than a conventional focus on accessibility
- It can help reduce exclusion and improve experience for everyone
- It can therefore generate growth and improve capacity utilisation
- It is best applied at the design stage of a project but can still be applied later to identify exclusionary issues
- It is best applied to the whole journey rather than just high speed or just rail

# THANK YOU



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## **NEW TRAVEL CONCEPT**

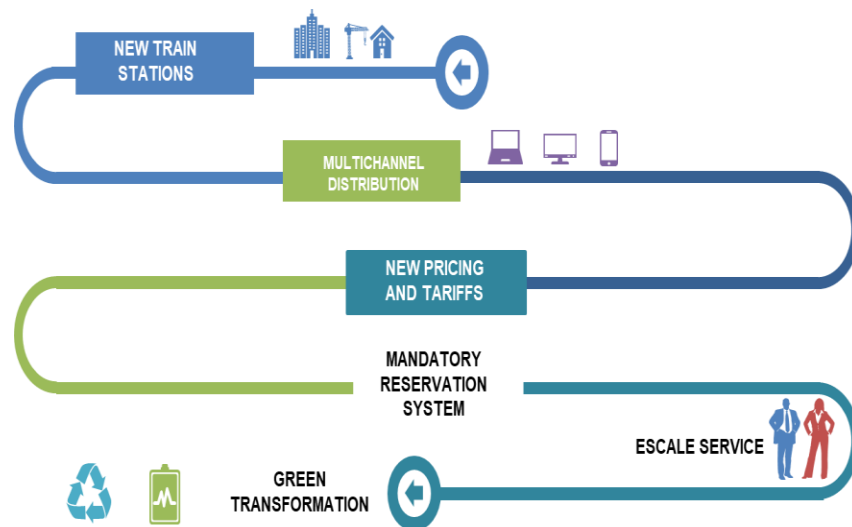
Tewfik, BOUARIF  
Passenger Commercial Director, ONCF, MOROCCO  
Session3-4.3 Commercial / Service quality





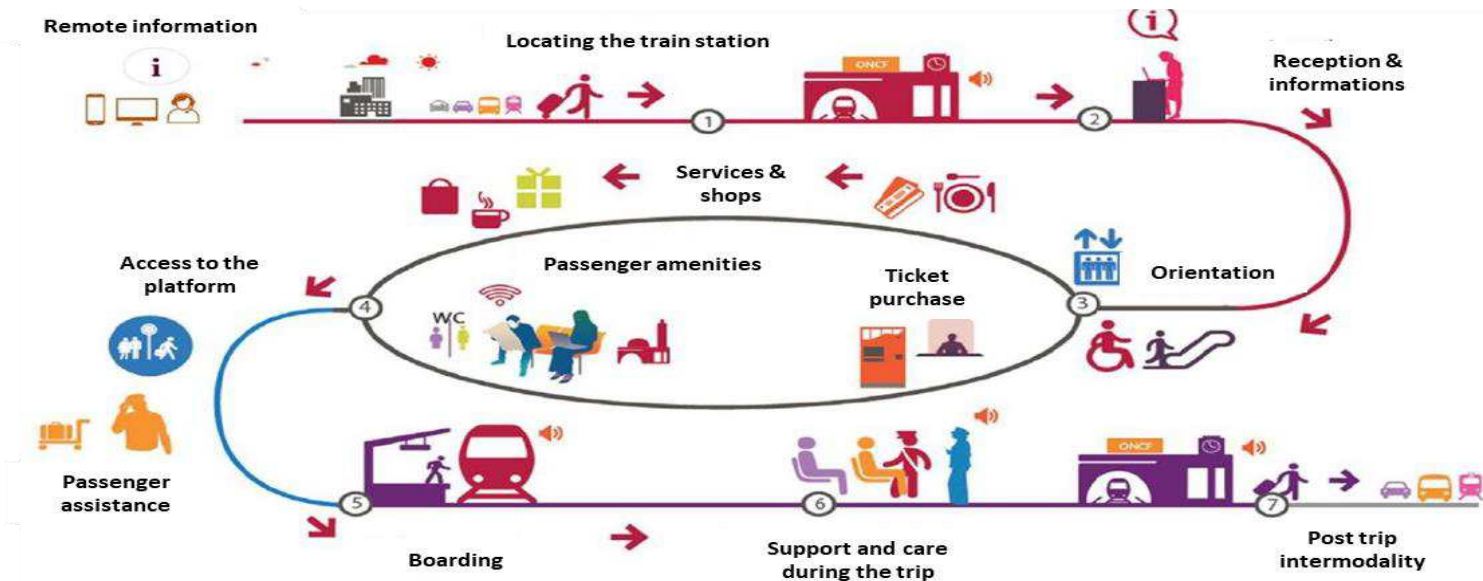
## PRESENTATION OUTLINE

- ❑ THE PASSENGER JOURNEY
- ❑ NEW TRAVEL CONCEPT
- 1 NEW TRAIN STATIONS CONCEPT
- 2 MULTICHANNEL DISTRIBUTION
- 3 NEW PRICING AND TARIFFS
- 4 MANDATORY RESERVATION SYSTEM
- 5 ESCALE SERVICE
- ❑ ONCF GREEN TRANSFORMATION





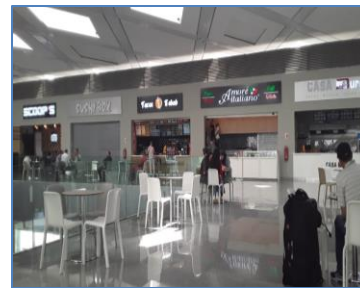
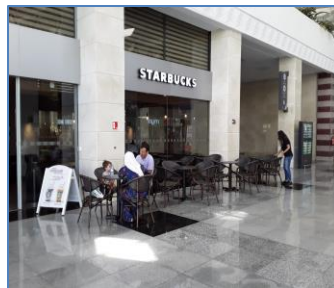
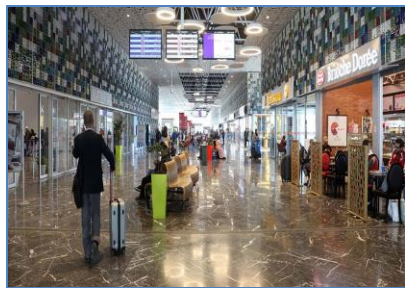
## THE PASSENGER JOURNEY





## NEW TRAIN STATIONS CONCEPT

Train station: a living space of service and exchange





## MULTICHANNEL DISTRIBUTION

To ensure customer proximity



**ATM & Station ticket offices**  
( 'Immediate Departure' or 'Trip Preparation' )



**Website**  
**Oncf-voyages.ma**



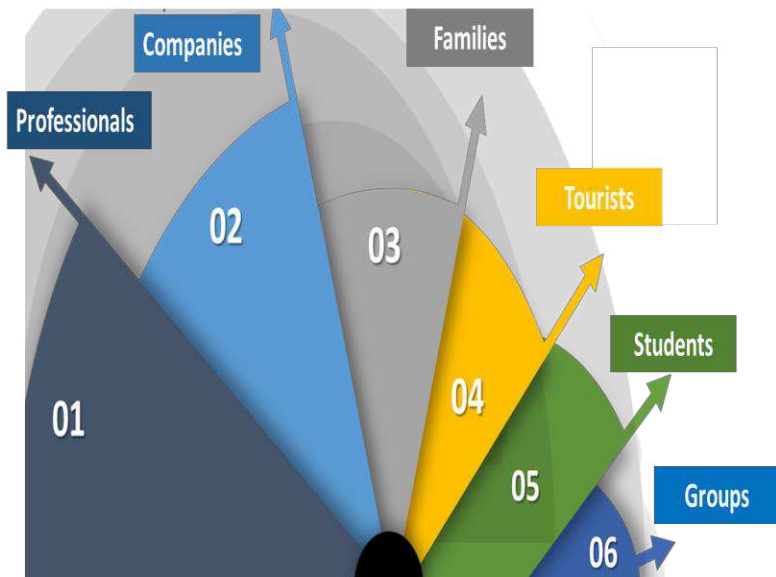
**« KHIDMAT AL QORB »**  
**Proximity service**





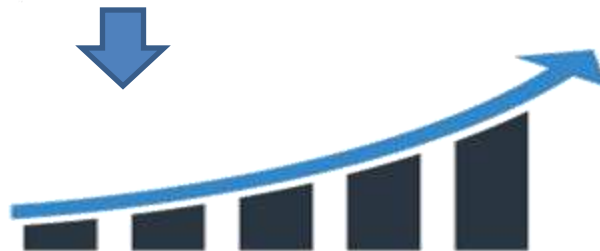
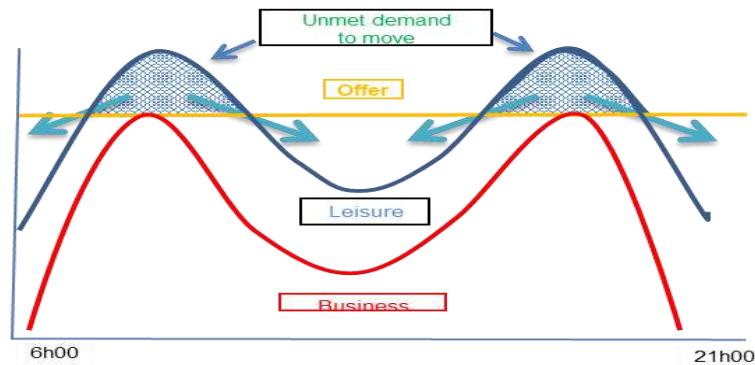
## NEW PRICING AND TARIFFS

A flexible and customer focused pricing system



Dynamic pricing policy: Yield management

- TRAFIC SMOOTHING AND BETTER FILLING OF TRAINS
- OPTIMIZING THE TRAFIC AND REVENUE COUPLE
- MAKE THE TRAIN ACCESSIBLE TO ALL SOCIAL CLASSES

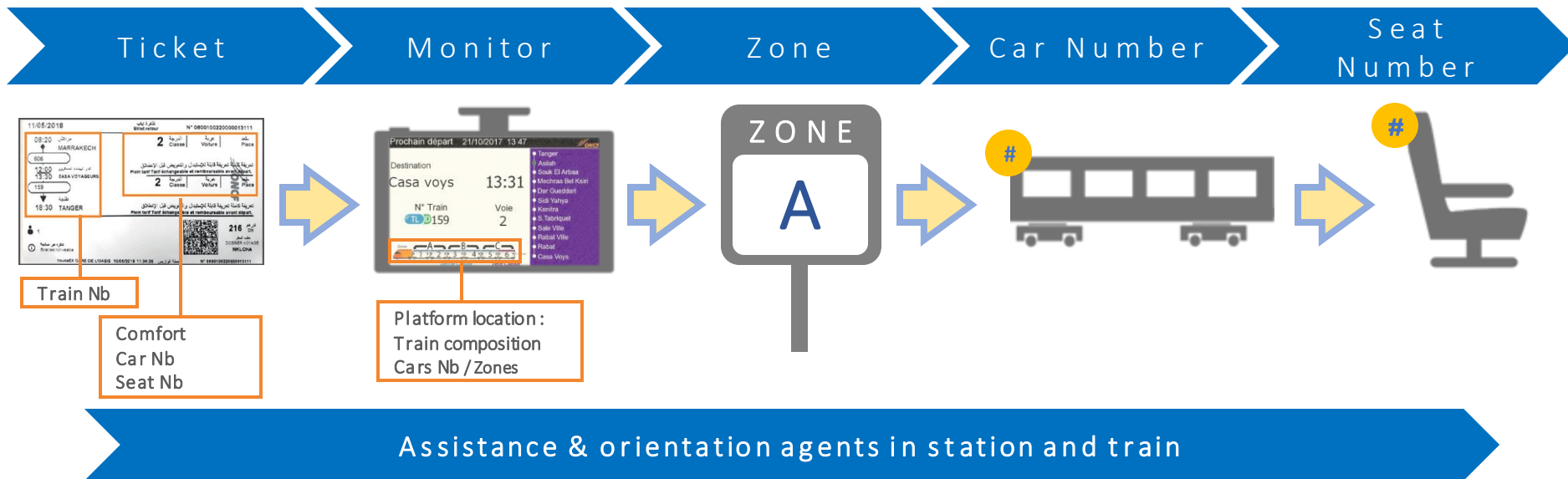






# MANDATORY RESERVATION SYSTEM

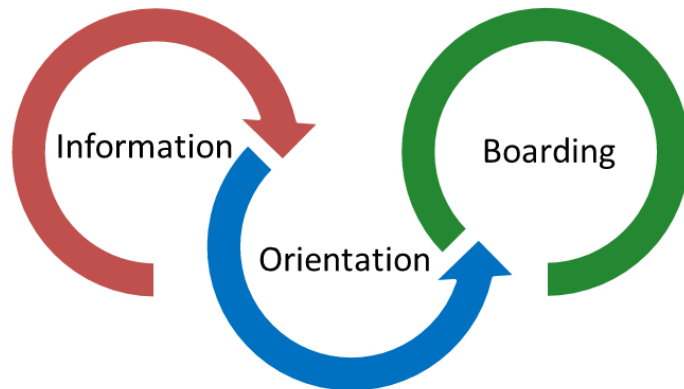
A guaranteed seat on board!





## ESCALE SERVICE

For a smooth stay at the station, on departure and on arrival



### Head of Escale

Secures the best possible coordination between the services in the station and the preparation of the trains

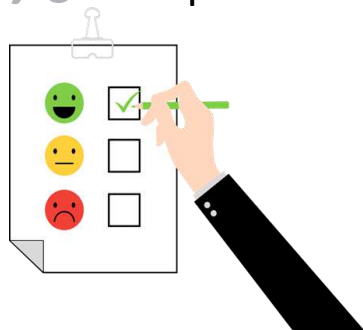




## IMPACT OF THE NEW TRAVEL CONCEPT

### CUSTOMER SATISFACTION

89% +19 pts



### TRAFIC BOOST

+28%





## ONCF GREEN TRANSFORMATION

AL BORAQgone Green since january 1, 2022 !





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# **Research and Prospect on the Architecture of China Railway Intelligent Travel Service System**

Jianxiong, WANG

Technical Director, China Academy of Railway Sciences Corporation Limited, China

Session3-4.3 Commercial / Service quality





## China railway intelligent travel service architecture

### Intelligent Ticketing Service

- ❖ E-ticket
- ❖ Design of products
- ❖ Ticketing organization
- ❖ Travel planning
- ❖ Precision marketing
- ❖ Integrated traffic information sharing

### Travel Extended Services

- ❖ Hotel reservation
- ❖ Railway tourism
- ❖ Attraction tickets
- ❖ Catering reservation
- ❖ Receive and send off
- ❖ Air-rail intermodality
- ❖ Plane ticket booking
- ❖ Internet car hailing

## Intelligent travel service

### Station and Train Intelligent Service

- ❖ Accessibility service
- ❖ Intelligent service for station and train
- ❖ Passenger transport integrated production command management
- ❖ Intelligent management and monitoring of passenger transport equipment
- ❖ Passenger station safety

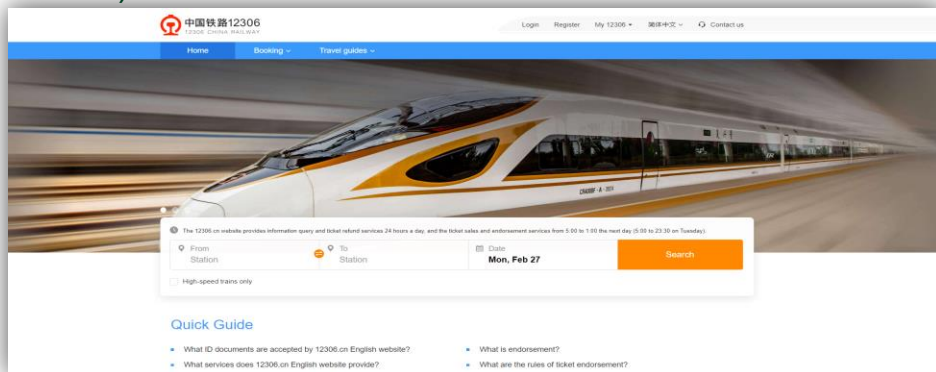


## China railway ticketing and reservation system (12306)

China Railway Ticketing System Technology and Service Development in 28 years (1996 - 2023)

1 Headquarter (2 Data Centers)  
18 Regional Centers  
3000+ Railway Stations

12306 Internet Ticketing Website with Dual-Active Data Centers  
Nationwide Inventory Cloud Computing Center Consisted of 50+ Nodes



**600M+**  
Registered Users

**400M+**  
App Installation

**20M +**  
daily tickets sales

**260B +**  
Peak daily visits



**30K+**  
Ticket  
Windows



**30,000+**  
TVMs/TPMs



**50,000+**  
Gates



**110,000**  
Telephone Booking  
Access Lines





## Intelligent ticketing system with ticket sales as the core



### ■ Travel Planning

- ❖ Inquire & Reservation / Continuous Transfer / Counting and Fixed Ticket
- ❖ Railway All-in-one Card
- ❖ Air-Rail / Rail-Sea
- ❖ Car Hailing / Bus Ticket



### ■ Innovative Services

- ❖ E-Ticket
- ❖ Waitlist Function
- ❖ Insurance
- ❖ Adaptive Aging and Accessibility Service, etc.



### ■ Flexible Time

- ❖ Flexible Adjustment of Pre-Sale Period
- ❖ Consistent Pre-Sale Period
- ❖ 24-Hour Service
- ❖ Differentiated Ticketing Time



### ■ Integration

- ❖ Offline: Ticket Counter, TVMs/TPMs, ATM-TVMs
- ❖ Online: Internet / Smart Phones, Telephone

### ■ Convenient Change

- ❖ Refund / Rebooking / Destination Rebook
- ❖ Downgrade / Region Suspension / Turn-Back Refund
- ❖ Overdue Rescheduling / Credits Exchange
- ❖ COVID-19 Full Refund

### ■ Multiple Payment

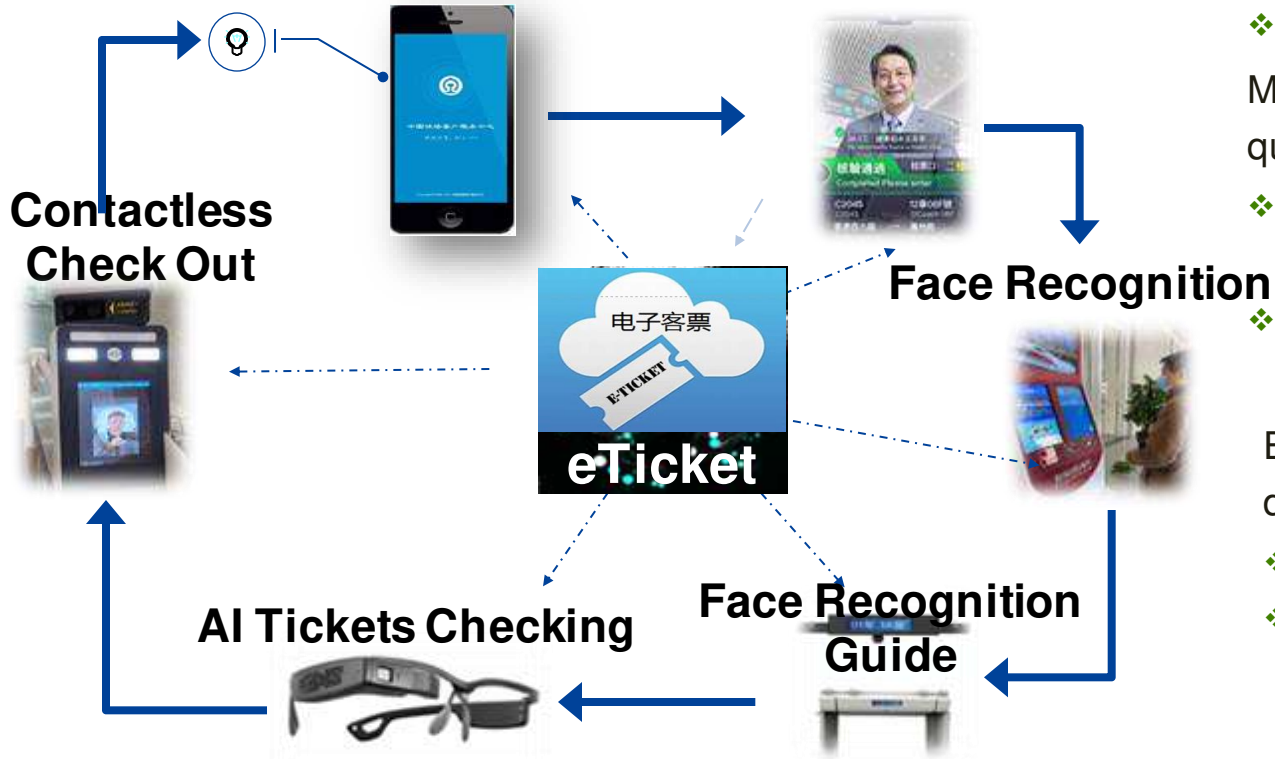
- ❖ Cash
- ❖ Bank Card / International Bank Card
- ❖ Third Party Payment
- ❖ Railway Expresspay



## Whole travel electronic ticket intelligent travel service

**12306 Client**

**ID Self-check**



Intellectualization improves passenger transport efficiency

❖ Gate check-in speed: 3.8 s/ppl → 1.3s/ppl

Management integration, improve the quality of service

❖ Online & offline refund, convenience for passengers, reduce station pressure

❖ Reduce the process of picking up tickets, save passengers' time

Eco-travel without paper tickets, decrease operating costs

❖ Cost saving: 660M/year

❖ Save a lot of equipment procurement, maintenance, management and labor costs



## One-stop railway travel extension service system

- ❖ online hotel booking
- ❖ railway tourism
- ❖ scenic spot tickets
- ❖ catering reservation
- ❖ shuttle service
- ❖ air and rail intermodal
- ❖ air ticket booking
- ❖ car-hailing booking
- ❖ business lounges
- ❖ exclusive VIP channels
- ❖ station and bus catering services

The 12306 connects and prospers the cities along the route with the modern intelligent railway service of "Internet plus travel," helps the recovery of the tourism industry in the post-COVID-19 era, and creates a one-stop ecological circle of railway travel services of "food, accommodation, travel, tourism, shopping, and entertainment."



**Station Shop:** 500+

**Train Service:** D-series High-Speed train 3000+, Ordinary Train 10000+



## Intelligent passenger station service

### ■ In-and-out service



### ❖ Intelligent inquiry machine



### ❖ Inquiry robot

### ■ Equipment green energy saving



### ❖ Intelligent control of power consumption of station



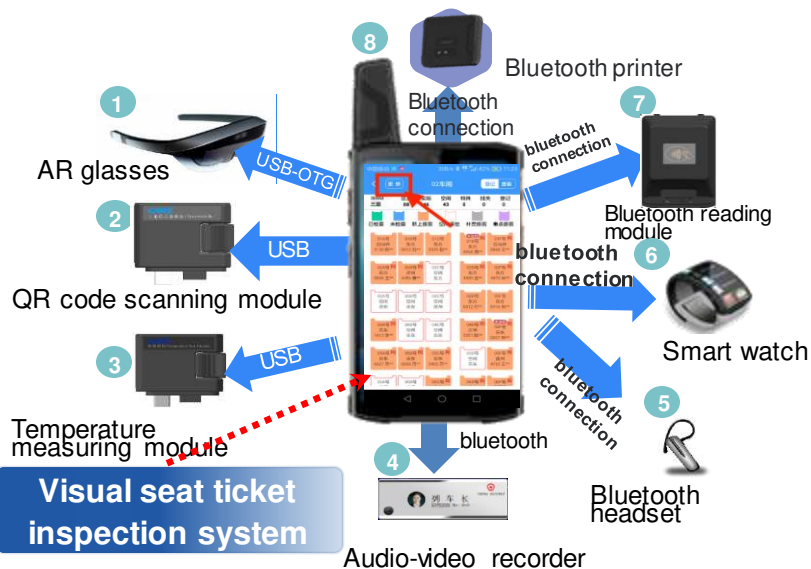
### ❖ Power consumption management





## Intelligent service of station and train integration

### ■ The invention of the "individual soldier" operating system



### Headset

- ❖ Voice transmission and voice control

### Audio-video recorder

- ❖ Inspection record

### Smart watch

- ❖ Information reminder, voice transmission and health monitoring

### Passenger transport mobile operation terminal

- ❖ Passenger transport mobile operation, intercom, train ticket and GSM-R communication

Reduce the number and weight of equipment, improve the efficiency and intelligence of passenger crew

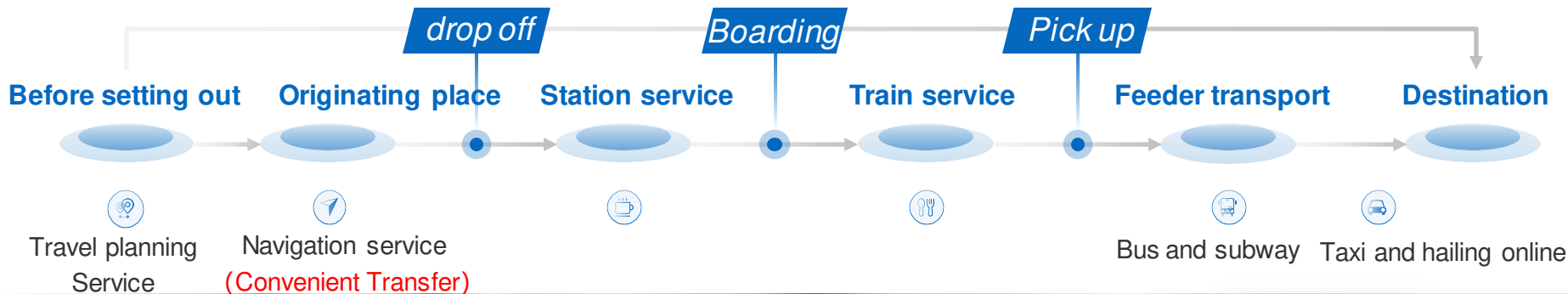


## Passenger intermodal service



Technical requirements for interoperability of integrated transportation electronic ticket information system (JT/T 1310-2020)

### Air-Rail, Rail-Road-Sea Multimodality



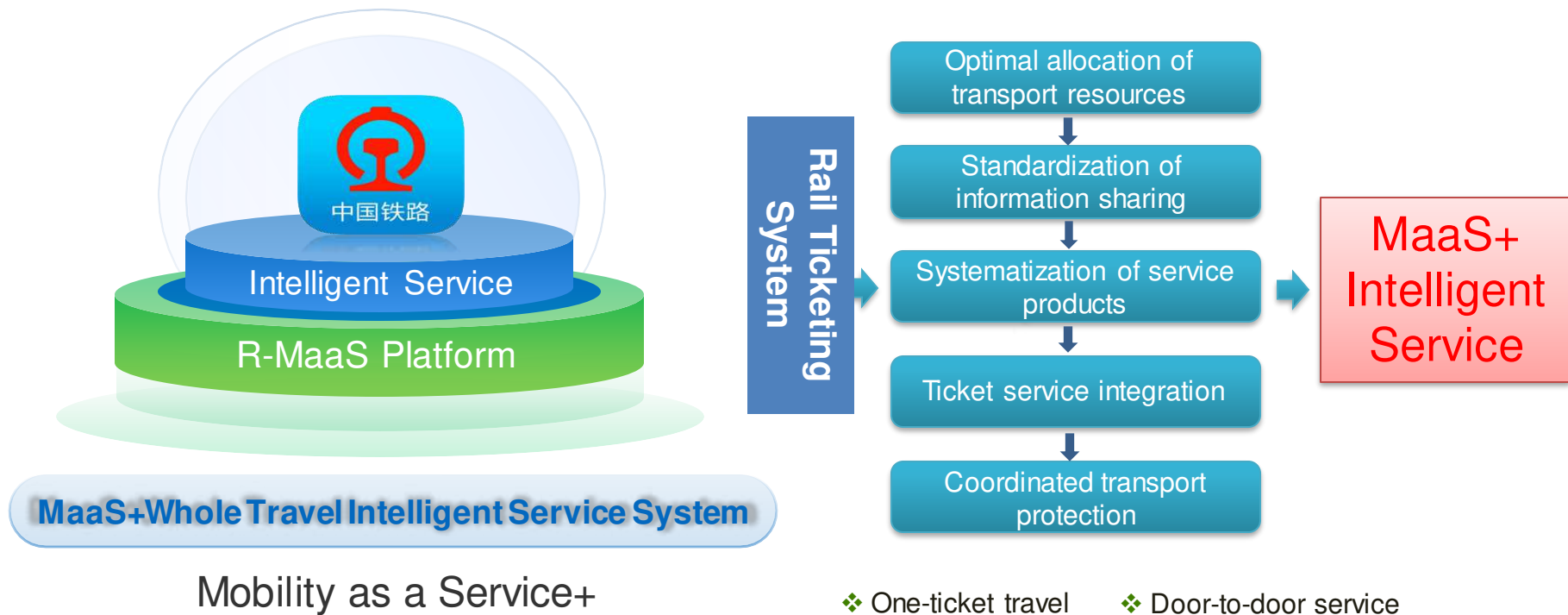
recommendaation





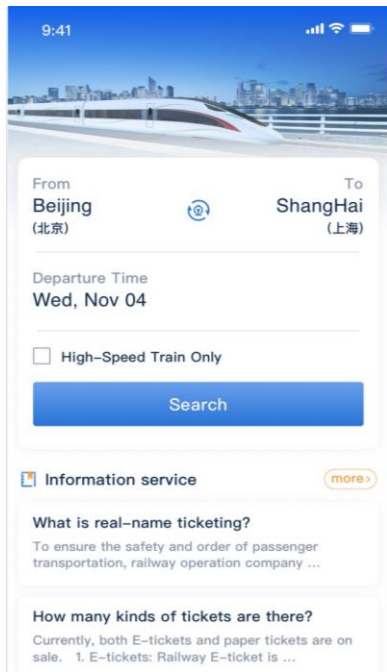


## Prospects1: More ubiquitous - MaaS+ whole travel intelligent service system





## Prospects 2: More intelligent, more international



- ❖ During the 2022 Winter Olympic Games in Beijing, we upgraded our ticketing system internationally and intelligently, successfully serving the needs of passengers from all over the world, and made a series of progress in cross-border railway and connectivity.
- ❖ With the support of 5G, blockchain, artificial intelligence, and other new technologies, and the direction of ticket sales to ticket services, we are building a comprehensive ticket service platform with available capabilities, resource sharing, safety, and efficiency, and realizing a passenger service system featuring intelligent passenger service, digitalized business management, intelligent revenue management, and integrated travel.
- ❖ In the future, we plan to fully integrate with the international railway industry and conduct more research and cooperation in e-ticket standards, international ticketing, international combined transport, and intelligent technology.





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# **CUSTOMER ENGAGEMENT STRATEGY IN THE DIGITAL TRANSFORMATION OF CLIENT SERVICES**

HAMZA, OURABAH

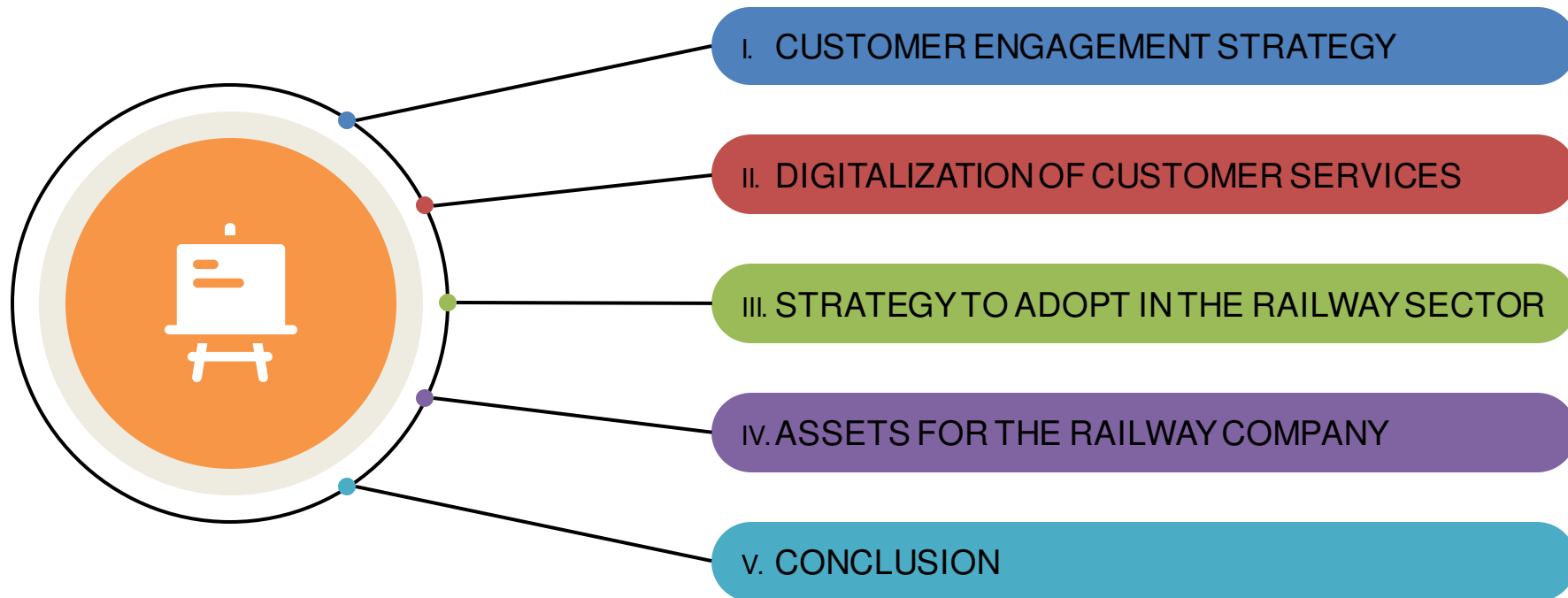
Head of Passenger IT systems, ONCF, MOROCCO

Session3-4.3 Commercial / Service quality





## PLAN





## I. CUSTOMER ENGAGEMENT STRATEGY

### ❖ Definition

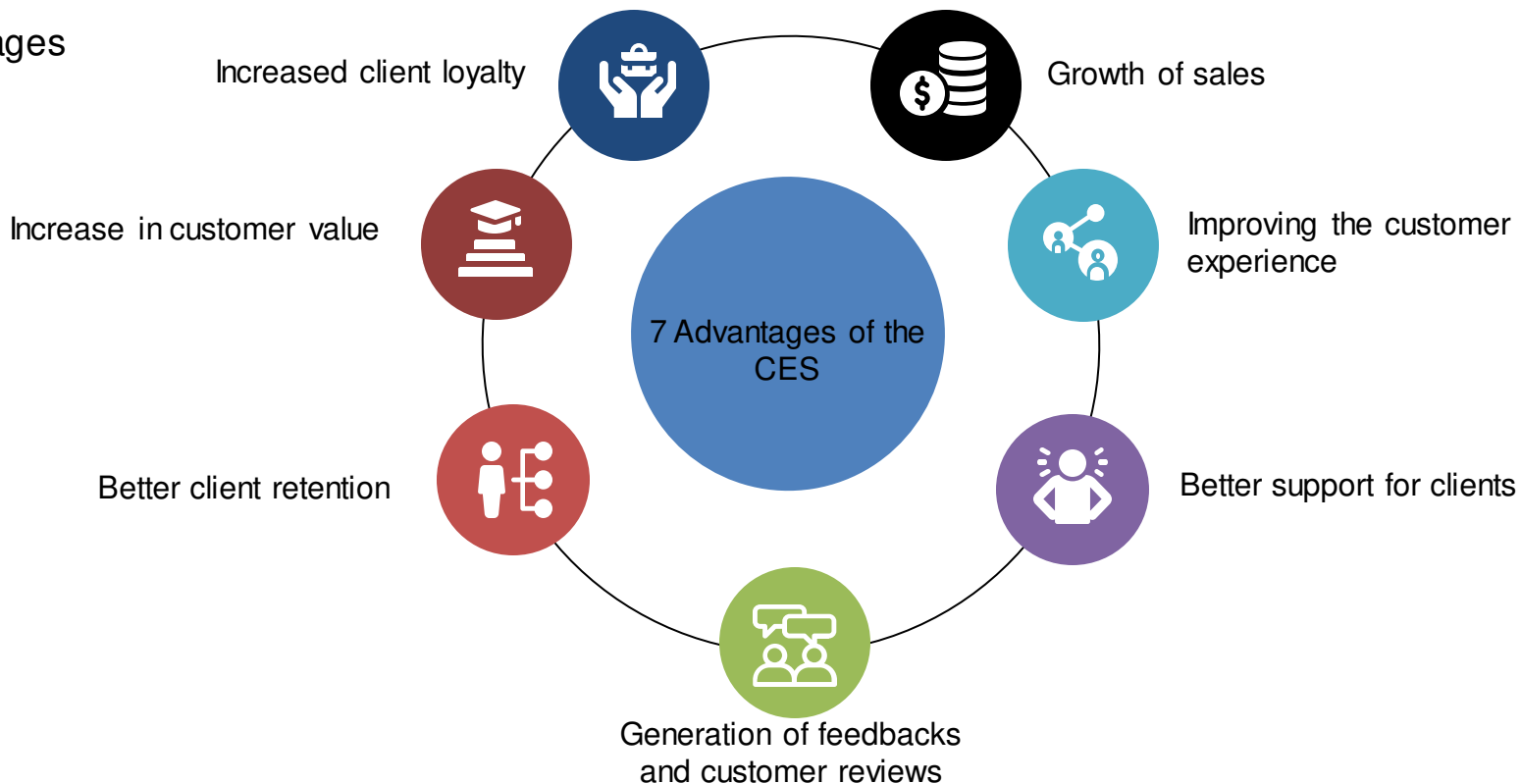
- ❖ A customer engagement strategy draws attention to :
  - The quality of the customer experience ;
  - Customization of the offer ;
  - Creating emotional connection with the brand.
- ❖ To implement an effective customer engagement strategy, it is essential to :
  - Understand customer needs and expectations ;
  - Collect (anonymously) data on customer behavior on enterprise platforms ;
  - Conduct satisfaction surveys or organize focus groups with customers.





## I. CUSTOMER ENGAGEMENT STRATEGY

### ❖ Advantages





## II. DIGITALIZATION OF CUSTOMER SERVICES



Online communication  
platforms



Mobile applications



Process automation



Openness on social  
networks



Integration of Chatbots



Customer relationship  
management systems

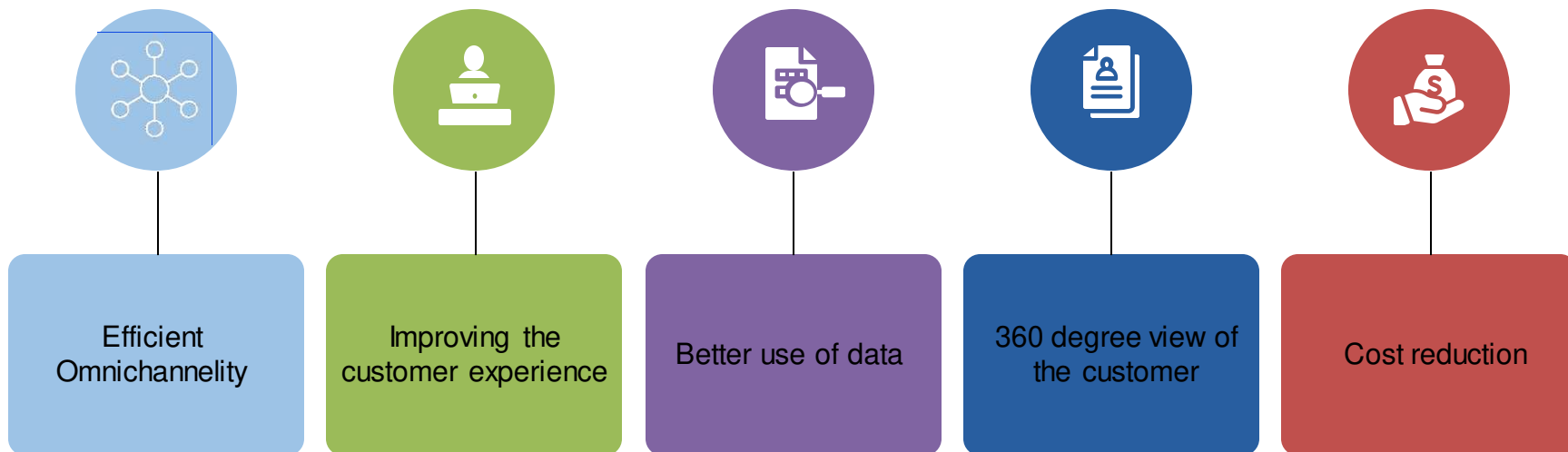


Data analysis platforms



## II. DIGITALIZATION OF CUSTOMER SERVICES

### ❖ Benefits



### III. STRATEGY TO ADOPT IN THE RAILWAY SECTOR



Improve customer knowledge

- Building a community
- Conducting surveys and satisfaction polls
- Creation of groups on social or professional networks



Putting the customer back at the center of the value creation process

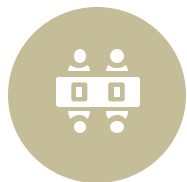
- Crowdsourcing
- Reward for bearers of innovative ideas
- Sharing achievements with customers



Offering exclusive content

- Attracts subscribers
- Reward loyalty
- Setting up a sponsorship system

### III. STRATEGY TO ADOPT IN THE RAILWAY SECTOR



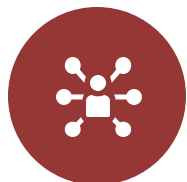
Define the objectives  
and priorities

- Prioritization of fields of action
- Improvement of the marketing and communication strategy
- Implementation of the Marketplace



Establish a digital  
culture in-house

- Process re-engineering
- Adherence of the teams to a true digital culture



Interact on multiple  
channels

- Flexibility
- Guarantee of the consistency of information



## IV. ASSETS FOR THE RAILWAY COMPANY



Promotion of low environmental impact, safe and space-efficient transportation



Transforming customers into company ambassadors



Accompanying travelers before, during and after their trip



Improvement of the brand image





## IV. ASSETS FOR THE RAILWAY COMPANY



Better competitiveness



Commercial intermediation via the Marketplace



Reduction of operational costs



Revenue growth



## V. CONCLUSION





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THANK YOU

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HAMZA, OURABAH  
Head of Passenger IT systems, ONCF, MOROCCO  
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**Marrakech, 7-10 MARCH 2023**

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**ONCF SERVICES**  
**to facilitate and enrich the customer**  
**experience**

Nacéra, BECHARI  
ONCF, MOROCCO

Session3-4.3 Commercial / Service quality





# SUMMARY

- 1 REMOTE INFORMATION
- 2 DOOR TO DOOR INTERMODALITY
- 3 AL BORAQ LOUNGES IN STATIONS
- 4 CATERING ON BOARD
- 5 ONLINE AFTER SALES SERVICES
- 6 PRM SERVICES
- 7 PACKAGE OFFERS



# REMOTE INFORMATION



## ONCF TRAFIC APPLICATION

Your train in real time!

This application provides real-time useful information to better plan your train journeys

- Locate the stations closest to you
- Check train schedules
- Stay informed in real time on the state of traffic
- Easy access and useful information about your trip

## CHATBOT « M'ONCF »:



- Equipped with artificial intelligence, which answers your questions in writing instantly to make your daily trip easier.
- available at any time.
- respond instantly to messages to get all the information possible about trips
- Understands different languages Classical Arabic, Darija, French, English, written and Vocal messages.





# REMOTE INFORMATION

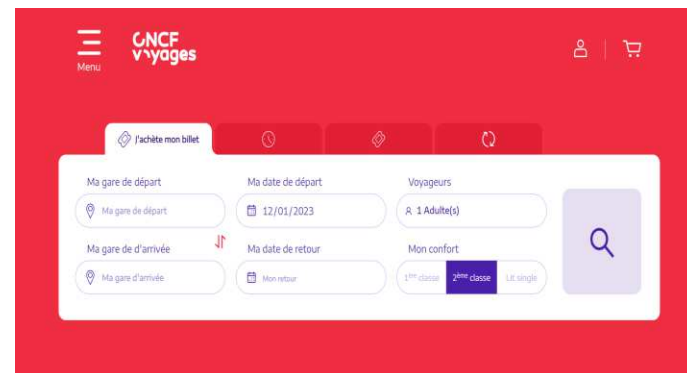
## CUSTOMER RELATIONSHIP CENTER



Operational 7 days a week and 24 hours a day, our customer relations center is accessible from any point in Morocco by a single easy-to-remember number 22-55.

this center goes further than timetable information by offering services that are today intimately linked to travel: traffic situation, travel prices, suggestions, complaints, etc.

## E-COM WEBSITE/ ONCF-Voyages :



Oncf-voyages is the online sales site of ONCF, it allows you to consult timetables, buy train tickets, find the latest offers and manage reservations, in particular exchange or cancel travel tickets.



# DOOR TO DOOR INTERMODALITY

## « TRAIN+AUTO » Service :

This available service is part of ONCF's strategy to develop complementary services to the train, with high added value to offer its customers a range of services to improve their mobility.



Customers can benefit from accessible prices with exclusive preferential rates and adaptability thanks to the variations of car rental service formulas with or without driver, which adapt to the different customer segments to cover their needs.

Travelers can benefit from a simplified customer journey from booking the "Train + Auto" service online to picking up/returning the vehicle in dedicated car parks at the station.



# Al Boraq lounges in stations

The new GV stations are designed to improve the journey of travelers as soon as they arrive at the station

The Al Boraq Travelers Lounge at the station is a premium space, conducive to relaxation, accessible to all our 1st class customers;

The services offered free in the Al Boraq travelers lounge:

- A comfortable space;
- Free wifi access in the lounge;
- Sockets to be able to recharge mobile terminals;
- A TV screen broadcasting information on our offers and our news;
- Monitors relaying information related to train departures and arrivals.

And self-service:

- Water bottles
- A large selection of hot and cold drinks.

Exchange:

The possibility of exchanging tickets in the Al Boraq lounge, a premium service reserved exclusively for Al Boraq 1st class passengers





# Catering on board

The "Chhiwat Mama" menu is fully in line with current food trends:

The "Chhiwat mama" menu follows the rhythm of the seasons and offers tasty products for a gourmet and healthy cuisine. It concerns a varied offers with gourmet recipes in Moroccan flavors, freshly prepared every day and according to the seasons.



**RECIPES CREATED BY CHEF KHADIJA**

*Chhiwat Mama*

**Jeu Concours**  
8 mars

**Cheffe Khadija**

**EXPRIMEZ VOTRE TALENT DE GOURMET.**

Participez à notre jeu-concours culinaire\* Chhiwat Mama pour tenter de retrouver le sandwich de votre création sur la prochaine carte de restauration et garantisiez votre participation au Cook Show en gare avec Cheffe KHADIJA.

**#ALBORAQ**

\*ANNONCE DES 2 GAGNANTS LE 8 MARS.

**Al boraq** البراق  
Notre train

Several events organised to introduce travellers to new flavours

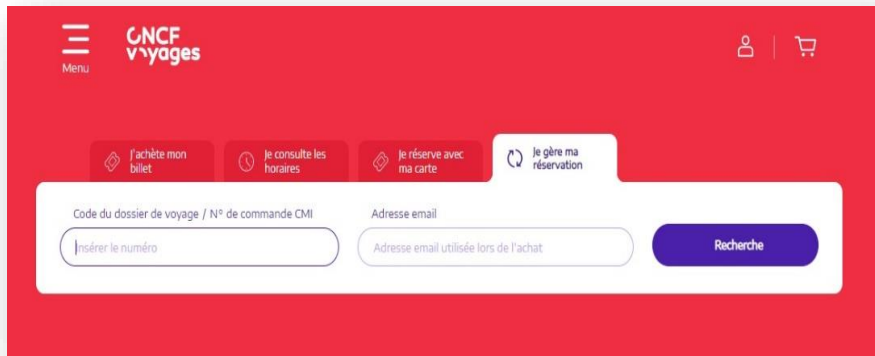






# ONLINE AFTER SALES SERVICES

## ONCF-VOYAGES.MA



### cancelation /refund:

Unused or partially used tickets can be refunded if their validity indicated therein has not expired, according to the general conditions of after-sales service.

### Exchange:

Customers can exchange tickets purchased on the Oncf-voyages.ma website (tickets to be collected at the station, e-tickets) or by going to the station, according to the general conditions of the after-sales service.

## ONLINE CLAIM PLATFORM ONCF2255.MA



ONCF also provides a reclamation platform online on "oncf2255.ma".



# PACKAGE OFFERS



several partnerships with tourism and cultural players to enrich the customer experience at attractive prices

## Al Boraq Nautico

Offering Several choices of activities wick are available to make a stay in tangier the pearl of the north an unforgettable moment

## Train'Art :

offering access to museums at attractive prices



# PRM services

**The new high-speed stations are designed and adapted to the specific needs of people with reduced mobility.**

In order to bring the facilities, tracks and platforms into conformity, various equipment intended to improve accessibility has been installed:

**In stations:** Adapted reception and sales areas, toilets for people with reduced mobility in the station, dedicated parking spaces and accessibility convenience (access ramps, lifts, wheelchairs,

**On the platform:** Adapted circuits, uneven passages, raised platforms and PAV lifts for hire.

**On board:** Dedicated travel space and toilets adapted to PRMs and possibility of traveling in 1st class at the price of 2nd class.

ONCF also offers a service allowing the necessary adaptation to the different needs of PRM customers free of charge by contacting the ONCF Customer Relations Center at 2255







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# **SEATS ALLOCATION OPTIMIZATION FOR HIGH- SPEED TRAIN SERVICES**

Valentina Pozzoli

Project Manager, SNCF Technologies, Innovation and Group projects Direction

Session3-4.3 Commercial / Service quality





## CONTEXT

### High speed train services in France

- ❖ Growing in terms of infrastructure, services and passengers
- ❖ SNCF is the main operator (InOui, Ouigo)
- ❖ New competitors appearing since market was open to competition (2020)

### Ouigo

- ❖ Low-cost high-speed service launched in 2013
- ❖ Operating model revolving around optimizing costs and maintaining a high occupancy rate





## SEAT ALLOCATION FOR OUIGO

- ❖ **Automatic assignation** of seats to passengers (unless a paid seat selection option is chosen)
- ❖ Communication of the seat number **4 days prior to the train departure**, as opposed to at the moment of reservation

Seat allocation can have an impact on the quality of the train occupancy:

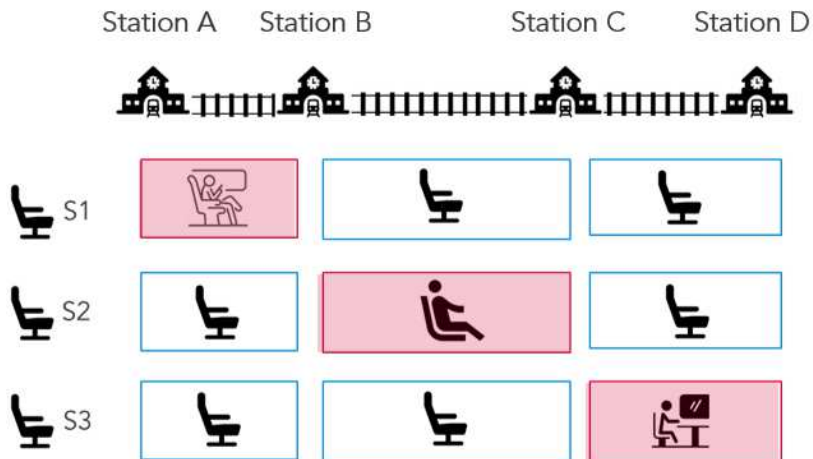
- ❖ Sales performances
- ❖ Clients' satisfaction
- ❖ Operational preferences



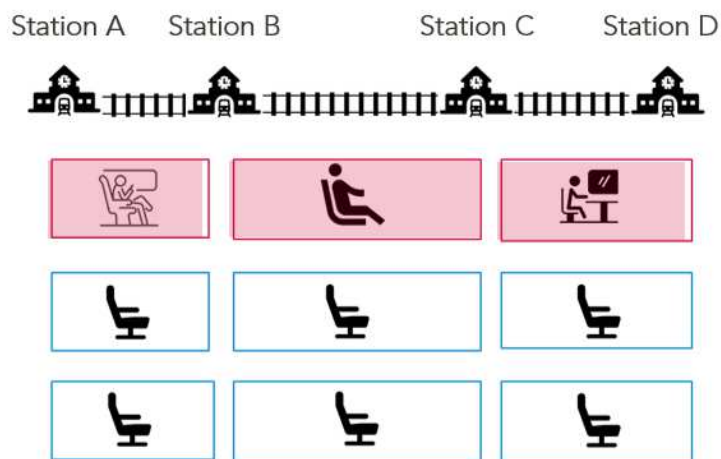


## MAIN PRINCIPLE

**Non-optimal situation**



**Optimal situation**





## GOAL : OPTIMIZE PASSENGERS' ALLOCATIONS

**Allocate passengers simultaneously**, right before the communication of the seat number, to optimize



Occupancy

- ❖ Free seats that could be sold before the train departure



Proximity

- ❖ Placement of people travelling together
- ❖ Focus on families with young children



Homogeneity

- ❖ Homogeneity of the occupancy rate of each coach
- ❖ Important for passengers' comfort and equal use of train equipment



Exchange

- ❖ Homogeneity of passengers getting on and off for each coach
- ❖ Important to respect train stopping time

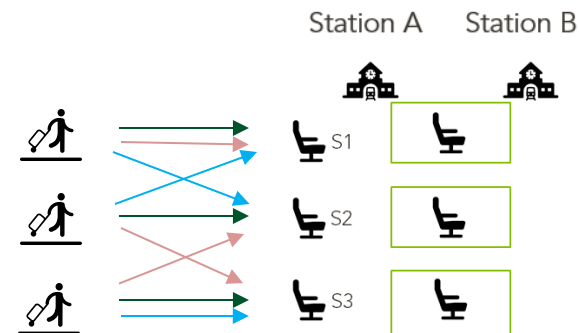
## MODEL

- ❖ Optimization algorithm modeled as an integer linear problema
- ❖ Objective function is a weighted sum of the optimization criteria:
  - ❖ More emphasis on occupancy for full trains
  - ❖ Emphasis on Passenger's comfort for less full trains

	3 seats 3 passengers	10 seats 10 passengers	450 seats 450 passengers	1 train
# possibilités	6	3M	$\sim 10^{1000}$	

[illegible] $\sim 10^{1533}$ 

oooooooooooooooooooooooooooooooooooo







## TESTS AND RESULTS

- ❖ Tests on historical data
- ❖ Comparison between optimized and historical allocation

### Average improvement per train



	Occupancy	Proximity	Homogeneity	Exchange
Full trains	<b>+7,6%</b>	<b>+84%</b>	<b>+53%</b>	<b>+59%</b>
Other trains	<b>+0,1%</b>	<b>+95%</b>	<b>+73%</b>	<b>+81%</b>



No separation for passengers travelling together



## CONCLUSIONS AND PERSPECTIVE

- ❖ **Significant improvement of the quality of train occupancy** by simultaneously allocating passengers right before the communication of the seat number, via an optimization algorithm
  - ❖ Increase of sales performances
  - ❖ Increase of customers' satisfaction
- ❖ Easy to add new criterion, change parameters, or use algorithm for tests
- ❖ **Operational implementation of the algorithm foreseen in 2023/2024**
- ❖ Challenges
  - ❖ Computation time
  - ❖ Reservations/modifications during the computation time



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