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TER4RAIL ROADMAPS AND VISIONS

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OBJECTIVE

- Workpackage 2 aims to review, support, and improve the sector roadmaps in order to prepare for the subsequent iterations of the road-mapping process.

METHODOLOGY

- In order to achieve the above-mentioned goals, a methodology was developed and followed. The approach consisted of the following two steps:
 - ✓ (a) compilation of key statements from the RAIL 2050 VISION (Mazzino *et al.*, 2017) ; followed by
 - ✓ (b) two rounds of Delphi study, conducted online and
 - ✓ (c) validated in a Word Café event between the first and second rounds.
- This webinar reports on and elicits views on the combined Rounds of the Delphi Study
 - ✓ It will be followed by a final presentation at the ERRAC plenary and a final report and paper submission

CONSENSUS

- $APMO = \frac{\text{Aggregate of Majority Agreements} + \text{Aggregate of Majority Disagreements}}{\text{Total Opinion Expressed}} \times 100$

ADVANTAGES/DISADVANTAGES



STATEMENT BUILDING

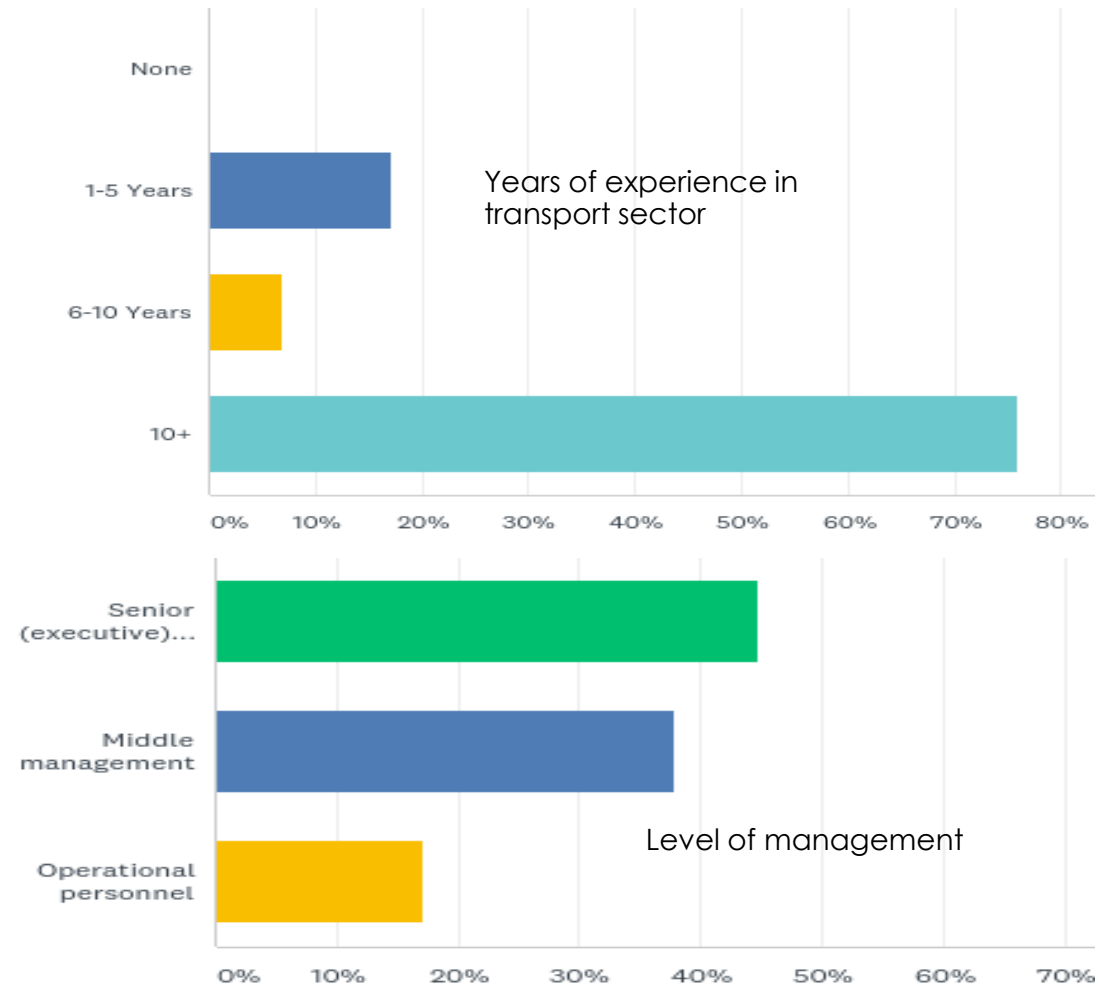
The construction of
statements for a Delphi
survey is key.



PANEL

The panel was experienced and used to executive decision making, with 75.86% having 10 or more years of experience in the transport sector, whilst still including those newer to the sector at 17.24% . Those with senior executive roles formed 44.83% of the panel with 37.93% having middle management roles, and 17.24% with operational roles or had had, in the possible case of retirees.

The panel in the first round was 57 strong and fell to 27 strong in the second round. This is normal for this kind of research.



CONSENSUS AND STABILITY

- *Round 1*
 - $$\frac{\text{Aggregate of Majority Agreements}=722+\text{Aggregate of Majority Disagreements}=0}{\text{Total Opinion Expressed}=1026} \times 100 = 70.37\%$$
 - In Round 1, whilst there were some statements for which the panel was unstable and had not reached consensus according to the APMO of, all had a simple majority of agreement.
- *Round 2*
 - $$\frac{\text{Aggregate of Majority Agreements}=245+\text{Aggregate of Majority Disagreements}=32}{\text{Total Opinion Expressed}=405} \times 100 = 68.40\%$$
 - In Round 2, whilst there were some statements for which the panel was unstable and had not reached consensus according to the APMO 31 had a simple majority of agreement and 1 had a majority disagreement.

ROUND ONE STATEMENTS RANKED HIGH TO LOW*

- Rail Freight transport units in 2050 in Europe can communicate with one another as well as with infrastructure and operational facilities, minimising downtime.
- Passengers across Europe are able in 2050 to access real time personal communication and new services for work or leisure continuously, before, throughout and after the journey.
- Rail in Europe in 2050 is the backbone of urban mobility, with intelligent stations at the heart of smart cities, being life-centric places to work, meet and communicate.
- The rail sector of 2050 manages a growing volume of data in Europe contributing to the data economy. Collection, analysis interpretation and prediction are automated to provide consistent up-to-date information, supporting fast, well-informed decisions and business benefits.
- By 2050 rail has maintained its place as the safest transport mode and this is recognised and valued by European citizens. Zero casualties per year is the current status of the rail sector at urban, regional and inter-city level.
- In 2050, rail transport in Europe is the backbone of an intermodal Mobility as a Service for passengers within cities and beyond, meeting the needs of customers, EU citizens and society.
- By 2050 innovative logistics services in Europe are driven by customer demand. Shipments are moved effectively, efficiently, safely and securely through the "Physical Internet".
[https://en.wikipedia.org/wiki/Physical_Internet]
- Manned and unmanned autonomous intelligent vehicles operate safely on the same European railway network of 2050, controlled by artificial-intelligence based traffic management systems.
- By 2050 European railways are a core part of any smart city planning, mobility management systems, and city fulfilment and delivery services, promoting interconnection by freeing up land which was previously needed by private road vehicles and minimizing pollution and congestion
- By 2050 new energy-efficient station designs in Europe provide easy access and seamless interchange across all transport modes, enabling railways to manage growing passenger volumes and mobility demands
- The European rail system of 2050 is fully integrated with the automated multimodal logistic chain forming the backbone infrastructure, comprising new intelligent, automated cross-modal shipment transfer nodes.

* Agreed and stable

ROUND TWO STATEMENTS RANKED HIGH TO LOW*

- By 2050 the rail freight sector will have to have addressed some fundamental issues around cost, asset utilization and customer facing connectivity.
- Rail is more of a mass transit solution. Tailor-made autonomous journeys will not be the solution. By 2050 as a backbone, rail in Europe will provide journeys on a regular time table so other "light" transport modes can offer autonomous trips.
- In 2050, by obliging access to data from all providers for all modes and all asset and service providers, relevant information is shared across the European rail stakeholders as a part of the data economy.
- A majority of native speakers in urban areas across Europe will have easy tailored access to mobility services by 2050.
- Only if the rail sector is financially supported through capital investment, large amounts of which are needed now, can the European rail system in 2050 be able to detect, understand and respond to individual and collective European citizens mobility needs, delivering tailored, on demand, integrated end-to-end mobility solutions.
- In 2019, Europe is still a leader in the railway products and services. But by 2050, companies from Japan, South-Korea and China would probably be the new leaders.
- People in cities feel safe and secure using European rail services in 2050 thanks to non-blocking security systems.

* Agreed and stable

UNSTABLE STATEMENTS RANKED LOW TO HIGH*

- By 2050 the European rail sector will remain largely technically led with service and user aspects not well recognised.
- By 2050 rail will not be the backbone of an intermodal Mobility as a Service for freight.
- Only some European smart vehicles on rail on low usage lines are aware of themselves by 2050 and have operational autonomy.
- Right now, national rail services do not integrate seamlessly with rail services available in neighbouring countries. So integrating seamlessly with all other available transport modes seems a very distant prospect indeed, not by 2050.
- In the year 2050 information that is shared across the European rail stakeholders as a part of the data economy is exploited by large businesses and threatens personal data privacy.
- The fragmenting political structures across Europe is unlikely to facilitate mobility services tailored regardless of demographics, culture, language, location, or technical proficiency by 2050
- Only in urban mixed traffic environments shall the rail system of 2050 deploy fully-smart vehicles that may be self-regulating by 2050 in traffic, negotiating vehicle-to-vehicle and vehicle-to-X to determine movement priority and resolve potential conflicts at junctions in the network and reacting to unexpected situations.
- European rail systems in 2050 will continue to be very vulnerable to terrorism.

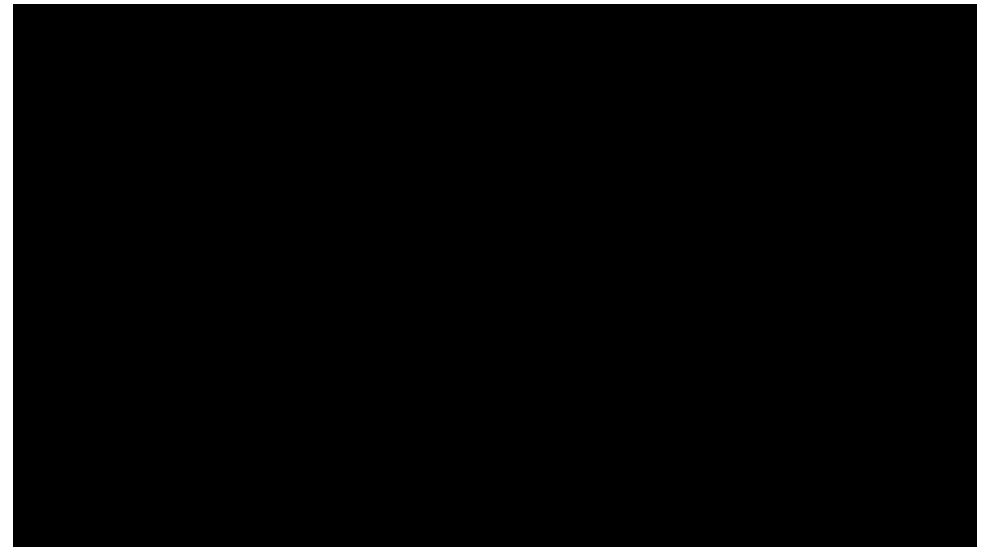
* Unstable with no consensus

COMMON THEMES

- Market orientation;
- Cost, competition and efficiency;
- Leadership, political issues, lobbying, government intervention for good or ill;
- Lack of seamlessness for many reasons;
- Inadequate speed of reaction/investments compared to Asian competitors;
- Lacking technical/technological innovations and skills;
- Language barriers;
- Different regulations barriers in EU rail space;
- Info, data availability sharing and management;
- Safety and security issues;
- Accessibility and capacity;
- A limiting of scope from universal visions to
 - Urban, Native, Backbone.

TER4RAIL DELPHI VIDEOS

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<https://vimeo.com/showcase/7247608>

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TER4RAIL

DELIVERABLE 2.2

REPORT ON THE PROGRESSION OF THE RAIL SECTOR ROADMAPS

Objective of D2.2:

- Provide a comprehensive vision of the strategic planning of the rail sector through a **review of the key roadmaps**.
- **Review and support** the progression of roadmaps
- **Identify the relevant gaps** in the roadmaps which are impeding the achievement of ERRAC vision of railway as the backbone of sustainable European mobility, thus **improving the quality of the transport sector strategic planning**
- “What are the gaps in the current EU mobility roadmaps that need to be bridged for promoting rail as being the backbone of European mobility?”

Methodology:

- The methodology is composed of two elements: **data collection** and data analysis

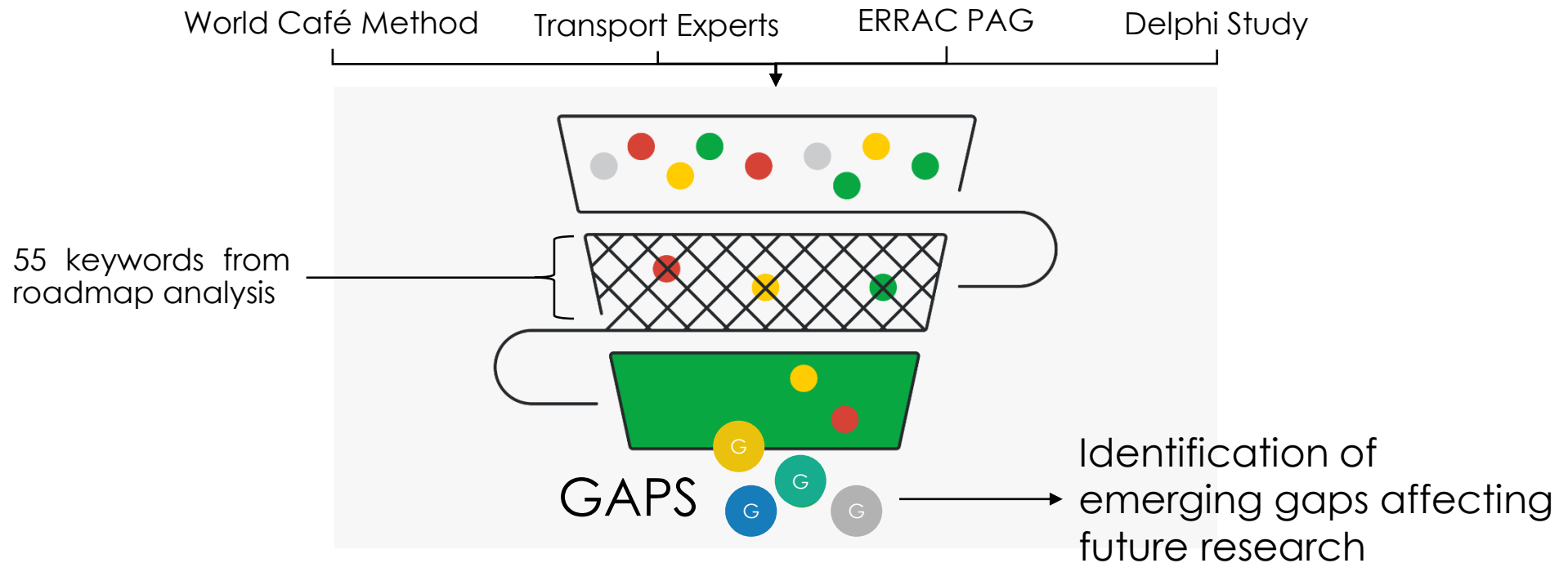
Data collection employs three different sources:

1. The research carried out two separate interviews with two transport experts (Dr Niels van Oort and Prof. D. Christian Hoffmann) to include cross-sectoral innovation processes
2. Data was collected from the Delphi study
3. Data was gathered by employing the World Café Method, held in London on 26 June 2019 with focus on the themes of “Rail as backbone and systems strategy”, “environment”, “European citizens mobility needs” and “smart vehicles”
4. Data has been collected from the group discussions held at the ERRAC PAG meeting of November 2019.

Methodology:

- The methodology is composed of two elements: data collection and **data analysis**
- In parallel with the data collection, the research carried out an analysis of the roadmaps published by the European Technology Platforms.
- The roadmap analysis provided a database and a word cloud of the keywords with a higher frequency throughout the roadmaps.

Finally, the research undertook an analysis to identify the nature of the gaps by using the word cloud – based on the roadmap analysis – as a filter for the data resulting from the interaction with transport experts.



The following table includes the themes presented in the roadmaps within the context of nine detected categories.

<p>Technologic solution</p> <p>Digitalisation</p> <p>Robotics</p> <p>Information management system</p> <p>Cognitive computing</p>	<p>Economy</p> <p>Balanced investment in infrastructure</p> <p>Cost efficiency reliable trains or infrastructure</p> <p>New business cases</p>
<p>Sustainable consumption</p> <p>Decarbonisation</p> <p>Alternative fuels</p> <p>Energy efficient</p>	<p>Holistic view</p> <p>Delivering the vision</p> <p>Long term aspects for the rail network</p> <p>New intelligent</p>
<p>Scale of transport</p> <p>Urban Mobility</p> <p>City Dynamics</p> <p>Connectivity</p> <p>Long-distance transport</p>	<p>EU level</p> <p>Safety and security</p> <p>EU innovation leader</p> <p>Education</p>
<p>Connectivity</p> <p>Accessibility</p> <p>Interconnecting rail network</p> <p>Physical transport network</p> <p>Sharing economy solutions</p> <p>Cross-sectoral / disciplinary research</p>	<p>Policies</p> <p>Trends and policies impacting</p> <p>User behaviour and needs</p>
<p>Infrastructure</p> <p>Electric and hydro charging stations for EV (car/train / truck/ small vehicle) in infrastructure</p>	

The following word cloud highlights which keywords are more frequent within the analysed roadmaps. This further step allowed the research to identify the outstanding keywords.



Railway users

- Citizens individual needs, user acceptance and integration, user-centric approach
- Social-oriented aspects (perceived obtrusive social barriers and social incentives)
- Needs and habits of prospective users (custom-oriented approach to meet needs and loyalty, and availability of mobile apps)
- Services personalisation (ease of transactions and payment, personal preference and dynamic journey management)
- Advancement in the service quality
- Shift from the current “production culture” to a “service culture”
- Inclusion of passengers' lifestyle, the perceived quality experience and the social atmosphere

Policymakers

- Dichotomy between short-term and long-term planning
- Long-term vision often not supported by necessary actions
- Short-term transport goals considered negotiable goals
- Government-driven approach to the identification of transport hubs
- Need for political support in the development of connectivity, infrastructure and hard technologies

Multi-modal approach

- Integrated communication system and strong ICT system
- Exponential technologies and safety & security measures
- Multi-modal approach to railway as the backbone of European mobility (higher frequency of “multi-modal approach” in the railway sector than other transport sectors)
- Railway experts should not only be involved within their own sector but also infiltrate other transport modes roadmaps.

On-demand mobility

- Lack of relevance for tailored and on-demand mobility services
- New technologies able to support end-users in the phases of booking, trip planning and connectivity

CONCLUSIONS & TAKEAWAYS

- The data show the mobility roadmaps lack focus on certain topics which are instead essential for achieving ERRAC vision:
 1. the necessity of adapting citizens' needs, user acceptance and integration of railways
 2. the influence of short-term policy on transport developments over the long term
 3. the absence of a multi-modal mindset in every transport sectors to integrate railways
 4. the need for tailored and on-demand mobility in railways.
- The research highlights comparability in some of the keywords mentioned in the transport roadmaps, thus it is expected an accelerated pace in the development of
 1. cross-sectoral and cross-disciplinary research
 2. information management systems
 3. physical transport network
 4. safety and security
 5. digitalization and interconnection of the rail network

the railway sector must achieve **more collaborations** with other transport modes, especially with **road transportation**

non-rail roadmaps frequently lack to mention in their respective transport vision the opportunities arising from **collaboration or integration with railway** services