

Competence Map of Austrian Rail Industry and Austrian Rail Research

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Executive Summary

bmvit has successfully established a series of competence map documentations on Austrian industry sectors. This “Competence Map of Austrian Rail Industry and Austrian Rail Research” is now a new member in this documentation family. This competence map is also input for successful participation in future partnering and consortia-building within SHIFT²RAIL (S2R) and other international activities for a more transport efficient to come. A small country's industry has learnt to successfully contribute to global road mapping activities and take a sustainable role in transport-related value chains. Austrian rail community stands strong in exports as well as in RTD&I capabilities. Technological breakthroughs have the potential to act as game changers in rail industry and could provide entry points for new stakeholders into the rail research and innovation market. At the same time international RTD&I programmes like SHIFT²RAIL open windows of opportunity for innovative newcomers (especially SMEs) to enter this field for a strong European transport system to come with all the benefits for our quality of living.

The study “Competence Map of Austrian Rail Industry and Austrian Rail Research” was designed and contracted in September 2015 to set-up a first competence map regarding the Austrian Rail Industry and Austrian Rail Research. Participating community to the online survey was industry and research within the rail market as well as interested stakeholders from other fields. The competence map focusses on: key company-figures, research fields and competences in the research and innovation domain (strengths), interest in future research and road-mapping in the rail area. For obvious reasons all participants were requested to self-categorize within industry segment (usually in this context termed as market segments) and SHIFT²RAIL topics.

bmvit provides support and enhances opportunities to Austria's strong and internationally-minded rail-related RTD&I players. Based on the results of the competence map including different stakeholder interests bmvit will investigate communication strategies for each sub-group. bmvit in this supporting activity is highly dependent on learning early about any stakeholder's road-mapping activities or R&D goals dynamically evolving (with projects and opportunities). An additional benefit from this data collection on competences is for the purpose of preparing cross-fertilization within bmvit's various departments, networks as well as in its international activities with other transport-related ministries.

From a methodological point of view setting-up a valid competence map of Austrian rail stakeholders is challenging. Most stakeholders have learned to feel strong on the basis of successful exports, successful pilot projects and joint international activities. The willingness to report key-competences, roadmaps or key personnel within a public or semi-public document is clearly limited. Therefore we integrated into our online questionnaire twice the possibility to skip completing the questionnaire in case of “not-want-to-share their information” or to state that the information provided is only for bmvit/-FFG internal use. Due to privacy issues some information is not provided within this report – bmvit/FFG are aware of this detailed information.

Cornerstones of the data gathering process: from December 2015 until end of July 2016 in total 264 individuals opened the questionnaire. 15 people did not answer the question on the “Declaration of Approval” at the first page of the questionnaire. 9 people answered that they do not want to share their data with bmvit or FFG. 240 respondents agreed to share data with bmvit and FFG and continued with the questionnaire. 75 data entries are directly related to a named company (valid entry on company name was provided). This data set of 75 institutions (industry, research, others) is the basis for all analysis in this published report. For some topics we clustered the stakeholders into three groups: **industry** (Railway Undertaking, Rail Infrastructure Management, Rail Supply Industry), **research** and **others** (Services, Meta-Organisations like Interest Groups or Rail-Clusters, Public Administration Body, Other Role). 24% of the respondents self-classified as industry, 36% as research and 40% as other stakeholder role.

Employment figures for the 75 respondents to the questionnaire: The self-declaration provides a total amount of employees worldwide of about 120,000. About 9,260 employees are women (8 per cent). How many people work in RTD&I rail departments? In total we cover 5,600 employees working in RTD&I rail global (4 per cent of total employees). The fact that about 98 per cent of those (5,470) working in Austria underlines the high importance of Austria for RTD&I in the rail domain. Very promising is the result that out of those 5,470 employees in Austria 1,600 (29 per cent) are women. This fits nicely within bmvit's policies to support and enhance women's careers in RTD&I. After consultation processes with the “bahnindustrie-brochure” coordinators we came to the conclusion that these results cannot be added or directly compared. There exist even significantly higher numbers from VCÖ Verkehrsclub Österreich. “bahnindustrie-brochure” reports a total number of employees in the Austrian Rail Industry of 8,100.

Results in a nutshell: First of all, the respondents' self-categorization to the SHIFT²RAIL interest topics generated data in an entirely new quality and validity. These results show clearly different fields of interest as a foundation for bmvit/FFG's future communication activities. Interestingly the biggest non-technical challenge for the future in rail RTD&I has been reported as the limited human resources.

Candidate options for activities based upon results from this survey: Some respondents stated strong interest in future H2020 and national programmes. This could be due to established project and programme routines. Public co-funding

schemes have evolved rather dynamically. However, the strong interest in future co-funded research could possibly mean that SHIFT²RAIL programme's central role and its impact on the rail community is not yet fully understood by all individuals in the community. We anticipate there is the need for further information or orientation.

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2. Study Design

This first section provides some background to report the study “Competence Map of Austrian Rail Industry and Austrian Rail Research” including study goals (2.1) followed by study background (2.2), and the study approach (2.3).

2.1 Goals

This study's goals have been:

- Set-up a survey and analysis regarding the Austrian Rail Industry and Austrian Rail Research within bmvit's established tradition of so called competence maps on Austrian industry sectors. Target group for the online survey was RTD&I (innovation) departments in industry and research within the rail sector.

The competence map should include:

- main company-figures
 - research fields and competences (strengths)
 - future research interest and interest in future road-map elements in the rail area
- Provide results clustered in market segments and SHIFT²RAIL topics (<http://ec.europa.eu/transport/modes/rail/doc/2015-03-31-decisionn4-2015-adoptions2r-masterplan.pdf>).
 - A written report as well as a data-set for bmvit internal and external usage with all data that respondents have agreed to share.

The study authors pro-actively included the teams at bmvit and FFG during the whole study. The planned project phase was extended due to requests from the rail community. Data was gathered from January 2016 to July 2016.

2.2 Study Background

bmvit has successfully established a series of competence map documentations on Austrian industry sectors. This “Competence Map of Austrian Rail Industry and Austrian Rail Research” is now a new member in this documentation family. It is also input for future printed or electronic versions of a promotion format to support Austrian rail stakeholders' successful participation in future partnering and consortia-building within SHIFT²RAIL and other international activities for a more transport efficient to come. A small country's industry has learnt to successfully contribute to global road mapping activities and take a sustainable role in transport-related value chains. Austrian rail community stands strong in exports as well as in RTD&I capabilities. Technological breakthroughs have the potential to act as game changers in rail industry and could provide entry points for new stakeholders into the rail research and innovation market. At the same time international RTD&I programmes like SHIFT²RAIL open windows of opportunity for innovative newcomers (especially SMEs) to enter this field for a strong European transport system to come with all the benefits for our quality of living.

bmvit provides support and enhances opportunities to Austria's strong¹ and internationally-minded rail-related RTD&I players. It will investigate communication strategies for each sub-group. bmvit in this supporting activity is highly dependent on learning early about any stakeholder's road-mapping activities or R&D goals dynamically evolving (with projects and opportunities). An additional benefit from this data collection on competences is for the purpose of preparing cross-fertilization within bmvit's various departments, networks as well as in its international activities with other transport-related ministries.

Cornerstones of the data gathering process: from December 2015 until end of July 2016 in total 264 individuals opened the questionnaire. 15 people did not answer the question on the “Declaration of Approval” at the first page of the

¹ Compare Peter Biegelbauer (AIT) et al (2015): Leistungsfähigkeit und Entwicklungspfade von Forschung und Entwicklung im österreichischen Transportsektor im europäischen Kontext (Horizon 2020).

questionnaire. 9 people answered that they do not want to share their data with bmvit or FFG. 240 respondents agreed to share data with bmvit and FFG and continued with the questionnaire. 75 data entries are directly related to a named company (valid entry on company name was provided). This data set of 75 institutions (industry, research) is the basis for all analysis in this published report. All data privacy issues were fully

Protection of data privacy: With signing a data service provider contract under §§10 and 11 DSG 2000 as well as the announcement of the data gathering process to the data privacy authority under § 17 DSG 2000 all data privacy requirements have been fully adhered to.

Challenges of co-funding R&D processes: One of the main challenges ensuring opportunities in co-funding R&D processes is to have in mind the changed strategic European R&D policy setting of research topics. The competition in successful participation of European research programmes has shifted in very early phases of R&D policy setting. Only if research topics can be placed in very early phases of roadmaps, work programmes and focus of call for proposals by Austrian representatives a successful participation of Austrian stakeholders in R&D projects is possible. Even the consortia for research projects may be set-up during these very early phases (preject phases (Darsø)).

One of the biggest challenges for Austrian R&D stakeholders is to become involved very early in these programme-setting phases. The green car initiative can be seen as best practice for integrating Austrian interest very early and to come-up with very successful participation of Austrian stakeholders within this 6-year-initiative. Therefore the competence map should also act as structured information on Austrian stakeholders in each market segment to disseminate specific information to the stakeholders.

Besides setting-up the Austrian rail competence map there are several international and national activities and initiatives ongoing with regard to mapping strengths of rail industry and rail research in Europe.

- Sparkrail.org (SPARK is a free, interactive web tool for the rail industry sector to share knowledge, reduce duplication and speed up innovation. SPARK helps you to understand what is known and who knows it, and creates opportunities for networking and cooperation.)
- European Rail Cluster Initiative (ERCI)
- Logistic Research Austria (LRA)

2.3 Study Approach

From a methodological point of view setting-up a valid competence map of Austrian rail stakeholders is challenging. Most stakeholders have learned to feel strong on the basis of successful exports, successful pilot projects and joint international activities. From preparatory work the study authors anticipated that the willingness to report key-competences, roadmaps or key personnel within a public or semi-public document will be clearly limited. Respondents shared their concern, that their organisations are well known within the international rail research community and that several documentations from specific conferences or exhibitions typically are used for partner search. On the occasion of Austrian Rail Industry's tenth anniversary a special documentation for this segment including information per industry partner had been produced only recently. Others have claimed that their road mapping and competence mapping is currently in a dynamically evolving stage where they feel that what they could provide is outdated already now and what would be needed has not yet been brought into quotable text. Therefore we integrated into our online questionnaire twice the possibility to skip completing the questionnaire for reasons of competitive sensitivity or to state that the information provided is only for bmvit/FFG internal use. Due to these privacy issues information within this report cannot directly be linked to the answering institution.

The study approach basis on the following corner stones:

- Stakeholders' self-categorization (basic information, S2R-interest, rail road mapping, etc.)
- Online-Tool (soscisurvey.de) for concept, data-input and analysis of the questionnaire
- In total 22 questions (general, S2R-specific, rail-RTD&I-specific) were used
- Integration of lessons learnt from other competence maps of bmvit during the design phase of this study
- Integration of leading stakeholders within the design phase of this study
- Integration of similar international initiatives (several European regions or countries' competence maps e. g. eMobility in Saxony)

- Integration of experience from evaluating entire industries progress in building up competencies (from HiTec's own evaluation in German programmes as well as from international conferences on evaluating impact of co-funded R&D activities onto entire industries.
- Extension of existing mapping-concepts by the dimensions „emerging strategizing“ (Eden/Ackermann) and projects (Darsø)
- After workshop with key representatives of successful participants in SHIFT²RAIL a question on qualifications in rail-specific certification processes was added.
- Interest in extending the data collection to all civil engineering or regional planning organisations who might take up results from rail-related research and innovation projects for deployment planning was stated at the workshop mentioned above. However this was clearly out of scope and together with bmvit the decision was made not to open up to a vast community for several reasons: drastically increased heterogeneity of stakeholders, marginal relevance for purposes of RTD&I stimulation, basically an entirely different industry/community.

Whom did we intend to cover with this study?

- Companies and institutions already participating in SHIFT²RAIL activities
- Austrian stakeholders who already participated in FP7 and H2020 programmes
- Austrian Rail association-members „RTCA“, „Verband der Bahnindustrie – bahnindustrie.at“, AC Styria
- Association of industry (“Industriellenvereinigung”)
- Austrian hidden champions with expressed interest in S2R
- Austrian innovation leaders with expressed interest in S2R
- Universities, Universities of applied sciences, non-universities and other research organisations
- Academic start-ups and spin-outs
- Participants at rail-specific congresses or conference tracks (Alpbach / ITS World Conferences)
- Paper-submissions of roadmap-relevant topics at ITS-Europe Conferences or TRA 2015

3. Results

The following chapter presents the online survey's results. Starting with basic information and statistics on the data base (3.1) and followed by respondents' interest in S2R (3.2). Other results are presented in sub-chapter 3.3 and finally a summary in sub-chapter 0 concludes this section.

3.1 General descriptors – who replied

All data is based on an online questionnaire (Annex) sent out by bmvit in December 2015 within a regular newsletter to the rail community. Data gathering process started end of December and lasted until end of July 2016. Rail cluster management in Austria (RTCA, AC Styria, bahnindustrie.at) provided support in disseminating the questionnaire and motivating respondents. In a later stage of the data collection phase bilateral calls with Austrian rail community stakeholders lead to improved completion of the questionnaire. Furthermore bmvit had reminded the community via email to provide their data. HiTec acted also as hotline and support for all questions.

At the end of the data processing phase (end of July) the following statistics can be reported:

In total 264 people opened the questionnaire. 15 people did not answer the question on the “Declaration of Approval” at the first page of the questionnaire. Nine respondents explicitly refused to share their data with bmvit or FFG and stopped completing the questionnaire. 240 people have been willing to share their data with bmvit and FFG and continued with the questionnaire, however not all of them completed the questionnaire: Possibly they handed over completion of the questionnaire to another department where it was not taken up but restarted again.

75 data entries provided a company name. This data set of 75 institutions (industry, research, others) is the basis for all following analysis.

The following sub-sections are intended to provide a feeling on who reported data. Starting with the “Rail Stakeholder Role”, followed by the “Rail Value Chain Role”, “Market Segments”, “Export Markets and Export Quotas”, “Rail-Revenues”, “Rail-Employees”, “Co-Funding Instruments” used or interest in using co-funding instruments and finally information on “Certification” is provided.

Rail Stakeholder Role

Crucial for the external validity of this study is the question whether there is a strong bias in who completed the questionnaire. As the following figure shows, a broad range of stakeholders provided data and the main group of respondents self-categorized as “Research” (36 per cent). “Services” with 27 per cent and “Rail Supply Industry” with 17 per cent followed as the next two biggest groups. The coverage of all rail stakeholders is a sound basis for further analysis.

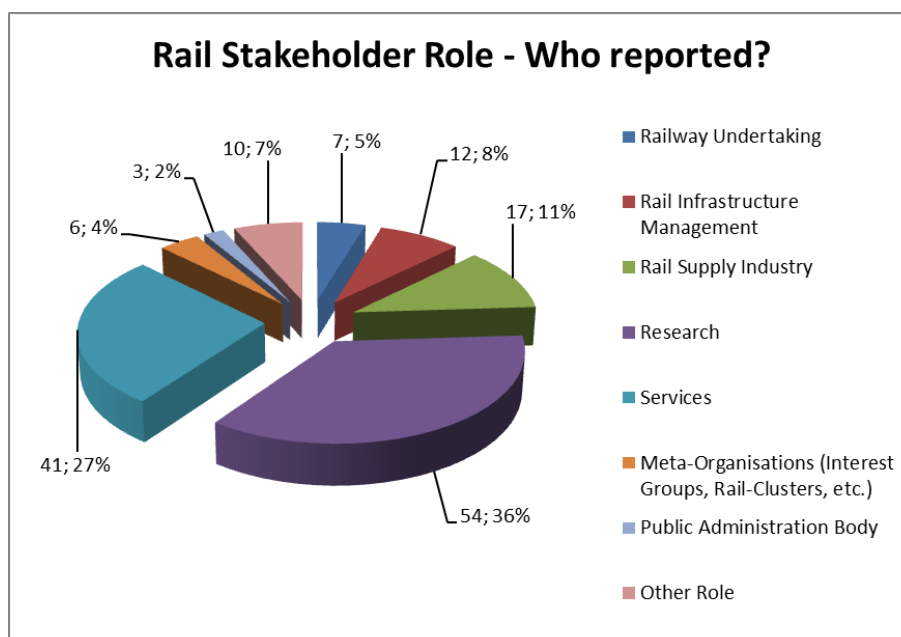


Figure 1 – Who reported to this study in terms of stakeholder roles covered (N=75, several selections possible)?

For some topics we clustered the stakeholders into three groups: **industry** (Railway Undertaking, Rail Infrastructure Management, Rail Supply Industry), **research** and **others** (Services, Meta-Organisations like Interest Groups or Rail-Clusters, Public Administration Body, Other Role). 24% of the respondents self-classified as industry, 36% as research and 40% as other stakeholder role.

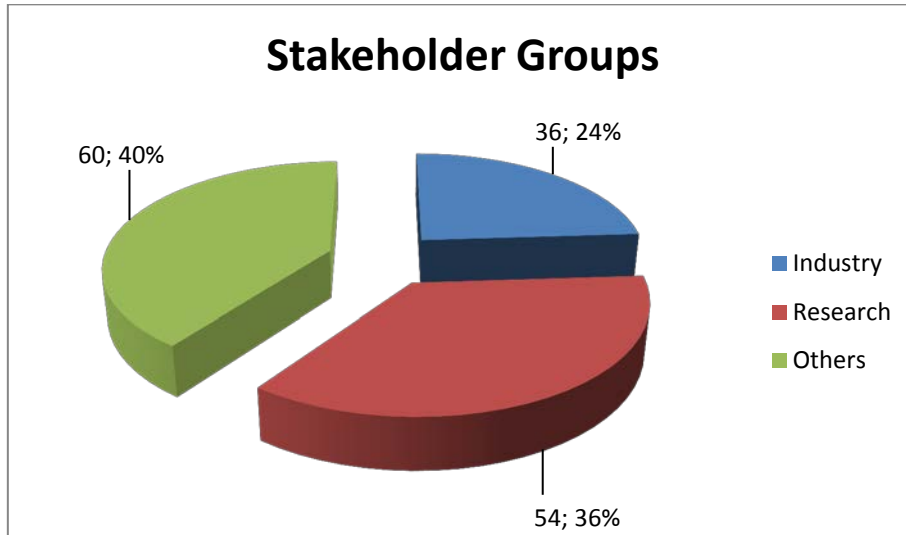


Figure 2 – Clustering of Stakeholder Groups (N=75, several selections possible)?

Rail Value Chain Role

Concerning the rail value chain roles it can be seen from the next chart that respondents cover the whole rail value chain “Services” (33 per cent) and “Tier 2” (20 per cent) are the biggest groups. Interestingly some 29 per cent self-categorized into “Other Value Chain Role” or “No Role”. Various interpretations are equally valid: This can signal a dynamically evolving out-of-the-box-thinking as well as a significant number of organisations interested in joining the community without (yet) fitting into established categories. Alternatively respondents could have hinted towards the known fact that not every innovation is related to technology.

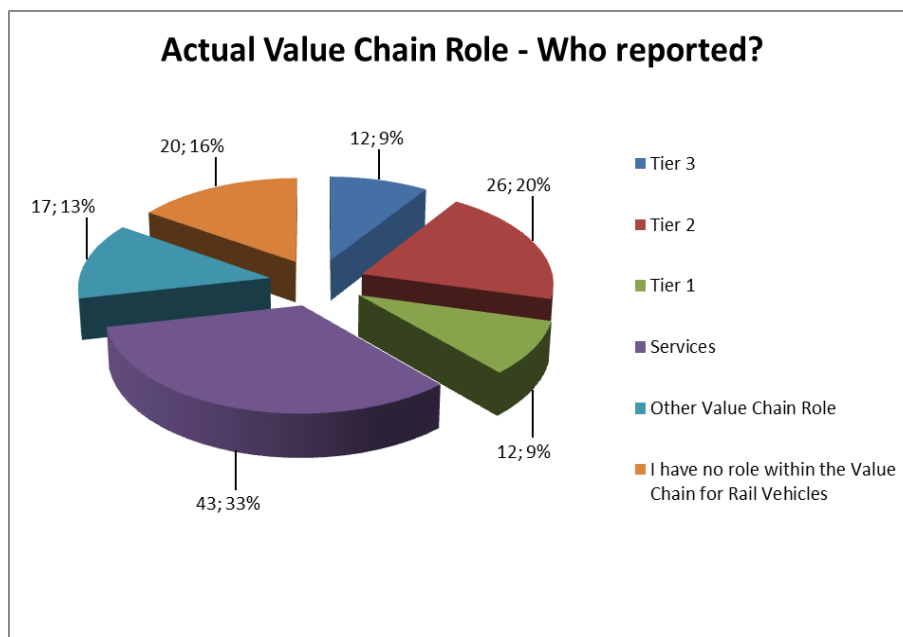


Figure 3 – Who reported to this study in terms of actual value chain roles covered (N=75, several selections possible)?

The definition of the Rail Value Chain roles is based on the ‘Sector Overview and Competitiveness Survey of the Railway Supply Industry Within the Framework Contract of Sectoral Competitiveness Studies – ENTR 06/054’, p. 17.

- Tier 1: Passenger & Transit Coaches / Locomotives, Freight Wagons / Locomotives, Maintenance Vehicles
- Tier 2: Propulsion Components, Propulsion Systems, Electronic Systems, Body & Interior, Infrastructure-related Equipment, Railcar Maintenance and Refurbishing
- Tier 3: Main Materials, Parts inputs

Rail Market Segments and Export Markets

The following section provides information on who responded in terms of market segments as well as export markets (and quota). Besides the rail market segment respondents cover the broad range of market segments from “Automotive”, “Multimodal”, “Aerospace”, “Public Safety”, “Maritime” to “Others”. This broad coverage mirrors the fact that a lot of Austrian companies or research institutes are doing RTD&I in more than only the rail sector.

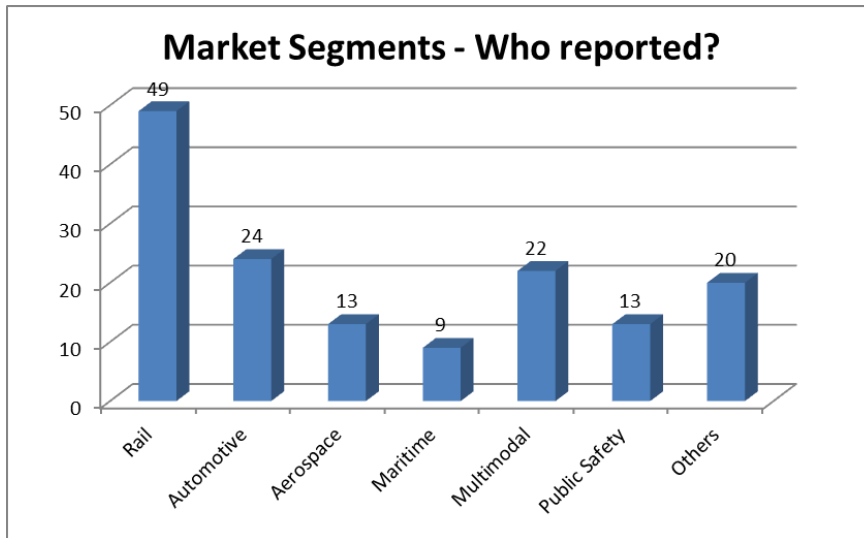


Figure 4 – Who reported to this study in terms of market segments covered (N=75, several selections possible)?

The next chart shows that respondents willing to share information on exports have a strong European focus (in terms of their exports). 75 respondents answered the question on their export markets with “Europe”. A significant number of the respondents did not want to share this information.

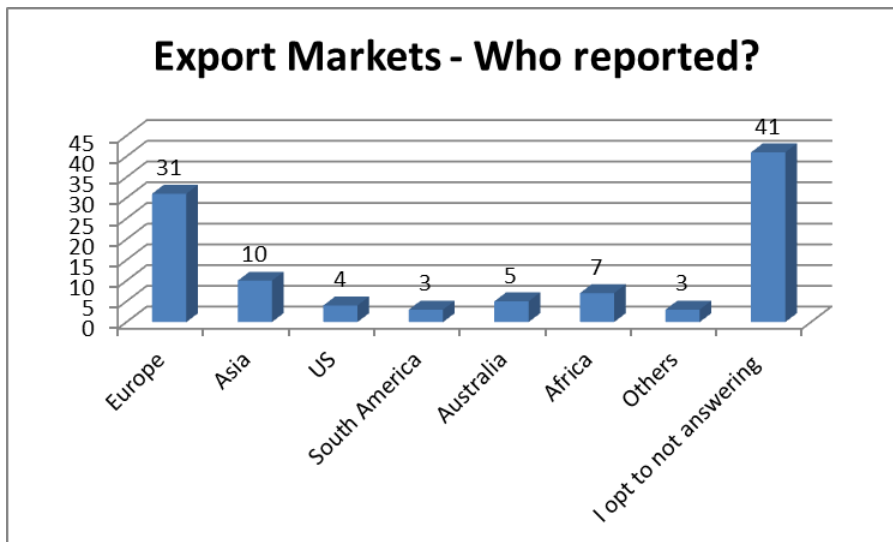


Figure 5 – Who reported to this study in terms of export markets covered (N=75, several selections possible)?

The hesitancy in sharing export data is mirrored also in the next chart. About 71 per cent did not provide their export share or have reported 0 per cent export share. At least some export champions with an export quota between 80-100 per cent (5 respondents) provided information. The official Austrian Rail Industry's anniversary brochure (bahnindustrie.at) reports an average export share of the Austrian Rail Industry of 71 per cent. So we can anticipate covering a significant share of the successful exporters the Austrian Rail Industry.

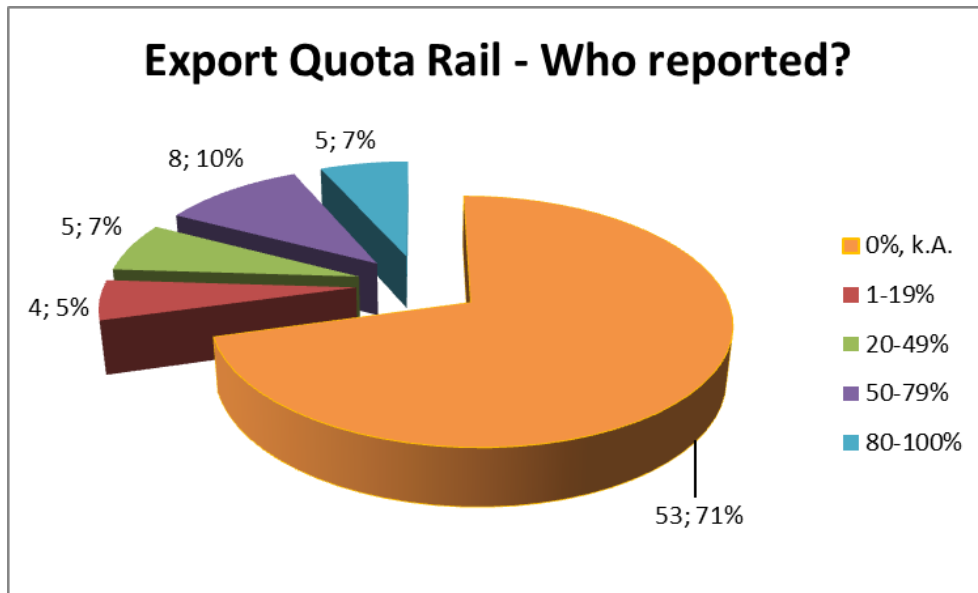


Figure 6 – Who reported to this study? Did the export champions respond (N=75)?

Rail Revenue

Based on the answers to the question on the revenue total and the rail revenue the 75 respondents cover in total 2.5 billion Euro total revenue and about 2 billion Euro rail revenue. From bilateral consultations with Austrian Rail Industry management we conclude that both figures certainly involve a significant amount of double counting – due to the fact that successful sales from suppliers within Austria in early segments of the value chain are certainly included in revenue figures at the next level. This artefact had also been known in the official brochure of “bahnindustrie.at” – the cluster of Austrian Rail Industry – where a total revenue of the Austrian Rail Industry of 2.6 billion Euro is reported. Due to the fact that we do not cover the whole rail industry (but only the RTD&I-related stakeholders) we anticipate that the high number of research institutions compensate for most of the rail-specific industry revenue from non-respondents or respondents who did not provide estimates. In Annex II we provide a list of rail stakeholders who have not yet completed the questionnaire.

Rail employees, Rail RTD&I employees

This section provides employment figures for the 75 respondents to the questionnaire. The self-declaration provides a total amount of employees worldwide of about 120,000. About 9,260 employees are women (8 per cent).

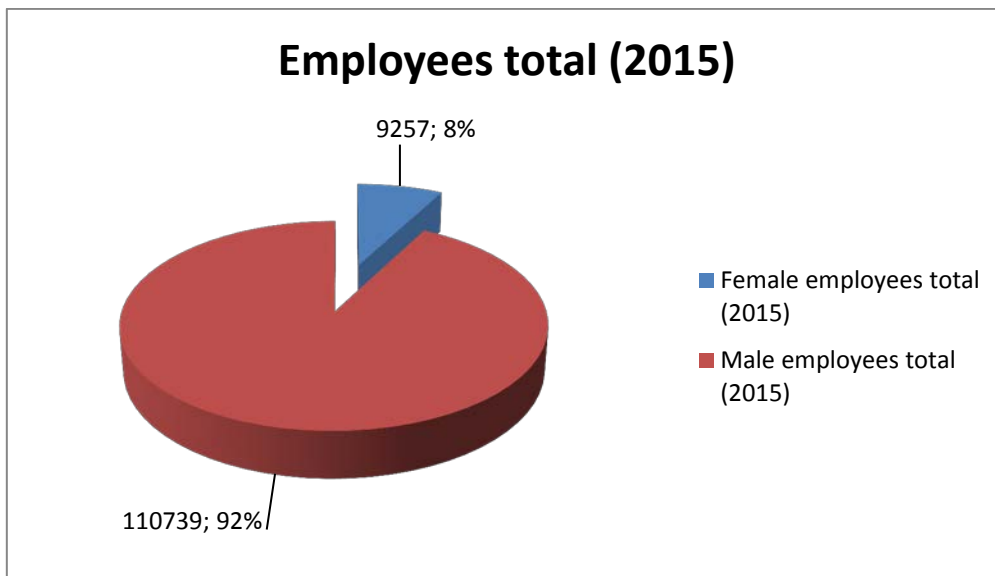


Figure 7 – Employees total (2015) of all respondents (N=75)

Besides the total amount of employees it was wondered how many people specifically work in the RTD&I rail department. In total we cover 5,600 employees working in RTD&I rail global (4 per cent of total employees).

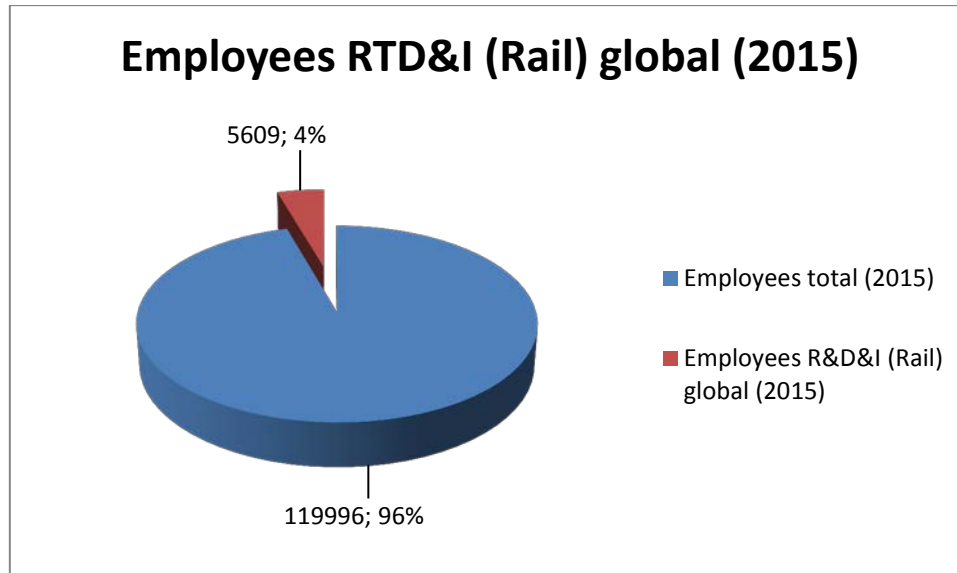


Figure 8 – 4% of global Employees are working in the RTD&I (Rail) domain (2015) (N=75)

The fact that about 98 per cent of those (5.470) working in Austria underlines the high importance of Austria for RTD&I in the rail domain.

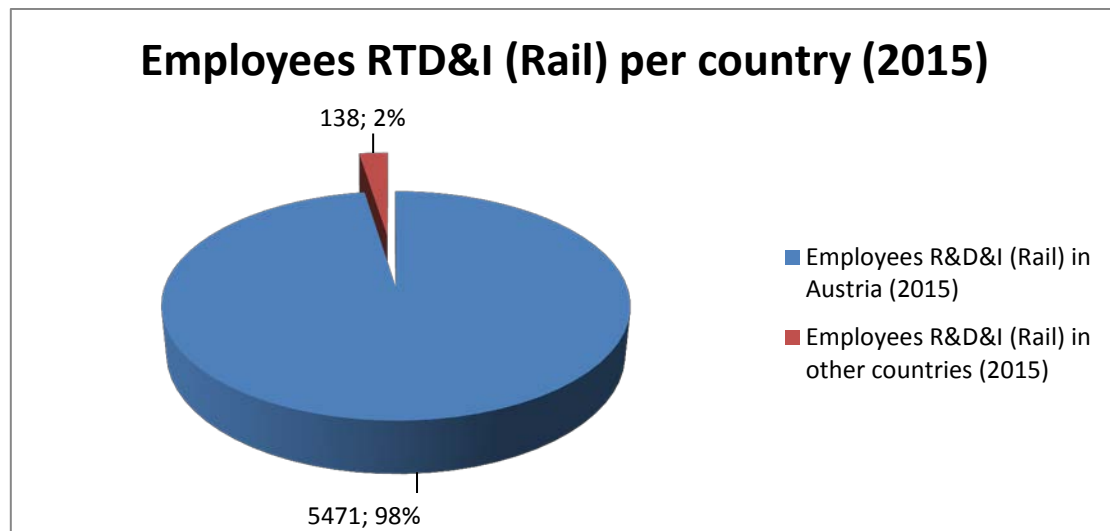


Figure 9 – 98% of all RTD&I (Rail) employees are working in Austria (2015) (N=75)

Very promising is the result that of those 5,470 employees in Austria 1,600 (29 per cent) are women.

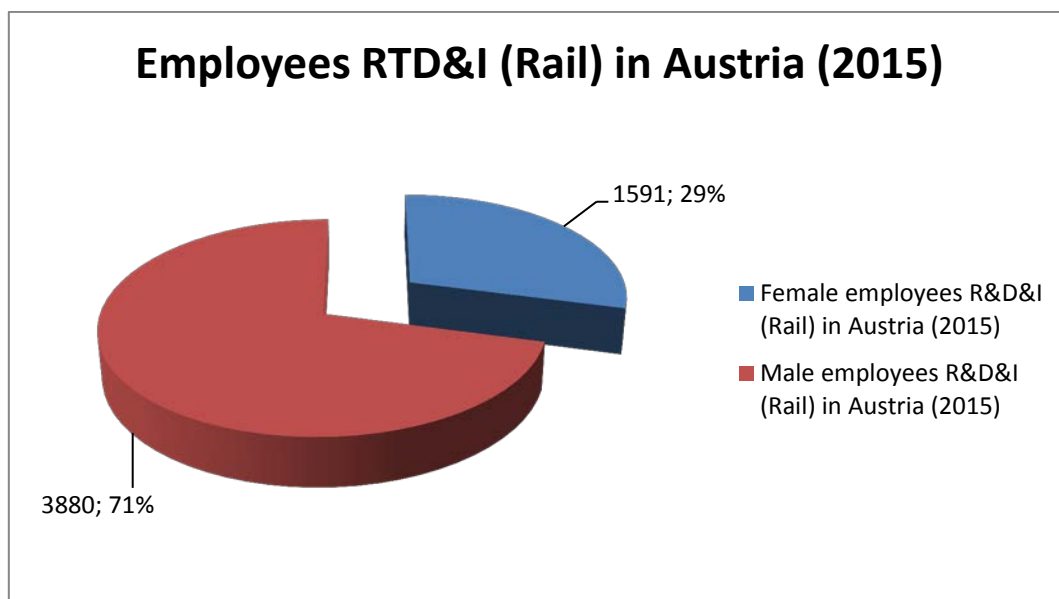


Figure 10 – 29% of all RTD&I employees (Rail) in Austria are female (2015) (N=75)

After consultation processes with the “bahnindustrie-brochure” coordinators we came to the conclusion that these results cannot be added or directly compared. There exist even significantly higher numbers from VCÖ Verkehrsclub Österreich. “bahnindustrie-brochure” reports a total number of employees in the Austrian Rail Industry of 8,100.

Co-funded research information of respondents

The following figures aims to give an impression on how the respondents already used co-funded research as well as their interest in using co-funding instruments. This is more or less to investigate the respondents' expertise respondents with regard to "co-funding-instruments", the knowledge of SHIFT²RAIL research programme as well as the potential for communication activities of bmvit/FFG to support the Austrian Rail community in successfully participate in SHIFT²RAIL.

The next figure shows that out of the 75 respondents just 7times the "I have not used any co-funding" option were chosen. This could possibly involve that respondents are quite experienced with national as also European research-funding instruments.

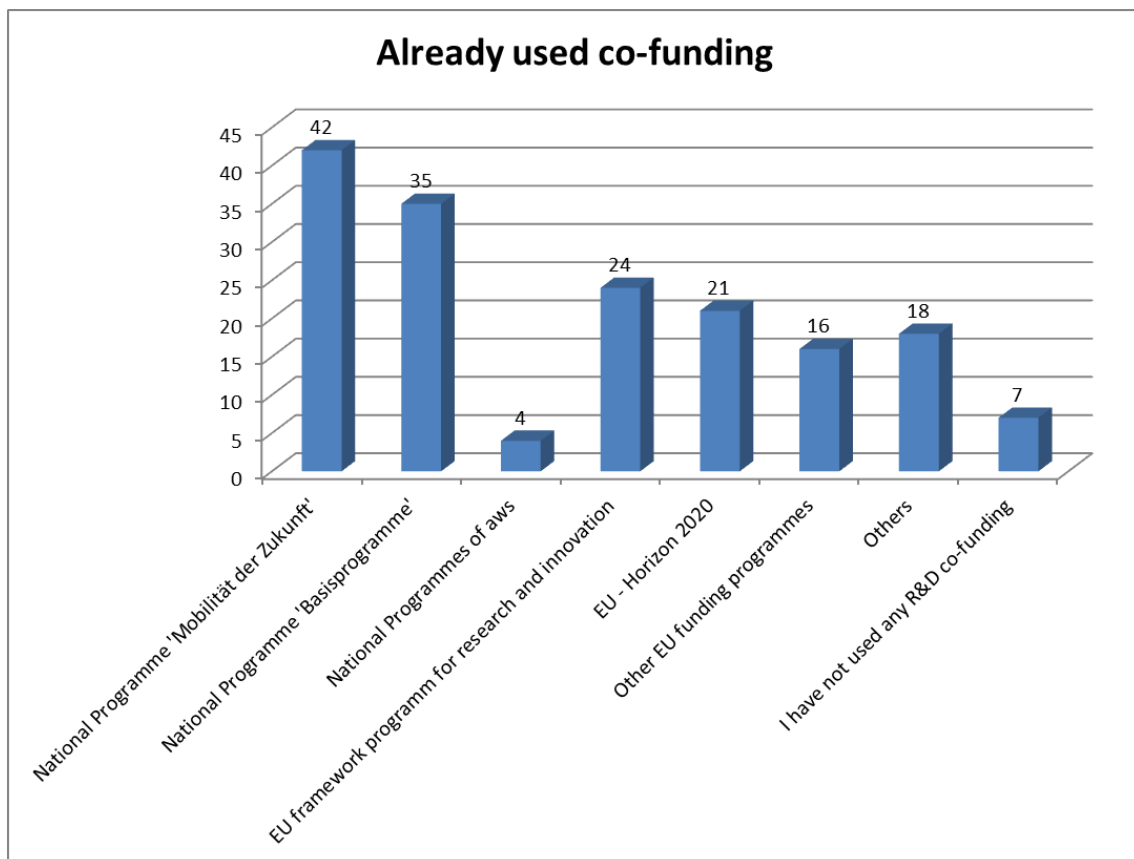


Figure 11 – Who has already used co-funding instruments (N=75, several selections possible)?

The figure below mirrors the picture of a high interest in co-funded research of the respondents. We anticipate that the information level with regards to SHIFT²RAIL within the Austrian Rail Community can be increased; this basis on the fact that within a rail-focussed survey the scores for "EU-H2020" and "EU-Shift2Rail" are both quite high.

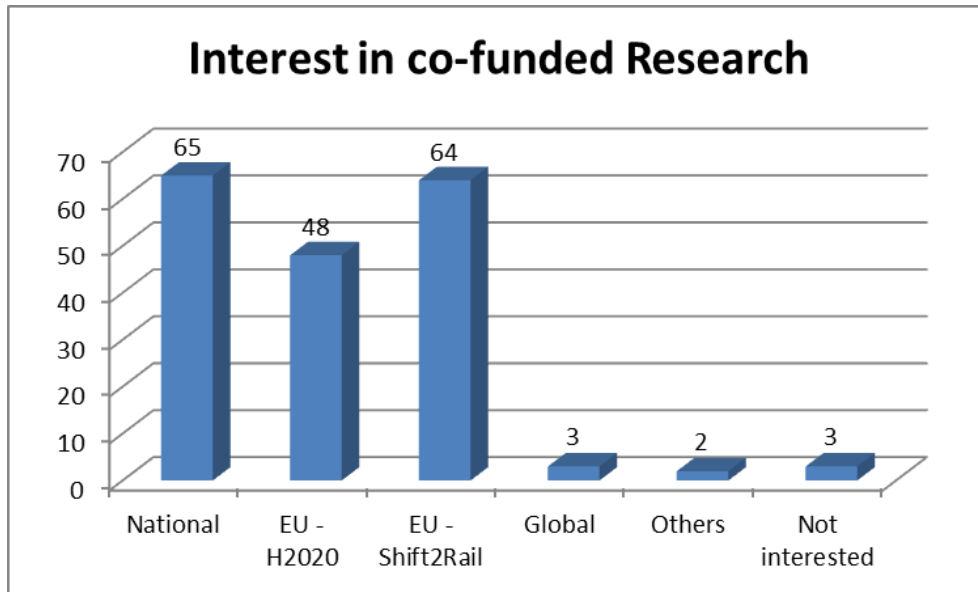


Figure 12 – Interest in co-funding instruments (N=75, several selections possible)

In total 7 respondents reported that they did not use co-funded research so far and are interested in co-funded research programmes. This could be seen as a promising potential for further activities of bmvit/FFG to include them into the Austrian research community. Due to privacy issues the company names are not provided in this report. We provided bmvit/FFG this information separately.

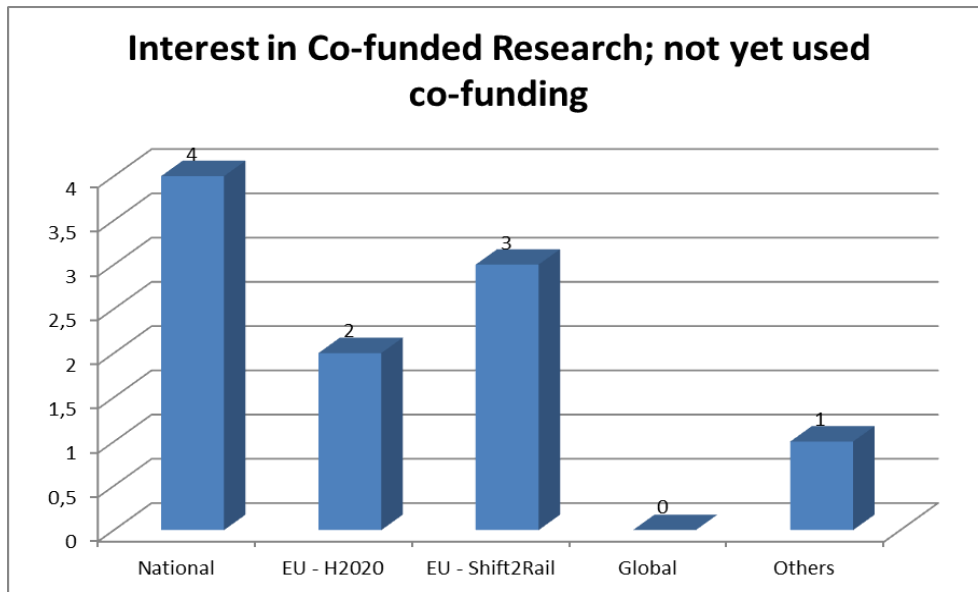


Figure 13 – Interest in co-funding research instruments by respondents who have not yet used co-funding instruments (N=75)

Certification

During the preparation phase of the survey there was explicitly asked for certification bodies in the Austrian rail market. Therefore the study team integrated the question on who is doing certification and in which fields. The following figure shows respondents' certification processes. Due to privacy issue the companies able to do these certifications cannot be provided within this report. In case of interest please contact bmvit for getting in contact with the certification companies.

Certification of...
Level crossing protection systems, signalling systems
noise abatement measures, certification of railway vehicles according to TSI-NOI
TSI, Interoperability
rail signalling solutions
Rails
In-house certifying body

Figure 14 – Respondents with specific qualifications in certification processes. (Something key stakeholders had a strong interest in)? (N=75)

Data Usage

At the end of the questionnaire the respondents had again the possibility to opt whether bmvit and FFG are allowed to use their data for “bmvit and FFG internal usage only” or for “bmvit/FFG internal and external usage”. The following chart shows the result where 9 out of 75 opt for only internal usage; in 25 cases no specification were made and 41 entries relate to institutions who are willing to share all data internal and external.

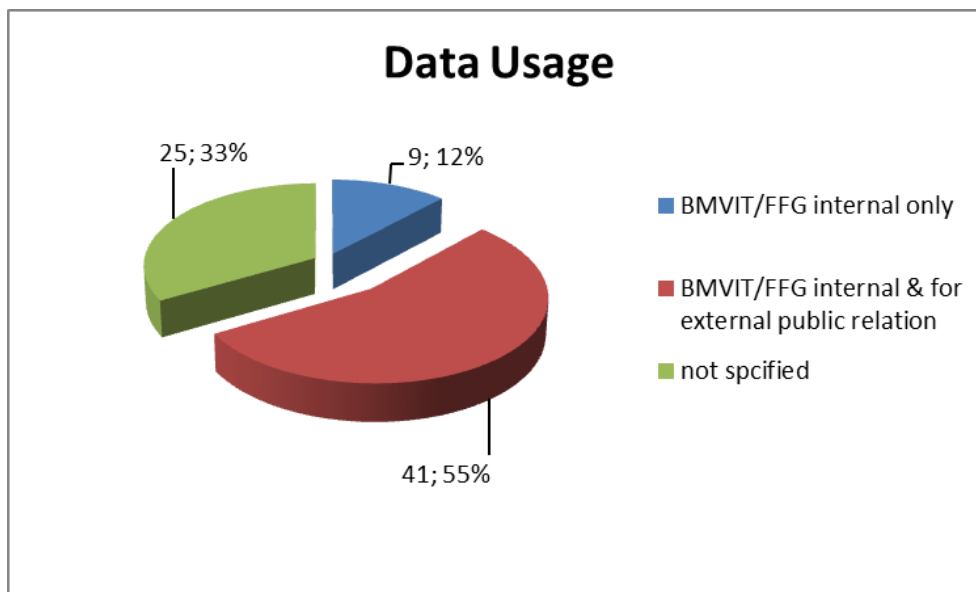


Figure 15 – Privacy concerns: Who is willing to share responses with bmvit/FFG only or with a broader public (N=75)

3.2 SHIFT²RAIL specific interest

This section presents respondents' interest in SHIFT²RAIL. One of this study's goals was to provide an overview of Austrian Rail Stakeholders' different approaches and interest to participate in SHIFT²RAIL. The following sub-chapters start with an overview on all SHIFT²RAIL IPs (S2R-Interest Summary). The next six parts are focussing on the IPs in detail:

- Interest in S2R IP1 - Cost-efficient and Reliable Trains, including high capacity trains and high speed trains
- Interest in S2R IP2 - Advanced Traffic Management & Control Systems
- Interest in S2R IP3 - Cost-efficient, Sustainable and Reliable High Capacity
- Interest in S2R IP4 - IT Solutions for Attractive Railway Services
- Interest in S2R IP5 - Technologies for Sustainable & Attractive European Freight
- Interest in S2R Cross-Cutting Themes

S2R-Interest Summary

The following figure shows the summary of self-declared S2R-Interest of all respondents in two different presentation formats. It can be seen that all IPs are quite interesting for the respondents. "Cross-cutting Themes" is top-ranked followed by IP5 and IP3. In four cases "no interest in S2R" was reported.

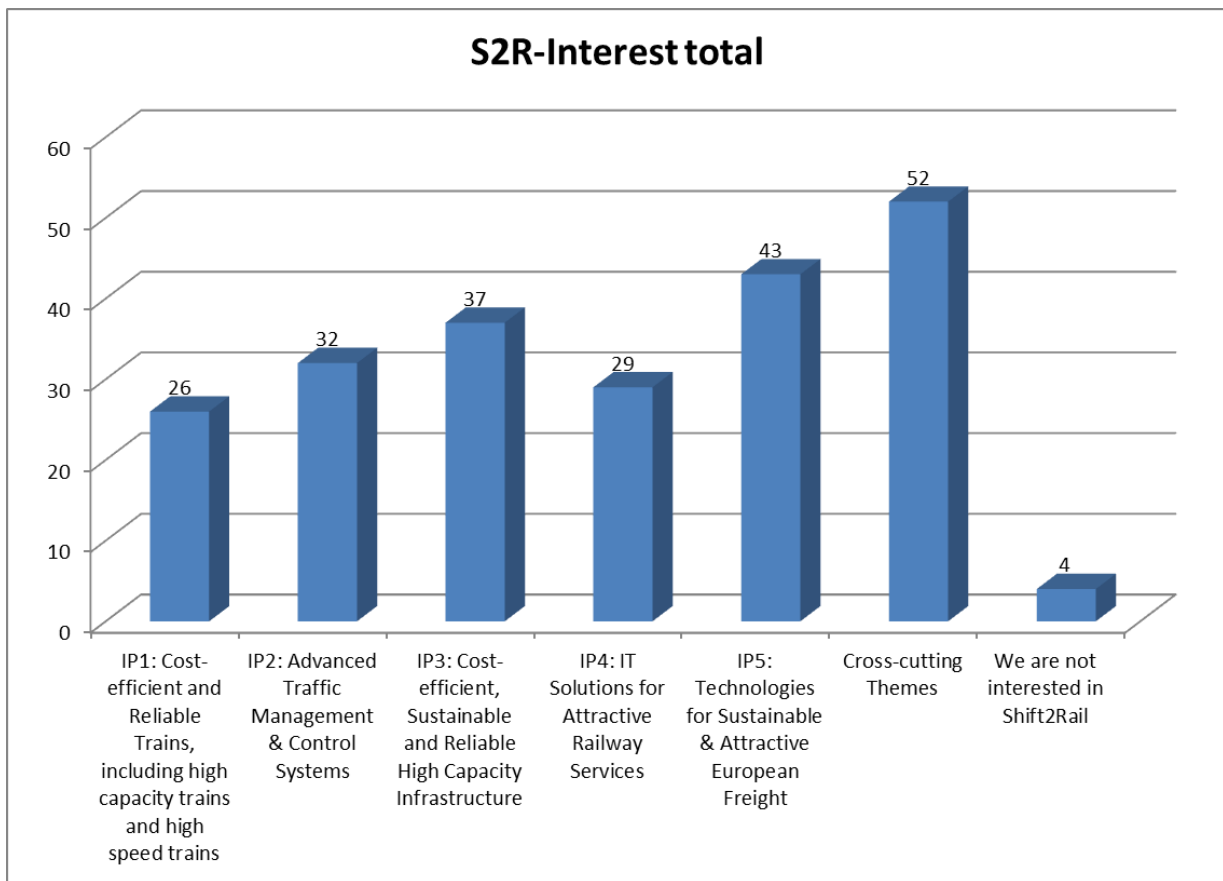


Figure 16 – Interest in S2R: Overview of all respondents who provided a company name (N=75, several selections possible)

A little bit more detail on the S2R-Interest overview is given in the following figure. There we present the S2R-interest with regard to the different stakeholder roles. The figure shows the interest of the research community. Top-ranked are as in total "Cross-cutting themes", IP5 and IP3. Industry interest is quite equal in all different topics. Die biggest difference between "Research" and "Industry" is given in IP4. When interpreting the following figure it has to be mentioned that the three groups "Industry" (24%), "Research" (36%) and "Others" (40%) are not represented equally.

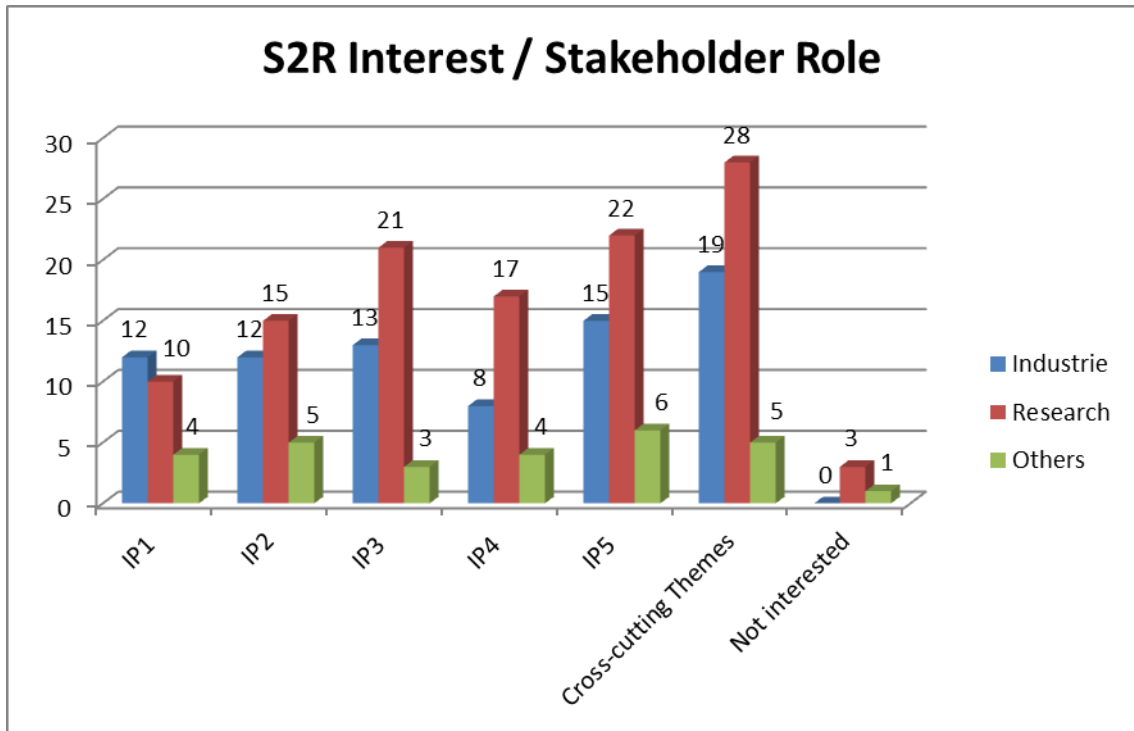


Figure 17 – Interest in S2R per stakeholder role: Research community’s highest interest in „Cross-cutting Themes“ (N=75, several selections possible)

Interest in S2R IP1 - Cost-efficient and Reliable Trains, including high capacity trains and high speed trains

The following figure is the first detailed analysis of S2R-interest of all respondents. With regard to “IP1 – Cost-efficient and Reliable Trains, including high capacity trains and high speed trains” respondents have reported a strong focus in the domain of “Train Control and Monitoring System (TCMS)”. All other sub-topics of this IP1 are of almost equal interest.

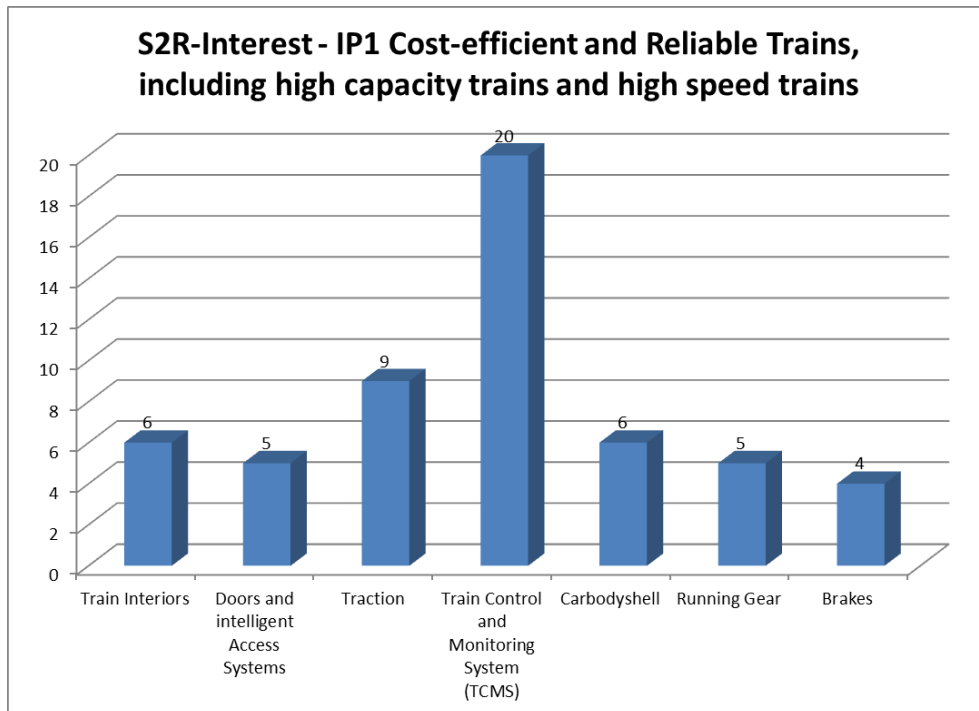


Figure 18 – Interest in S2R IP1 – „Train Control and Monitoring System (TCMS)“ is ranked top“ (N=75, several selections possible)

After divided the S2R-Interest for IP1 each stakeholder group it can be seen the very high interest of the industry player for “Train Control and Monitoring System (TCMS)”.

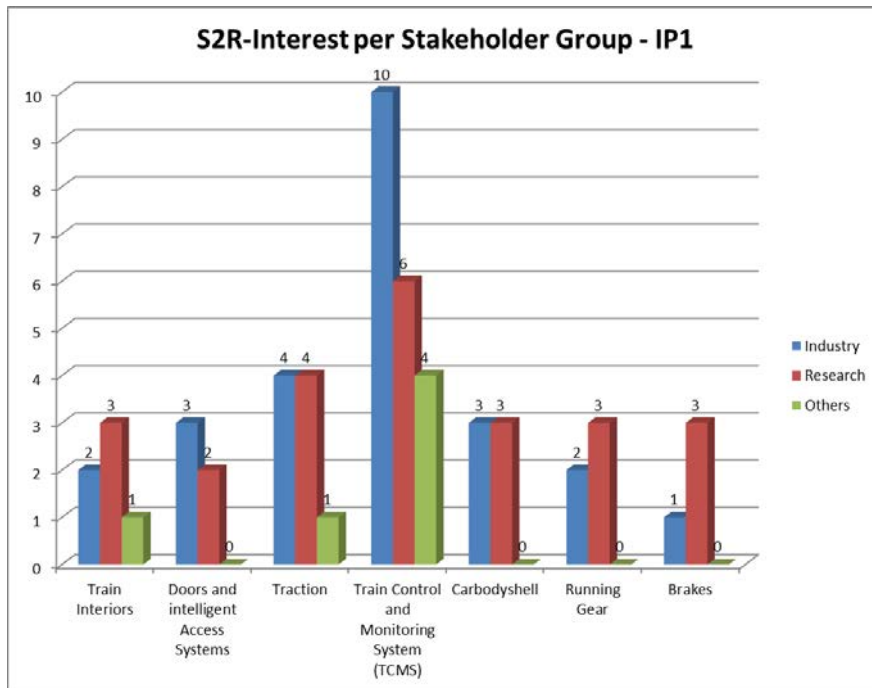


Figure 19 – Interest in S2R IP1 per stakeholder group (N=75, several selections possible)

Interest in S2R IP2 - Advanced Traffic Management & Control Systems

Within “IP2 - Advanced Traffic Management & Control Systems” the 75 data entries show high interest in two sub-categories. 23 times “Traffic Management Evolution” and 17 times (Smart, fail-safe Communications and Positioning Systems) high interest was stated.

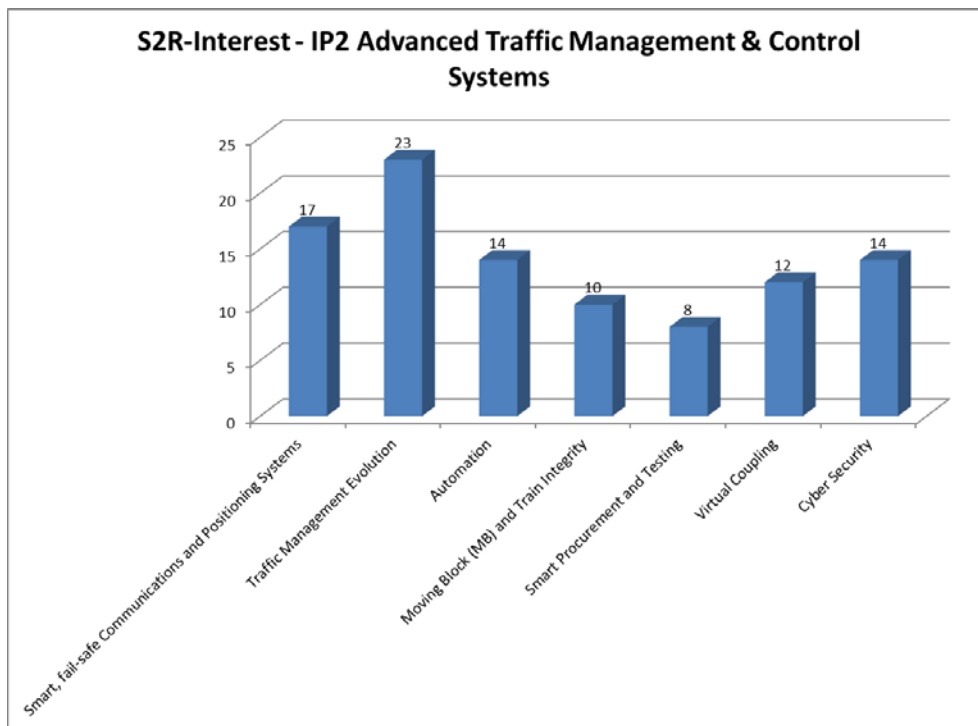


Figure 20 – Interest in S2R IP2 – „Traffic Management Evolution” is ranked top” (N=75, several selections possible)

The detailed analysis each stakeholder group shows a very high interest of the research group for “Traffic Management Evolution”. Industry interest is top-ranked also for “Traffic Management Evolution”. In total IP2 seems to be very interesting for industry player.

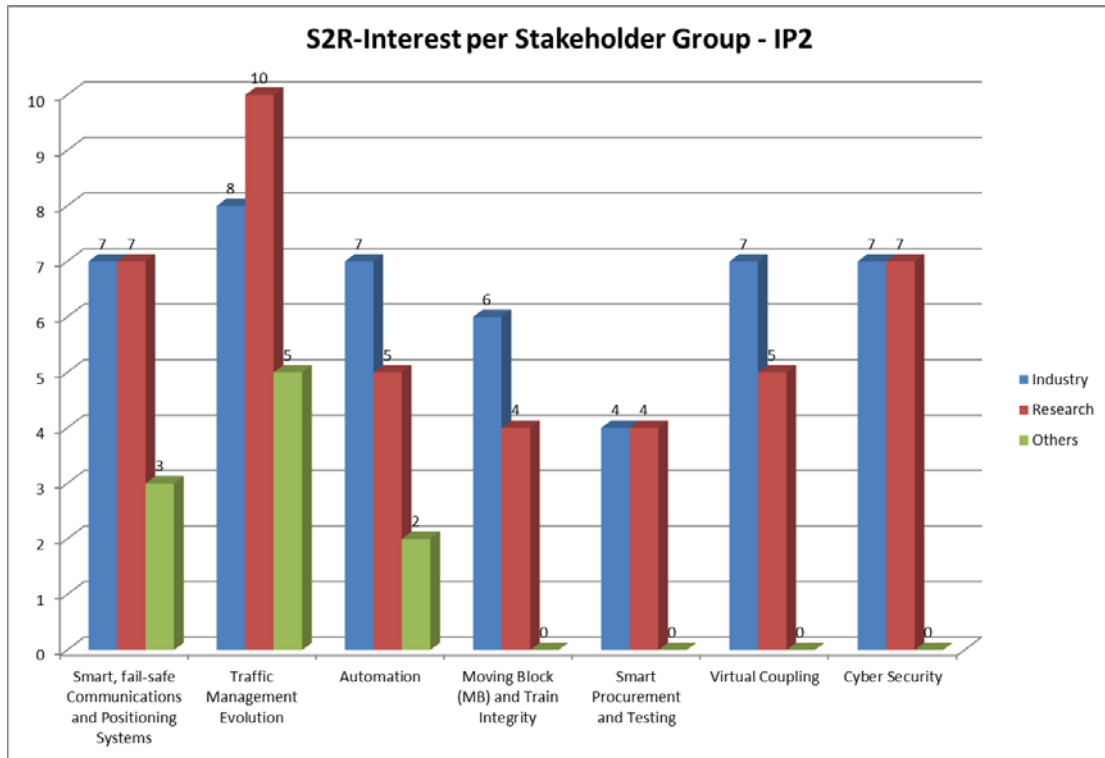


Figure 21 – Interest in S2R IP2 per stakeholder group (N=75, several selections possible)

Interest in S2R IP3 - Cost-efficient, Sustainable and Reliable High Capacity

The analysis of data regarding interest in “IP3 - Cost-efficient, Sustainable and Reliable High Capacity” show high interest in “Intelligent System Maintenance” followed by “Energy Efficiency” and “Innovative Track Design and Materials”.

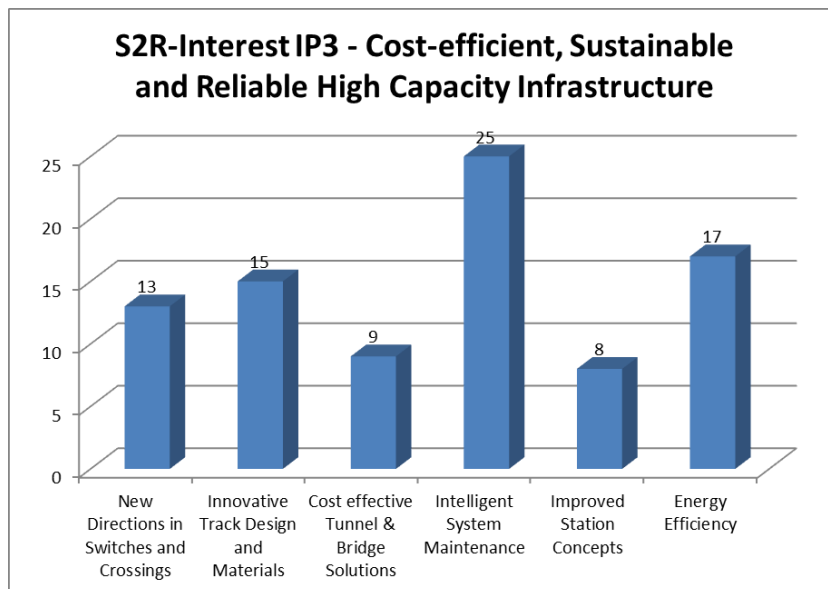


Figure 22 – Interest in S2R IP3 – „Intelligent System Maintenance” is ranked top“ (N=75, several selections possible)

The following analysis each stakeholder group shows in total a strong research interest focus of IP3. Top-ranked are “Intelligent System Maintenance” and “Energy Efficiency”.

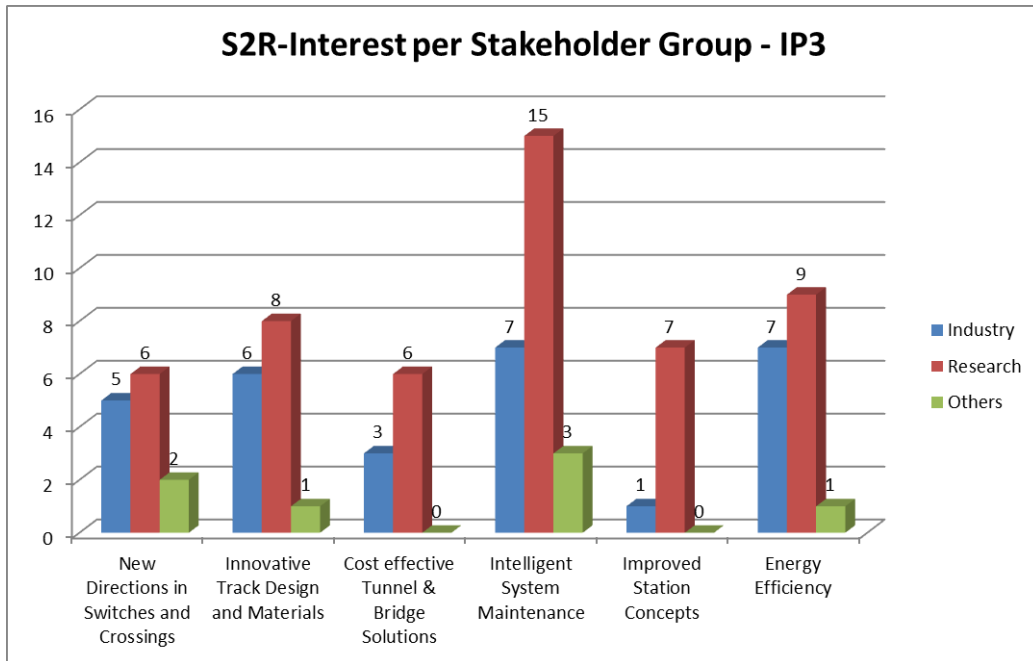


Figure 23 – Interest in S2R IP3 per stakeholder group (N=75, several selections possible)

Interest in S2R IP4 - IT Solutions for Attractive Railway Services

The following figure shows a broad interest of all parts of “IP4 - IT Solutions for Attractive Railway Services”. “Multimodal Travel Services” is ranked top with 19 entries.

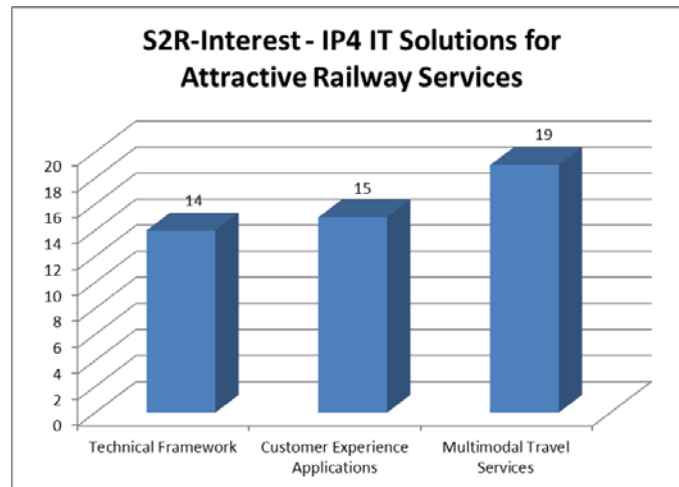


Figure 24 – Interest in S2R IP4 – „Multimodal Travel Services” is ranked top“ (N=75, several selections possible)

The analysis each stakeholder group shown in the next figure shows that all sub-topics of IP4 are in the interest focus of research groups. “Customer Experience Applications” and “Multimodal Travel Services” both are mentioned 11 times.

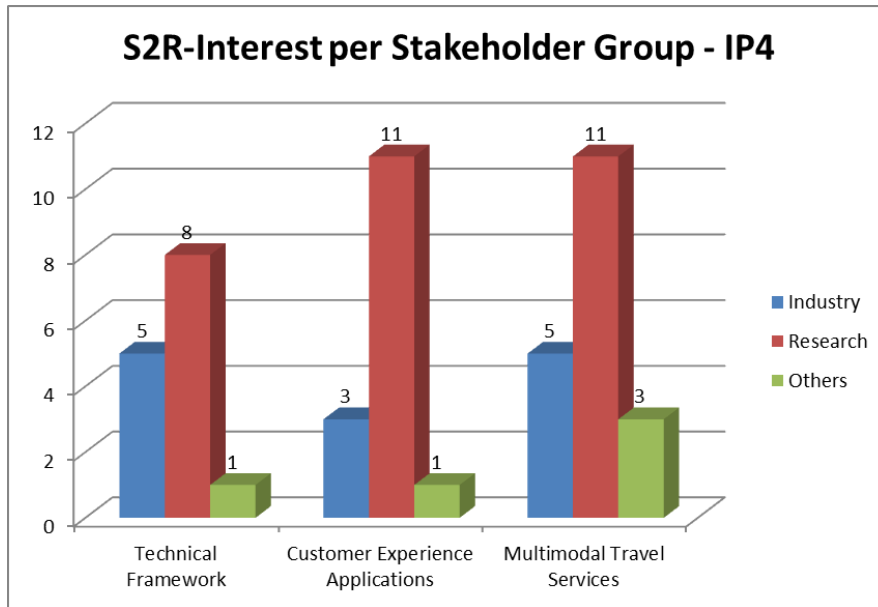


Figure 25 – Interest in S2R IP4 per stakeholder group (N=75, several selections possible)

Interest in S2R IP5 - Technologies for Sustainable & Attractive European Freight

The respondents stated their interest with regard to “IP5 - Technologies for Sustainable & Attractive European Freight” as follows. The most attractive topic is “Implementation Strategies and Business Analytics” (23times) followed by three almost equal interesting topics: “Access and Operation”, “Long-term Vision of an Autonomous Rail Freight System”, and “Novel Terminal, Hubs, Marshalling Yards, Sidings”.

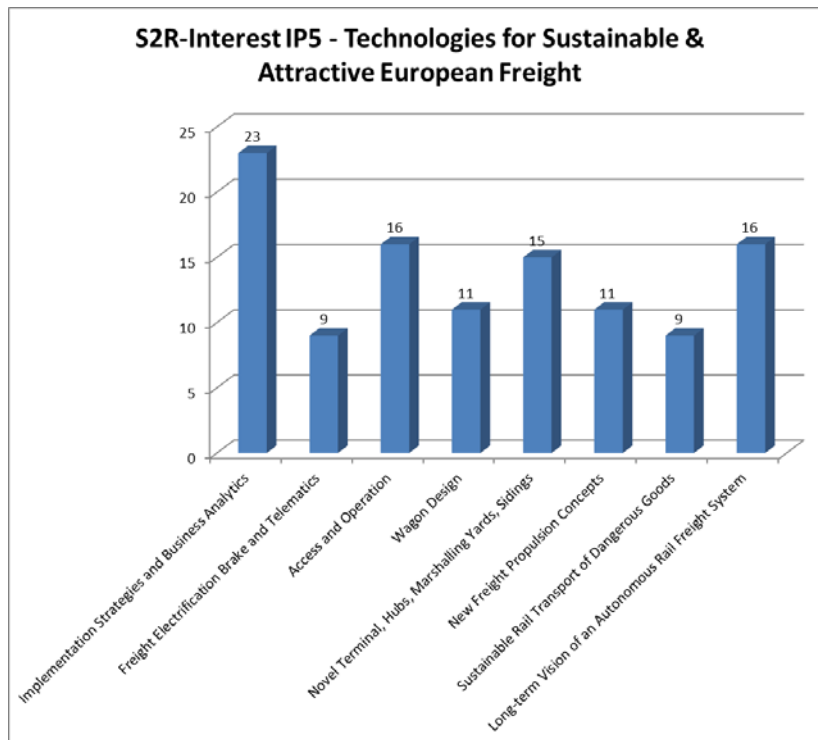


Figure 26 – Interest in S2R IP5– „Implementation Strategies and Business Analytics” is ranked top “ (N=75, several selections possible)

The detailed analysis each stakeholder group given in the next figure highlights the strong interest of the research groups in “Implementation Strategies and Business Analytics”. Industries’ interest in IP5 is focused on “Implementation Strategies and Business Analytics” as well as “Access and Operation”.

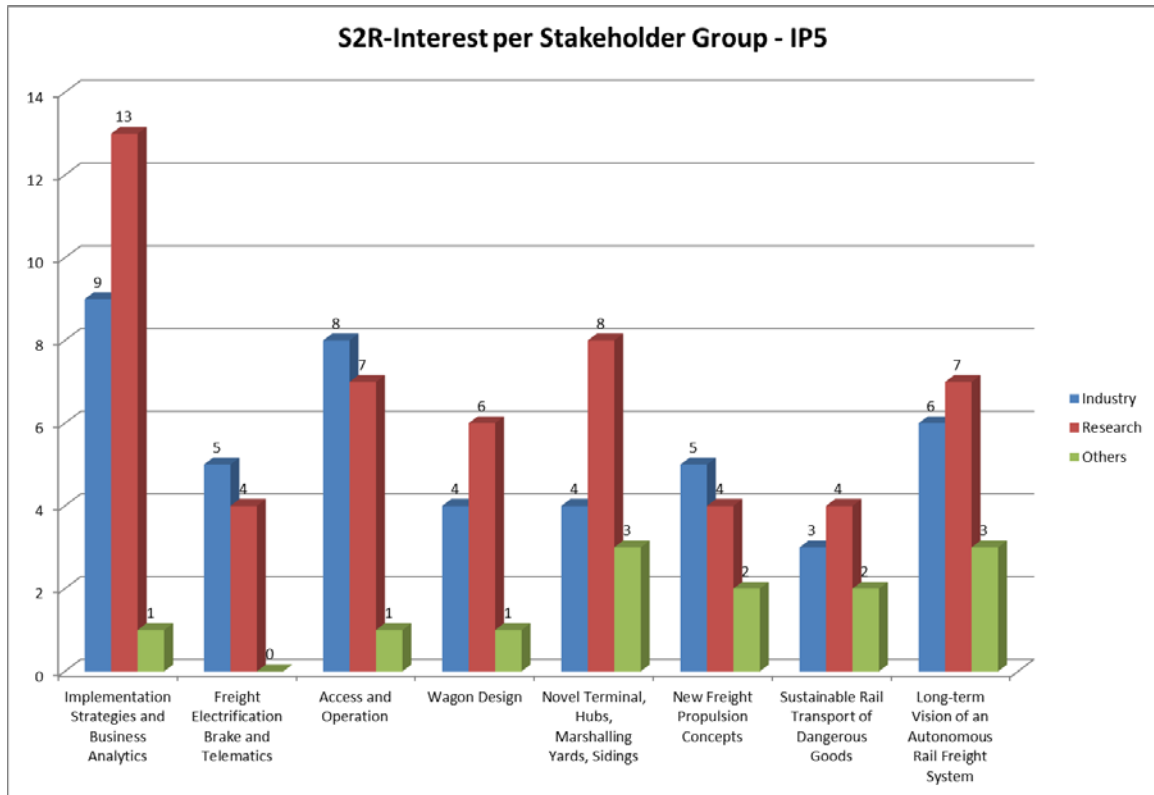


Figure 27 – Interest in S2R IP5 per stakeholder group (N=75, several selections possible)

Interest in S2R Cross-Cutting Themes

The last part of the detailed S2R-interest analysis focus on “Cross-Cutting Themes”. This section is top-ranked of all sub-categories of S2R topics. Within this part of Cross-Cutting Themes there is one topic highlighted by the respondents. 36times respondents expressed their interest in the domain of “System integration, safety and interoperability”. Second and third ranked is “Long-term needs and socio-economic research” (25times) and “Energy and sustainability” (24times).

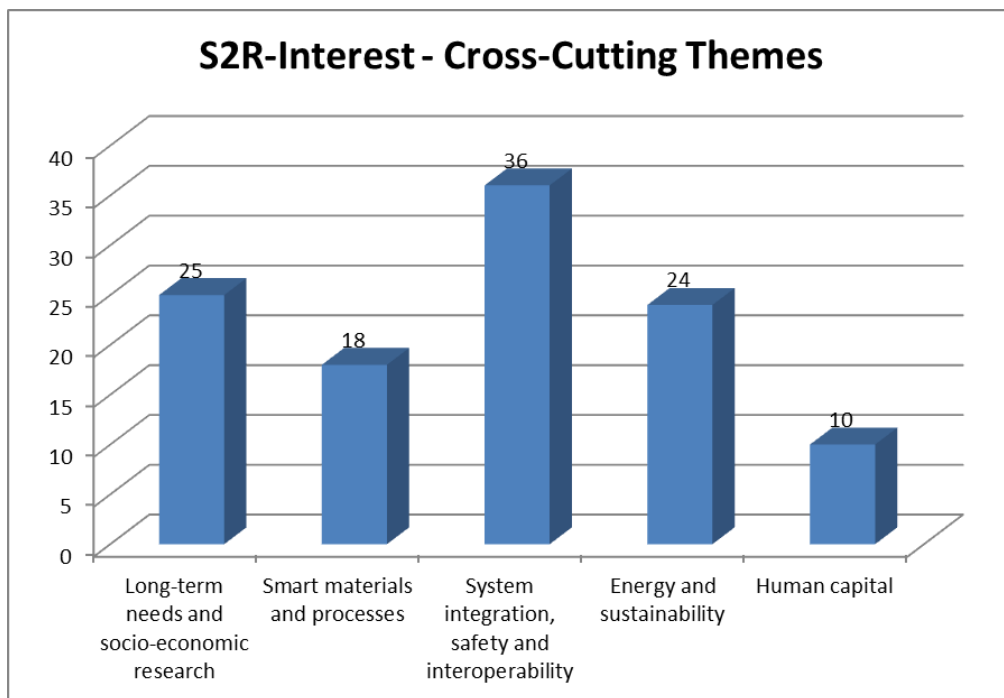


Figure 28 – Interest in S2R Cross-Cutting– „System integration, safety and interoperability” is ranked top“ (N=75, several selections possible)

Cross-Cutting-Themes are almost all very interesting for research groups. This is shown in the next figure as a result of the detailed analysis each stakeholder group. Industry interest is focussed on “System Integration, safety and interoperability” as well as “Energy and sustainability”.

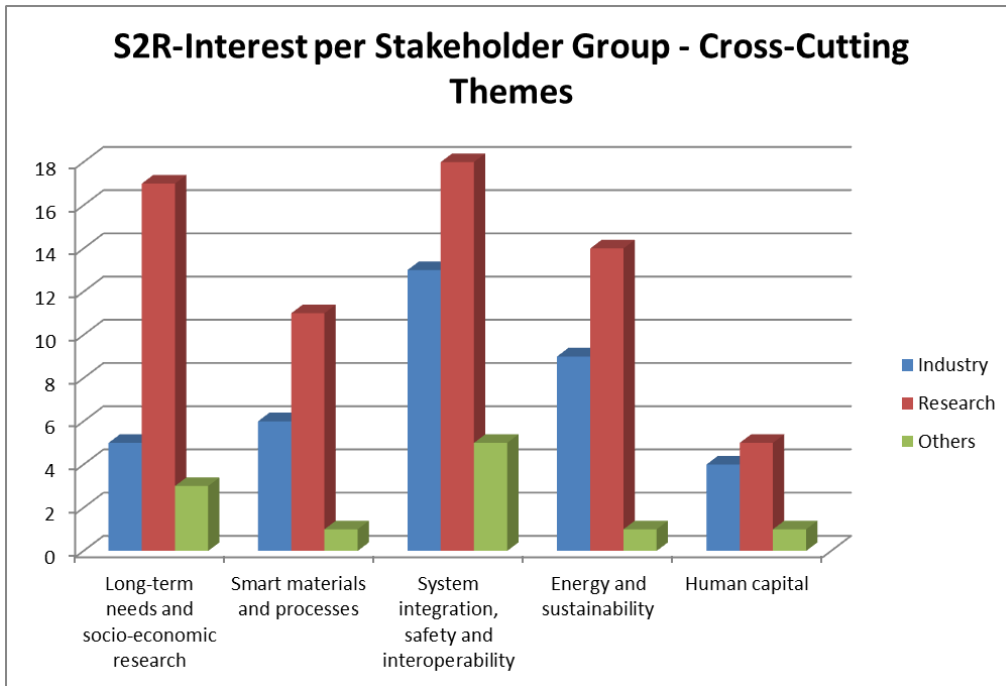


Figure 29 – Interest in S2R Cross-Cutting Themes per stakeholder group (N=75, several selections possible)

3.3 Other results

This section contains results focussing on future challenges in the rail sector reported by the respondents. First “In their own words: Future Rail Innovation Fields - Road Map Tags” are presented followed by answers to the question on “Future Non-Technical Challenges” in the rail domain. The answers to both questions are presented as word-cloud. This is based on the fact that the question was formulated as “free-text”-field. With the word cloud we tried to come-up with a presentation format which is able to give you a feeling of some main topics out of the broad range of answers.

In their own words: Future Rail Innovation Fields - Road Map Tags

Study authors feel, that this section is only for bmvit/FFG internal use and is not really meant to become publicly available:

The following figure shows the word cloud for the question on “Future Rail Innovation Fields - Road Map Tags”. The authors' intention has been to collect some future R&D topics in the rail sector. The size of the words represents the amount of entries – bigger words were stated more often. Words like “systems”, “High”, “Track”, “Mobility” or “Optimization” are used quite often. Unfortunately for answering a R&D roadmap these words are not that useful. In between the lines there are maybe some more interesting topics like “Automated”, “Intelligent Vehicle”, or “smart railway”. In total the respondents used a broad range and mostly generic words for describing their future innovation fields. This could be also seen as kind of hesitation or protection from other stakeholders copying specific future buzzwords.



Figure 30 – Where will rail-innovation head in the years to come? A word-cloud presentation (N=75, several tags each respondent possible)

The following bullet-point lists are a classification of the road map tags of the 75 respondents. We clustered in industry, research and others. This is one approach to let the reader a little bit more grasp the ideas of the different stakeholder ideas on their future road maps. The lists are not cumulated, the order does not represent any kind of importance – it is ordered alphabetically.

‘INDUSTRY’ Road Map Tags

- Advanced signalling and train control
- Analysis and simulation
- Assessment of existing structures
- Automatisatation and optimisation of train operation
- Availability of railway net; focusing on infrastructure maintenance management;
- Bearer independent communication
- Bridge Engineering - Integral Bridges for railways
- Centralisation
- Converged fixed/mobile networks and solutions
- Detailed performance evaluation of future rail IT-solutions by simulation

- Developing training and education methods for railway Staff (Drivers, shunters)
- Development of bogies
- Development of rolling stock
- Enabling the 24/7 Railways by optimising maintenance activities
- Enforcement of light high strength steel in railways
- Engineering services
- Flexible wagons with different products
- High-efficient and low cost solutions for: traction systems + automatisisation
- Infrastructure safety equipment
- Innovative signalling
- Integrated Life-Cycle-Engineering
- Integrated (i.e. for different infrastructure systems) lifecycle optimisation of maintenance considering direct costs and socio-economical aspects
- Integration of communication and information management
- Integrator of LRV/LRT systems
- Intelligent decision support tools for train traffic management features
- Interaction - track - structure
- IoT. safety, data management and integration
- Level crossing protection 4.0
- Maintenance of bridges and Renovation - strengthening
- Next generation communication system for railways - ERTMS
- Noise monitoring and analyses
- Operates and integrates the comprehensive rail-value-network solution RTMO for multiple stakeholders of an e2e rail-logistic-network
- Optimization of drivers and staff information using internet technology according to TSI OPE
- RAIL 4.0 - Smart and Safe Rail Infrastructure Systems
- Rail as part of carbon free urban supply
- Service integrator for condition-based vehicle maintenance
- Service oriented architecture
- Smart client
- System integration
- Traction inverter and control system
- Vehicle identification based on RFID technology
- Wireless fail-safe field elements

'RESEARCH' Road Map Tags

- Additive manufacturing
- Advanced joining technologies
- Aeroacoustics
- Automation and digitalization
- Automation in logistics
- Automation in shunting
- Autonomous (Highly automated) systems in rail applications of all kinds Autonomous (Highly automated) systems in rail applications of all kinds; Safety, dependability and cybersecurity co-engineering of ICT systems in rail applications; Validation
- Autonomous driving of trains on open access
- Benchmark of maintenance and investment evaluation
- Business concepts & cases
- City rail and freight
- Combined transport
- Condition Based Maintenance
- Cyber security
- Dependable wireless connectivity (Beyond GSM-R and ETCS Level 3)
- Dependable wireless connectivity for intelligent transport
- Detection of Graffiti-sprayers
- Disruptive innovations in the field of surveillance for rail track security
- Dynamic analysis of bridges
- Embedded Systems
- Energy Efficiency
- Evaluation of energy savings in the rail sector
- Evaluation of track innovations
- First last mile delivery

- Fracture mechanics
- Freight hub industry connection
- Full prognosis of track maintenance demands
- High mobility telecommunications
- High performance concrete for infrastructure
- High strength light metals alloys and their processing and joining
- Joining of reinforced plastics with metal structures
- Hubs & terminals
- Improve safety at level crossings
- Improve safety on low density lines
- Improved track components
- Improved wheel / rail interaction
- Innovative predictive maintenance concepts/solutions for rail infrastructure and services
- Innovative public transport services using existing rail infrastructure
- Innovative ticketing and charging systems
- Integrated Mobility
- Integrated sustainable mobility provision
- Integration of rail transport supply into urban and regional development scenarios
- Intelligent, adaptive and durable rail infrastructure
- Railway system with low noise and vibration impact
- Railway infrastructure with high resilience to natural hazards
- Intermodal services
- Life cycle management of rolling stock
- Life cycle management of track
- Life cycle orientated modelling and process optimization in rail infrastructure and components
- Low cost safety systems
- Mobility behaviour
- Modal split improvements for rail sector (freight and passengers)
- Modelling transport demand
- Multi use railway
- Multimodality
- Noise & Vibration
- Novel yet operational tunnel inspection systems directly available to infrastructure providers
- Optimization of multimodal hubs
- Optimization problems in railway infrastructure design
- Optimizing spatial development in rail catchment areas
- Passenger Information
- Physical internet
- Powertrain
- Product and service engineering
- Quiet railroad traffic
- R&D-support, Finite Element Analysis
- Rail data analytics - IoT - sensor data analytics
- Rail freight products
- Real-time noise related track access charge
- Remaining fatigue life of steel railway bridges
- Safety & Security Co-analysis, design and assurance for autonomous (CBTC) in (urban) rail
- Smart and new materials
- Smart production of vehicles and bogies
- Strengthening of existing bridges
- Surveillance for tunnel safety
- Sustainable track systems (environment and long term behaviour)
- Sustainable bridge construction
- Use of GNSS for safety systems
- Vehicle - Track - Environment Interaction
- Vehicle Dynamics
- Wear based track access charging
- Whole Rail System Assessment

'OTHERS' Road Map Tags

- 24/7-self-service hubs
- Automated bundling of consolidation cargo

- Automated container handling
- City Logistics
- Connected systems
- Consulting
- Fully automated freight handling
- Funding of sustainable railway / public transport services
- ICT
- Interface between market and public authorities
- Projects in the area Industry 4.0
- Publishing
- Space-saving intermodal Hubs
- Transport and storage network

Future Non-Technical Challenges

The next figure tries to mirror the respondents' feeling on what are the future non-technical challenges in the rail sector – especially in the R&D domain. The picture seems to be quite clear. The main future challenge seems to be the lack of high-quality employees. This limited resource was reported as the main non-technical challenge for future.



Figure 31 – Where are non-technical challenges of the future? A word-cloud presentation (N=75, several tags each respondent possible)

3.4 Summary

To conclude this chapter on here the study's results in a nutshell: First of all, the respondents' self-categorization to the SHIFT²RAIL interest topics generated data in an entirely new quality and validity. These results show clearly different fields of interest as a foundation for bmvit/FFG's future communication activities. The self-categorization under "other roles" within the Rail-Value-Chain and the rather high interest in "Cross-Cutting Activities" seem to be signals of at least the majority of Austria's rail-community to actively move between the different tiers or categories and this group could be seen as elevated potential in Austria's innovation system – also outside the rail domain and S2R.

Interestingly the biggest non-technical challenge for the future in rail RTD&I has been reported as the limited human resources.

As we mentioned in the section on interest on future co-funded research there is sufficient support that the SHIFT²RAIL programme and its impact on the rail community is not yet fully understood by all community members. This would involve the need for further information.

There is one main result on the non-technical challenge of the future in rail RTD&I. This is the limited human resources. This had been confirmed at a recent Austrian Rail Industry event.

At the end of the results chapter we want to highlight the valuable support to this study from Mr. Chodasz (Austrian Rail Industry), Mr. Perstel (AC Styria Autocluster GmbH) and Mr. Rohowetz (FFG).

4. Limitations

Any self-administered online survey has its strengths and limitations. In this study we clearly seem to have touched the limits of what respondents can report in terms of quotable language and self-categorisation when it comes to an organisation's future activities. There have been significant signals that several departments within an organisation contributed. In several cases this had led to restarting the questionnaire procedure, because different departments (research, project management, innovation, public relations, business development, and corporate strategy) clearly have different languages, different perspectives and varying degrees of competitive sensitivity. Within the used approach of self-categorization it was not possible to verify the reported data entries.

The rather high number of self-categorization under "other roles" within the Rail-Value-Chain and the rather high interest in "Cross-Cutting Activities" seem to be signals of at least the majority of Austria's rail-community to actively move between the different tiers or categories and this group could be seen as elevated potential in Austria's innovation system – also outside the rail domain and S2R. However this could possibly have resulted from company or sector specific jargon and the quick fix that respondents rather opted for categories that are less limiting.

This clearly has not been a study in the economic strength of Austrian rail. Self-reporting was limited to companies who are strong in RTD&I. On top of this, revenue figures in any self-reporting procedure involve double counting within supply chains / value chains. This also holds true for similar activities at Austrian rail industry. With international groups and rather diverse cultures and regionally dispersed groups, some organisations seem to have reported only figures for selected departments (e. g. development engineering).

There has been evidence, that road mapping and any work on core competences involves activities beyond traditional company boundaries. Several industry champions have been involved in cluster-wide or network-wide activities and stated, that in their view this study collects data one or two years too early (because they have not yet come up with a presentable content or format on their competencies). The study authors have concluded this openness as strength and fully in line with the concept of emerging strategizing (Eden/Ackermann), even if it might feel disturbing from the point of view of a presentable snapshot (cf their examples of core distinctive competences and how they evolve during strategy making processes e.g. Ackerman/Eden/Brown: The Practice of Making Strategy p 157).

Although within the data gathering process there were several reminders for providing data to the questionnaire 76 companies / institutions organized within rail-specific clusters (bahnindustrie.at, RTCA, AC Styria) have not provided any data.

A motivational issue reported by several industry representatives has been the felt overlap with rail-industry's 10year anniversary publication end of 2015 and this survey.

5. Next steps

Based upon this study's results bmvit could pro-actively disseminate future S2R information to specific interest groups according to the reported fields of interest. Due to the high interest in cross-cutting themes, one of the next rail-specific newsletter could focus on cross-cutting themes.

Respondents who have not yet participated in co-funded research of bmvit/FFG could receive a welcome letter /information package with basic information on co-funding instruments and R&D.

A contract for a dissemination brochure or material could involve data collection with some of the champion organisations who have not reported data within this survey.

The study authors have concluded this openness as strength and fully in line with the concept of emerging strategizing (Eden/Ackermann), even if it might feel disturbing from the point of view of a presentable snapshot. Therefore the better half of the community deserves further encouragement in their joint road mapping and competence presentation activities. This is also supported by a study (2016; Technopolis) on reframing Austrian organisations' vision statements and research roadmaps within European road mapping contexts.

Candidate options for activities based upon results from this survey: Some respondents stated strong interest in future H2020 and national programmes. This could be due to established project and programme routines. Public co-funding schemes have evolved rather dynamically. However, the strong interest in future co-funded research could possibly mean that SHIFT²RAIL programme's central role and its impact on the rail community is not yet fully understood by all individuals in the community. We anticipate there is the need for further information or orientation.

Annex

Annex I – Questionnaire



Seite 01

Dear Sir or Madam,

The Austrian Ministry of Transport, Innovation and Technology (BMVIT, Unit III/4) currently evaluates the competences of the Austrian Rail Industry and Austrian Rail Research. Therefore a competence map will be set-up (Kompetenzatlas zu Forschung und Entwicklung in Österreich im Bereich Eisenbahn). The following questions help the Ministry to collect a detailed overview of the Austrian rail industry and research strengths and the rail innovation road-map for the upcoming years. This is to foster the position of the Austrian Rail Sector.

Until now it is not yet decided how the results of the survey will be published. Options are a brochure, public website or database for BMVIT usage only.

We want to thank you in advance for taking your time to answer our questions.

Declaration of Approval

Herewith I declare that the data of the following questionnaire can be used by BMVIT and FFG (Österreichische Forschungsförderungsgesellschaft mbH).

At any time you are able to cancel your declaration of approval. In that case please contact BMVIT (i4@bmvit.gv.at)

- Yes, I declare that BMVIT and FFG are allowed to use my data of the following questionnaire. In case of publishing your data in a brochure BMVIT will again request for permission (public relation contact).
- No, I do not want to share my data with BMVIT or FFG and stop here with answering the following questionnaire.

Seite 02

text('Organisation Role')

Role of your Organisation

The following questions give us an insight of your actual and planned role of your organisation in the rail market.

1. What is the role of your organisation in the rail market?

(Multiple answers possible)

- Railway Undertaking**
- Rail Infrastructure Management**
- Rail Supply Industry**
- Research**
- University
- technical
- non-technical
- Non-University
- technical
- non-technical

Fragebogen

<https://www.sosicisurvey.de/admin/preview.php?questionnaire=base&...>

- University for Applied Science
 - technical
 - non-technical
- Services**
 - Infrastructure Construction
 - Finance, Leasing
 - Project Management
 - Travel Information
 - Ticketing
 - Multimodal Services
 - Data Management
 - WLAN / Communication Services
 - Certification
 - Information and Communication Technology (ICT)
 - System Integration
 - Others
- Meta-Organisations (Interest Groups, Rail-Clusters, etc.)**
- Public Administration Body**
- Other Role**

In case you entered 'Other Role' in question #1 please describe your Role

Seite 03**2. What is your actual role within the Value Chain for Rail Vehicles?**

(Question based on Sector Overview and Competitiveness Survey of the Railway Supply Industry Within the Framework Contract of Sectoral Competitiveness Studies – ENTR 06/054 (Funded by the European Commission), Rotterdam, May 2012)

(Multiple answers possible)

- Value Chain – Tier 3**
 - Main Materials
 - Aluminium
 - Chemicals
 - Fabrics
 - Glass
 - Iron
 - Paints
 - Plastics
 - Rubber
 - Stainless Steel
 - Steel
 - Others
 - Parts inputs
 - Air Compressor Brake Parts
 - Blower Motor
 - Cable
 - Elastic Material
 - Flanges, Forgings, Gears, Shafts
 - Fuel supply controller
 - Inverter

Fragebogen

<https://www.sosocisurvey.de/admin/preview.php?questionnaire=base&...>

- circuit boards
- Rectifier
- Sensors
- Speed indicator
- Switch gear
- Voltage converter
- Others
- Others
- Value Chain – Tier 2**
- Propulsion Components
 - Electric Generator
 - Engine
 - Fuel System
 - Truck System
 - Brakes
 - Wheel set
 - Suspension
 - Under Carriage Casting
 - Others
 - Traction Motors
 - Others
- Propulsion Systems
 - Integrated propulsion system
 - Others
- Electronic Systems
 - Communication System
 - Security System
 - Driving Control System
 - Integrated Software
 - Electric Collector
 - Auxiliary Power Unit
 - Others
- Body & Interior
 - HVAC
 - Bathroom
 - Hatch Cover
 - Lighting
 - Body
 - Door System
 - Seating Flooring
 - Coupler
 - Window
 - Others
- Infrastructure-related Equipment
 - Signaling/Info.Systems
 - Steel Track
 - Other Track Parts
 - Electrification
 - Others
- Railcar Maintenance and Refurbishing
- Others

Fragebogen

<https://www.soscsurvey.de/admin/preview.php?questionnaire=base&...>

- Value Chain – Tier 1**
- Passenger & Transit Coaches / Locomotives
 - Passenger/Metro/Light Rail Transit (LRT)/Street Cars
 - Locomotives
 - Others
 - Freight Wagons / Locomotives
 - Freight Wagons
 - Locomotives
 - Others
 - Maintenance Vehicles
 - Others
- Value Chain – Services**
- Infrastructure Construction
 - Finance, Leasing
 - Project Management
 - Travel Information
 - Ticketing
 - Multimodal Services
 - Data Management
 - WLAN / Communication Services
 - Certification
 - Information and Communication Technology (ICT)
 - System Integration
 - Others
- Other Value Chain Role**
- I have no role within the Value Chain for Rail Vehicles**

In case you entered ‚Other Value Chain Role‘ in question #2 please describe your Value Chain Role

In case you entered ‚Others‘ in one of the parts of question #2 please describe this briefly

3. In question #2 you entered your actual role in the Value Chain for Rail Vehicles. What is your planned role in about five years within the Value Chain for Rail Vehicles?

(Question based on Sector Overview and Competitiveness Survey of the Railway Supply Industry Within the Framework Contract of Sectoral Competitiveness Studies – ENTR 06/054 (Funded by the European Commission), Rotterdam, May 2012)

(Multiple answers possible)

- There will be no difference from today.**
- Value Chain – Tier 3**
- Main Materials
 - Aluminium
 - Chemicals
 - Fabrics
 - Glass
 - Iron
 - Paints
 - Plastics
 - Rubber

Fragebogen

<https://www.sosicurvey.de/admin/preview.php?questionnaire=base&...>

- Stainless Steel
- Steel
- Others
- Parts inputs
 - Air Compressor Brake Parts
 - Blower Motor
 - Cable
 - Elastic Material
 - Flanges, Forgings, Gears, Shafts
 - Fuel supply controller
 - Inverter
 - circuit boards
 - Rectifier
 - Sensors
 - Speed indicator
 - Switch gear
 - Voltage converter
 - Others
- Others
- Value Chain – Tier 2**
 - Propulsion Components
 - Electric Generator
 - Engine
 - Fuel System
 - Truck System
 - Brakes
 - Wheel set
 - Suspension
 - Under Carriage Casting
 - Others
 - Traction Motors
 - Others
 - Propulsion Systems
 - Integrated propulsion system
 - Others
 - Electronic Systems
 - Communication System
 - Security System
 - Driving Control System
 - Integrated Software
 - Electric Collector
 - Auxiliary Power Unit
 - Others
 - Body & Interior
 - HVAC
 - Bathroom
 - Hatch Cover
 - Lighting
 - Body
 - Door System
 - Seating Flooring
 - Coupler

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Fragebogen

<https://www.sosicurvey.de/admin/preview.php?questionnaire=base&...>

- Window
- Others
- Infrastructure-related Equipment
 - Signaling/Info.Systems
 - Steel Track
 - Other Track Parts
 - Electrification
 - Others
- Railcar Maintenance and Refurbishing
- Others
- Value Chain – Tier 1**
 - Passenger & Transit Coaches / Locomotives
 - Passenger/Metro/Light Rail Transit (LRT)/Street Cars
 - Locomotives
 - Others
 - Freight Wagons / Locomotives
 - Freight Wagons
 - Locomotives
 - Others
 - Maintenance Vehicles
 - Others
- Value Chain – Services**
 - Infrastructure Construction
 - Finance, Leasing
 - Project Management
 - Travel Information
 - Ticketing
 - Multimodal Services
 - Data Management
 - WLAN / Communication Services
 - Certification
 - Information and Communication Technology (ICT)
 - System Integration
 - Others
- Other Value Chain Role**
- I have no role within the Value Chain for Rail Vehicles**

In case you entered ‚Other Value Chain Role‘ in question #3 please describe your Value Chain Role

In case you entered ‚Others‘ in one of the parts of question #3 please describe this briefly

Seite 04

Shift2Rail Interests

The following questions give us a feeling on your Shift2Rail Innovation Programme interests.

Fragebogen

<https://www.sosocisurvey.de/admin/preview.php?questionnaire=base&...>**4. Which Shift2Rail Innovation Programmes are you interested in?**

(SHIFT2RAIL STRATEGIC MASTER PLAN, Version 1.0, 31 March 2015)

(Multiple answers possible)

- IP1 Cost-efficient and Reliable Trains, including high capacity trains and high speed trains**
 - Train Interiors
 - Doors and intelligent Access Systems
 - Traction
 - Train Control and Monitoring System (TCMS)
 - Carbodyshell
 - Running Gear
 - Brakes
- IP2 Advanced Traffic Management & Control Systems**
 - Smart, fail-safe Communications and Positioning Systems
 - Traffic Management Evolution
 - Automation
 - Moving Block (MB) and Train Integrity
 - Smart Procurement and Testing
 - Virtual Coupling
 - Cyber Security
- IP3 Cost-efficient, Sustainable and Reliable High Capacity Infrastructure**
 - New Directions in Switches and Crossings
 - Innovative Track Design and Materials
 - Cost effective Tunnel & Bridge Solutions
 - Intelligent System Maintenance
 - Improved Station Concepts
 - Energy Efficiency
- IP4 IT Solutions for Attractive Railway Services**
 - Technical Framework
 - Customer Experience Applications
 - Multimodal Travel Services
- IP5 Technologies for Sustainable & Attractive European Freight**
 - Implementation Strategies and Business Analytics
 - Freight Electrification Brake and Telematics
 - Access and Operation
 - Wagon Design
 - Novel Terminal, Hubs, Marshalling Yards, Sidings
 - New Freight Propulsion Concepts
 - Sustainable Rail Transport of Dangerous Goods
 - Long-term Vision of an Autonomous Rail Freight System
- Cross-cutting Themes**
 - Long-term needs and socio-economic research
 - Smart materials and processes
 - System integration, safety and interoperability
 - Energy and sustainability
 - Human capital
- We are not interested in any Shift2Rail activity.**

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Fragebogen

<https://www.soscisurvey.de/admin/preview.php?questionnaire=base&...>

5. In case you would like to pre-announce (for BMVIT and FFG) your favourite project/consortium idea or specific interest within an area of the S2R Innovation Programmes, please briefly describe in one or two sentences.

Mention first the IP, then the Area and then your project/consortia ideas.

Example: IP 4 / Technical Framework:

Seite 05

Innovation Road Map

The following questions give us a feeling of your innovation road map as well as your innovation funding strategy.

6. Which R&D co-funding finance instruments have you already used?

(Multiple answers possible)

- National Programme ‚Mobilität der Zukunft‘
- National Programme ‚Basisprogramme‘
- National Programmes of aws
- EU framework programm for research and innovation
- EU – Horizon 2020
- Other EU funding programmes
- Others
- I have not used any R&D co-funding finance instrument

7. Are you interested in co-funded innovation / research in the rail sector?

(Multiple answers possible)

- National
- EU – H2020
- EU – Shift2Rail
- Global
- Others
- I am not interested in co-funded innovation / research in the rail sector

8. How would you tag (catchy descriptors) your future fields of rail innovation? How would you tag your rail innovation road map until 2025?

(Please enter one tag per line)

9. What are your rail-specific research fields?

Seite 06**10. What rail-products, services or processes features you as an expert / leading company / leading R&D institute?**

This question helps the BMVIT to better understand your rail-specific competences and strengths.

Please enter one product/service/process per line.

11. What rail-specific methods features you as an expert / leading company / leading R&D institute?

This question helps the BMVIT to better understand your rail-specific competences and strengths.

Please enter one specific method per line.

12. Are you certifying rail-technology components or solutions?

In case yes, please let us know what kind of components or solutions you are certifying.

- YES
- NO
- I opt to not answering this question.

13. Which rail-specific non-technical challenges could influence the rail-innovation road-map (e.g. limited resources, lack of high-quality employees, ...)?

Seite 07**Company Profile**

The following questions give us an insight of your company profile.

14. Please enter your company information

Company Name

Fragebogen

<https://www.soscisurvey.de/admin/preview.php?questionnaire=base&...>

Company Profile
(About 600
Characters)

At a glance – Your
company is best
described

Company Website

Employees total
(2015)

Employees R&D&I
(Rail) global (2015)

Employees R&D&I
(Rail) in Austria
(2015)

Female employees
total (2015)

Female employees
R&D&I (Rail) in
Austria (2015)

Patents Rail in
Austria

Revenue (total)
(2015)

Revenue (Rail)
(2015)

Export quota Rail
(2015)

R&D quota (2015)

Market share rail
Austria (2015)

Market share rail
Europe (2015)

Market share rail
global (2015)

With respect to your
global rail market
share in 2015, do
you see your
company as global
market leader?
(yes/no)

15. Which market segments do you serve with your organisation?

Please mention the share of revenue each market segment in the field right to the option (in total 100%).

- Rail
- Automotive
- Aerospace
- Maritime
- Multimodal

Fragebogen

<https://www.soscisurvey.de/admin/preview.php?questionnaire=base&...>

- Public Safety
- Others
(Please name the market segment and the share of revenue.)
- I opt to not answering this question.

16. Which rail export market segments do you serve with your organisation?

Please mention the name and the respective share of rail export each market in the field right to the option (in total 100%).

- Europe
 (Please name the names of the most important European export markets and its share of total exports.)
- Asia
 (Please name the names of the most important Asian export markets and its share of total exports.)
- US
 (Please name the names of the most important US export areas and its share of total exports.)
- South America
 (Please name the names of the most important South American export markets and its share of total exports.)
- Australia
 (Please name the names of the most important Australian export areas and its share of total exports.)
- Africa
 (Please name the names of the most important African export markets and its share of total exports.)
- Others
(Please name the market and its share of total exports.)
- I opt to not answering this question.

17. Your company is member of...

(Multiple answers possible)

- ACStyria
- AC-OÖ
- Österreichische Verkehrswissenschaftliche Gesellschaft (ÖVG)
- Rail Technology Cluster Austria (RTCA)
- Verband der Bahnindustrie
- Union internationale des chemins de fer (UIC)
- UNIFE
- UNISIG
- GSM-R Industry Group
- ETSI
- Others

Seite 08**Contact Details**

The following contact details help us to target-oriented communicate with your company.

Fragebogen

<https://www.soscisurvey.de/admin/preview.php?questionnaire=base&...>**18. Please enter your public relations contact details**

Title _____
Surname _____
Name _____
Job Title _____
Department _____
eMail _____
Phone _____
Address: Postal Code _____
Address: Place _____
Address: Street _____
Address: Street Number _____

19. Please enter your R&D (rail) contact details

Title _____
Surname _____
Name _____
Job Title _____
Expert Field _____
Department _____
eMail _____
Phone _____
Address: Postal Code _____
Address: Place _____
Address: Street _____
Address: Street Number _____

20. Please enter your innovation (rail) contact details

Title _____
Surname _____
Name _____
Job Title _____
Expert Field _____
Department _____
eMail _____
Phone _____
Address: Postal Code _____
Address: Place _____
Address: Street _____
Address: Street Number _____

Seite 09

Picture Upload

This section is to upload your company logo as well as rail related company pictures. Please upload at least your company logo as well as two rail related company pictures. The third rail related company picture is optional. Please upload pictures with a size of maximum 1MB.

In case of publication BMVIT will request for permission again (public relations contact). In case we need your pictures in high-quality (resolution minimum 300dpi) we will contact your public relation unit.

Company logo (maximum size 1MB)

Durchsuchen... Keine Datei ausgewählt.

Public relations rail-specific picture 1 (maximum size 1MB)

Durchsuchen... Keine Datei ausgewählt.

Public relations rail-specific picture 2 (maximum size 1MB)

Durchsuchen... Keine Datei ausgewählt.

Public relations rail-specific picture 3 (maximum size 1MB)

Durchsuchen... Keine Datei ausgewählt.

Seite 10

21. In case of your positive declaration of approval at the beginning of the questionnaire, the data of the questionnaire can be used for

- BMVIT and FFG internal usage only
- BMVIT and FFG internal usage as well as for BMVIT information material (e.g. brochure, public website, public database). In case of publishing your data BMVIT will again request for permission (public relation contact).

Seite 11

Rail-specific Requests or Recommendations to BMVIT

22. In case you have rail-specific requests or recommendations to BMVIT (Unit III/4, Innovation), please enter below.

(Your answers are for BMVIT internal usage only.)

Fragebogen

<https://www.soscsurvey.de/admin/preview.php?questionnaire=base&...>

Letzte Seite**Thank you very much for taking your time!**

Your answers were saved. You can close the window of the browser.

Please forward this questionnaire (link) to all your partners and network nodes in Austria including key individuals.

In case of any questions please email us (verwaltung@hitec.at) or call +43 1 718 25 30 300.

Dr. Wolfgang Schildorfer , Vereinigung High Tech Marketing - HiTec