

INNOVATIVE RUNNING GEAR SOLUTIONS FOR NEW DEPENDABLE, SUSTAINABLE, INTELLIGENT AND COMFORTABLE RAIL VEHICLES

D5.4 Dissemination and Exploitation activities report

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EXECUTIVE SUMMARY

This document provides a description of the RUN2Rail dissemination and communication activities carried out during the whole duration of the project. The aim of this report is to provide a detailed description of the dissemination strategy and how this was implemented during the 25 months of project implementation, including the materials and strategies that have been used to facilitate a wide spread of information and knowledge of the results created by the project. The dissemination of RUN2Rail has been essential throughout the project's life and been carried out with the cooperation of all Work Packages.

In this respect, materials and strategies that were used for communicating and disseminating RUN2Rail to the target audiences and the general public, as described in the dissemination plan (D5.3), are presented in this report. Those include: the creation of a project identity; the creation of a public website; the creation of a project brochure; the production of two newsletters; the organisation of dissemination events; the participation to conferences and the publication of results in relevant journals/conferences.

Moreover, this report gives an outlook of the discussions that took place under the Advisory Board setting, which is composed of ERA, CEN/CENELEC and members of the PIVOT Project as main beneficiaries of the outcomes of RUN2Rail.

Lastly, the achieved and potential exploitation activities of each partners are summarized.

The dissemination of the project's research activities and results have been fundamental components of the RUN2Rail project. As shown in this deliverable, a large audience has been reached by RUN2Rail messages and the project has at the same time ensured proper dissemination towards the Shift2Rail Joint Undertaking to ensure a smooth and effective transfer of results into the Shift2Rail projects.

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1. INTRODUCTION

RUN2RAIL (Innovative RUNning gear soluTiOns for new dependable, sustainable, intelligent and comfortable RAIL vehicles is a Shift2Rail Open Call project within the Horizon2020 Programme of the European Commission.

RUN2Rail has explored an ensemble of technical developments for future running gear, looking into ways to design trains that are more reliable, lighter, less damaging to the track, more comfortable and less noisy. These innovations have been proposed in the form of case studies supported by the methods and tools elaborated in the project.

RUN2Rail develops across four thematic Work Streams:

- 1) Innovative sensors & condition monitoring
- 2) Optimised materials & manufacturing technologies
- 3) Active suspensions & mechatronics
- 4) Noise & Vibration.

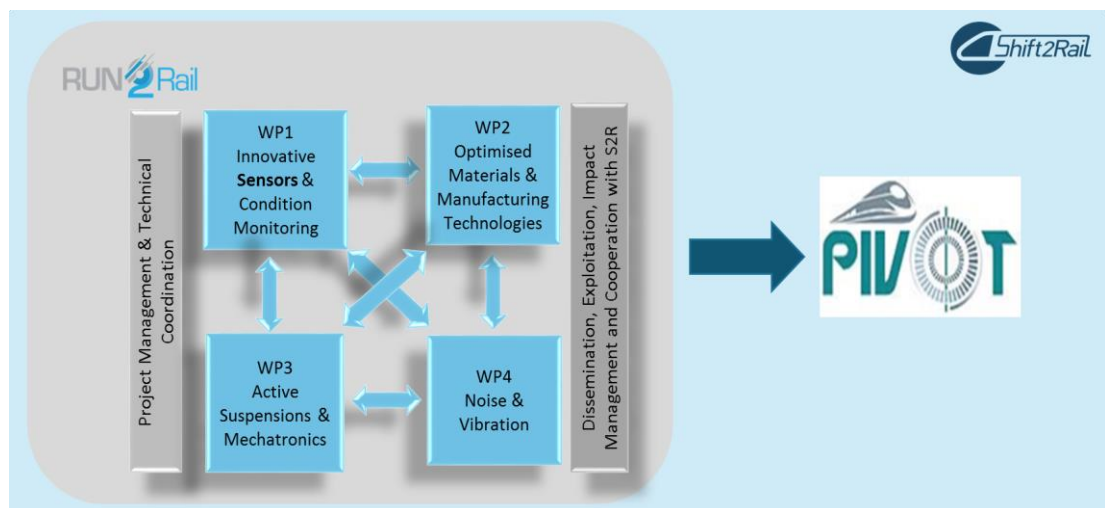


Figure 1: Project structure

The dissemination and exploitation of the project's research activities and results are fundamental components of the RUN2Rail project.

In order to address these priorities, the project has a dedicated Work Package (WP5), which coordinated and handled the dissemination activities of RUN2Rail. UNIFE, POLIMI, HUD, ISVR, KTH and DICEA, with the active collaboration of all partners, engaged in activities such as organising and participating in conferences, congresses and workshops as well as standardisation activities. WP5 with the collaboration of all the other partners also worked on the publication and distribution of material such as scientific publications, articles and brochures, press releases, newsletters and a website towards accomplishing dissemination of the project results to a wide range of audiences.

The research carried out in RUN2Rail has provided valuable input for the work planned in Innovation Programme 1 'Efficient Technologies for High Capacity Trains' and it contributed in particular to the work of its corresponding CFM Project PIVOT.

Given the importance of the RUN2Rail project for the success of Shift2Rail, the widespread and targeted dissemination of project outputs was vital to the acceptance and implementation of the achievements developed. The implementation of solutions aims at generating business for industries (SME and large) and at contributing to the R&D activities of Shift2Rail.

RUN2Rail established a detailed and clear strategy to reach the wider public and raise awareness of its main results. This report illustrates how this strategy was successfully implemented.

1.1 SHIFT2RAIL

The RUN2Rail communication and dissemination strategy has been designed to provide the most extensive coverage, meeting the limitation of the scale of the project and ensuring an efficient and co-ordinated take-up by the Joint Undertaking with their future R&D activities. The activities are also designed to ensure a solid communication of the project with players outside of the Shift2Rail JU. The approach consists of three elements:

1. Interaction with the Shift2Rail JU of the RUN2Rail results;
2. Public dissemination, outside of the JU but very much aligned with the Shift2Rail dissemination objectives and strategy; and
3. Focus on users/advisory groups/standardization bodies.

The first task focused on the link with and dissemination of appropriate results to the future Shift2Rail Research and Development activities. For this purpose, a detailed description of the input delivered by Shift2Rail for the success of its projects has been provided in *D5.5 Report on the project results-achievements for future S2R activities*.

The second element focused on the wide dissemination of project results through several tools: events, publications, the public website etc. This element will be the main focus of this Deliverable.

The third element was also very much developed; an Advisory Group was created and dedicated meetings organized. More details on the impact of the project has been provided in *D5.7 Report on RUN2Rail targeted impacts*.

2. EXTERNAL COMMUNICATION

External communication was of key importance for maximizing RUN2Rail's impact and for disseminating the project results. Communication of the project research activities involved reaching relevant railway stakeholders, the scientific community and creating awareness among the general public. This has been achieved through creating a project identity and a public website, attending conferences and relevant events and publishing articles in relevant journals.

2.1 PROJECT IDENTITY

A project identity has been set up at the beginning of the project and it includes templates for presentations and reports, a project brochure as well as the RUN2Rail logo. The project identity helped dissemination activities and ensured a consistent communication of the project concept, objectives and results. The brochure has been distributed at project workshops and at conferences where project partners have participated.

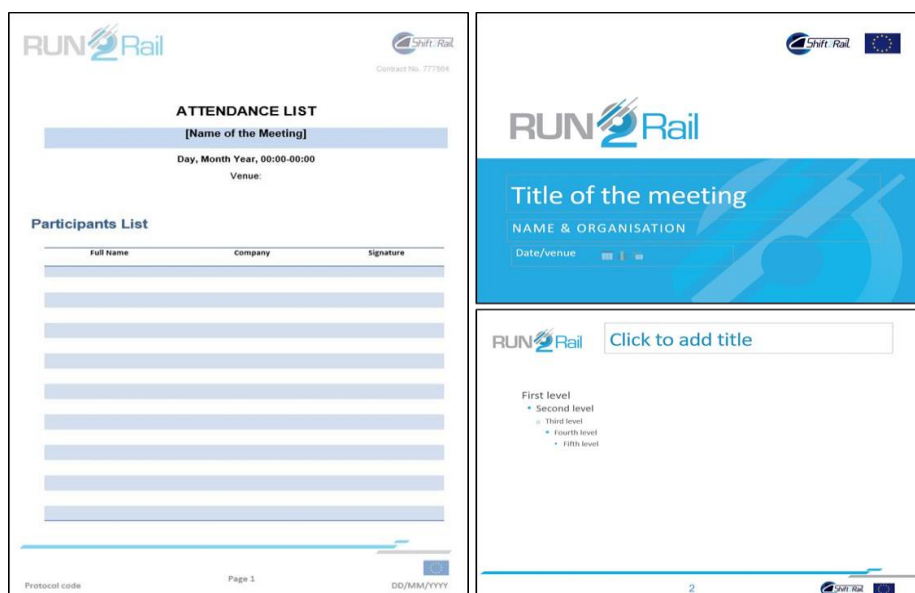


Figure 2: RUN2Rail template samples (Attendance List & PPT)

2.2 WEBSITE

A dedicated website was set up at the beginning of the project. The website (<http://www.run2rail.eu>) has been available throughout the whole project, with a section where visitors can register their interest. It is divided in two parts: the public portal and the private portal. The public portal displays the key project information, partners, Deliverables, news/events and links to the partners' institutions. All the public deliverables have been published on the website and are available for download. The project website will be available after its conclusion.

The webpage also lists all related projects including links to them. The webpage also offers links to the Shift2Rail website as well as to the websites of other projects such as PIVOT.

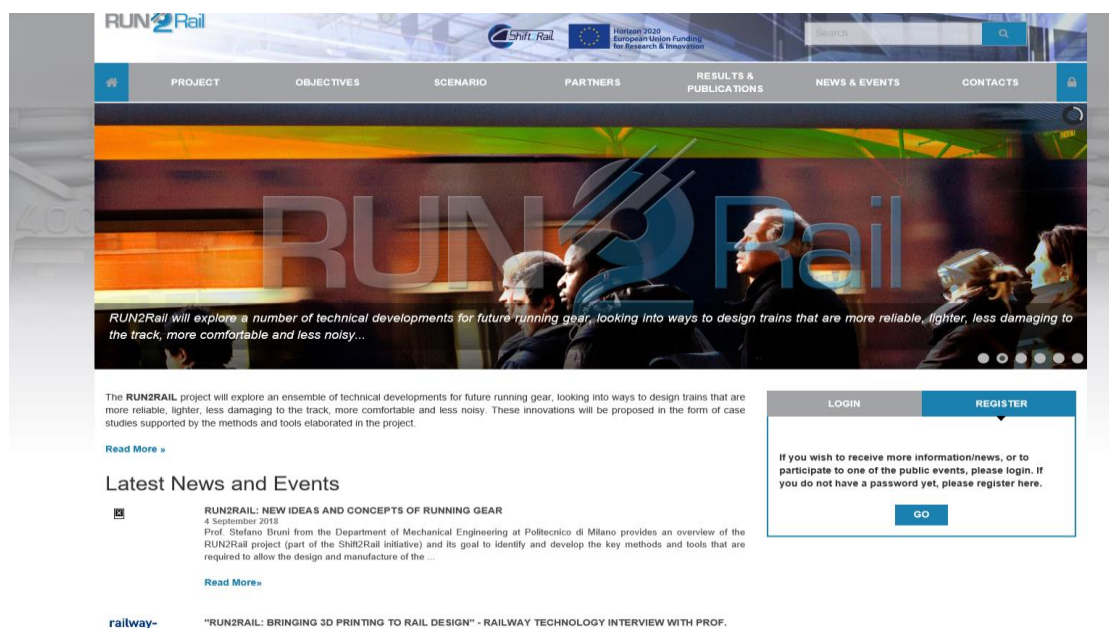


Figure 3: RUN2Rail website

The project website has been visited regularly during the whole duration of the project, as shown by the graph below:

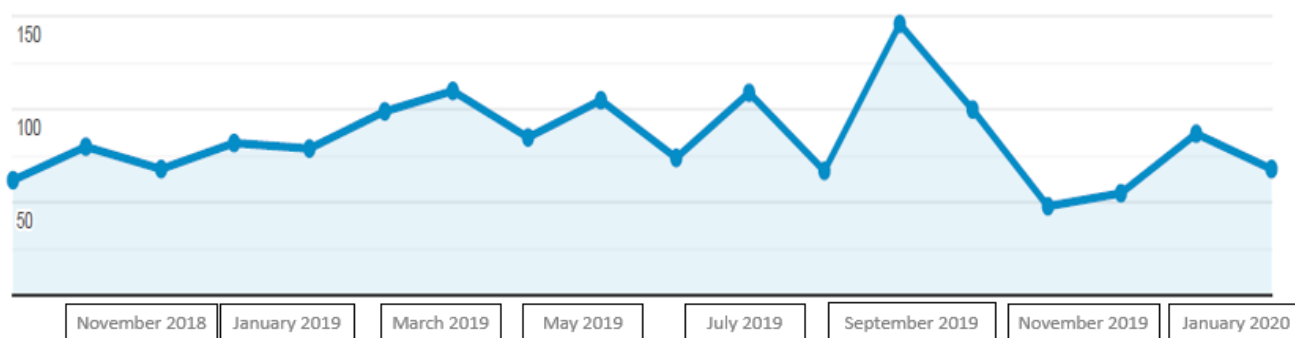


Figure 4: RUN2Rail website's visits

2.3 BROCHURE

During the first part of the project, a brochure was delivered. The main objective of this publication was to provide a wide audience with some preliminary information on the goals of the project, the structure and main planned activities and the members of the RUN2Rail consortium. The brochure anticipated the newsletters and has been distributed at events and workshops.



Figure 5: Extract from RUN2Rail brochure

2.4 NEWSLETTER

The project has produced two newsletters to provide up-to-date information on the status and achievements of the project.

The first newsletter was released in August 2018 and the second newsletter was produced in time to be distributed during the Final Conference taking place on 16th September 2019 in Paris.

The newsletters were circulated via e-mailing lists and in a printed version that complements the project brochure. In order to ensure that the widest audience possible is reached, each partner has used its own mailing list. The newsletters are also uploaded on the project webpage and the printed copy has been distributed at events and workshops.



Figure 6: Two pages from the 1st and 2nd RUN2Rail newsletters

2.5 EVENTS

The RUN2Rail consortium has organised two major project events: the RUN2Rail Final Conference and the Joint PIVOT, Mat4Rail, RUN2Rail, Fair Station Final Event.

The RUN2Rail Final Conference took place on the 16th September 2019 at the Mariott Champs Elysees Hotel in Paris with the participation of around 30 experts from all around Europe. The event was the occasion for Work Package Leaders to present the main results of the project and their important links to Shift2Rail. A special focus was given on the evaluation of impacts of the explored new technologies and a dedicated panel discussion was organized.

The Joint PIVOT, Mat4Rail, RUN2Rail, Fair Station Final Event took place on the 17th September 2019 at SNCF premises in Paris. The event was the occasion for the partners of the four projects to present the main results achieved in five Technical Demonstrators within S2R IP1 and show how they are jointly collaborating to reach Shift2Rail overall goals.

Apart from the Final Conference, RUN2Rail partners promoted the project results during public events organised in Europe during the whole term of the project such as at TRA2018 (Vienna, April 2018), InnoTrans 2018 (Berlin, September 2018), International Conference on Railway Technology (Barcelona, September 2018), International Wheelset Congress (Venice, June 2019),

Symposium of IAVSD (International Association for Vehicle System Dynamics, Gothenburg, August 2019), IWRN (International Workshop on Railway Noise, Ghent, September 2019), International Conference on Railway Bogies and Running Gears (Budapest, September, 2019), and other relevant occasions. An oral presentation will be given at the World Congress of Railway Research in Tokyo in October 2019.

2.6 PRESENTATIONS AND PUBLICATIONS

Project results have been published in several specialized magazines, scientific journals and at relevant national and international conferences and workshops. RUN2Rail has actively looked out for high profile academic and industrial events that are within the domain of interest of the project. At the end of the project, RUN2Rail has been presented/published in the following events and press (an exhaustive list will be included in the Final Report):

Event/Publication	Title	Authors	Type of audience
Non-scientific and non-peer reviewed publications (popularized publications)			
Global Railway Review	RUN2Rail: New ideas and concepts for the next generation of running gear	S. Bruni (POLIMI)	General Public
Railway Technology	Run2Rail: bringing 3D printing to rail design	S. Iwnicki (HUD)	General Public
Scientific publications			
Submitted to international journal (under review)	Eulerian models of the rotating flexible wheelset for high frequency railway dynamics	L. Baeza (UPV), J. Giner-Navarro (UPV), D.J. Thompson (ISVR), J. Monderde (University of Valencia)	Scientific Community
Submitted to international journal (under review)	Precision analysis and dynamic stability in the numerical solution of the two-dimensional wheel/rail tangential contact problem	J. Germán Giménez (TECNUN-Universidad de Navarra), A. Alonso (CAF), L. Baeza (UPV)	Scientific Community
Participation to a conference			
InnoTrans 2018, September 2018, Berlin	Presentation of RUN2Rail at UNIFE stand	M. Andreoni (UNIFE), S. Iwnicki (HUD), S. Stichel (KTH)	Scientific Community, Industry, Policy Makers
PIVOT Midterm conference	Presentation of RUN2Rail results and contribution to	S. Bruni, (POLIMI)	Scientific Community, Industry
The 26th IAVSD	Fault tolerant analysis for	Bin Fu, S. Bruni (all	Scientific

International Symposium on Dynamics of Vehicles on Roads and Tracks	active steering actuation system applied on conventional bogie vehicle	POLIMI)	Community
The 26th IAVSD International Symposium on Dynamics of Vehicles on Roads and Tracks	A direct control approach for automatic steering and stability of motorized independently rotating wheels	Xiaoyuan Liu, Roger Goodall, Simon Iwnicki (all HUD)	Scientific Community
The 26th IAVSD International Symposium on Dynamics of Vehicles on Roads and Tracks	Gain scaling for active wheelset steering on innovative two-axle vehicle.	R. Libero Giossi, R. Persson, S. Stichel (all KTH)	Scientific Community
13 th International Workshop on Railway Noise	Virtual test method of structure borne sound for a metro bogie	Gang Xie (CDH), Martin Rissmann (VBT), Pascal Bouvet (VBT), Xiaowan Liu (ISVR), David Thompson (ISVR) Luis Baeza (UPV), Juan Moreno (MDM), Julián Martín Jarillo (MDM), Francisco D. Denia (UPV), Juan Giner-Navarro (UPV), Ines Lopez Arteaga (KTH)	Scientific Community
13 th International Workshop on Railway Noise	Using a 2.5D BE model to determine the sound pressure on the external train surface	Hui Li (ISVR), David Thompson (ISVR), Giacomo Squicciarini (ISVR), Xiaowan Liu (ISVR), Martin Rissmann (VBT), Francisco D. Denia (UPV), Juan Giner-Navarro (UPV)	Scientific Community
WCRR 2019	An Integrated, Systems-Based Approach to	R. Goodall (HUD), R. Licciardello (DICEA)	Industry, authorities,

	Authorisation of Actively-Controlled Running Dynamics		Scientific Community
10th International Conference on Railway Bogies and Running Gears	Condition monitoring of suspension components based on on-board acceleration measurements	S. Alfi, B. Liu, S. Bruni (all from POLIMI)	Industry, Scientific Community
SIDT 2019 Italian Society of Transport Academics	Intelligent Wheelsets for the trains of the future: the role of in-service wheel-rail force measurement	F. Velletrani, R. Licciardello (DICEA)	Scientific community
Participation to an event other than a conference or workshop			
Stand and poster at IWC 2019	<ul style="list-style-type: none"> General overview of the project Dissemination of results 	M. Andreoni (UNIFE), S. Iwnicki (HUD)	Scientific Community, Industry, Policy Makers
KTH Railway Group spring seminar 2019	<ul style="list-style-type: none"> Presentation of innovative single axle vehicle concept 	Rickard Persson (KTH)	Industry, authorities, public (ca. 150 participants)

Table 1: Targeted Publications and Conferences

2.7 ADVISORY GROUPS

In RUN2Rail, research and technology uptakes have been developed in parallel with standardisation activities. The RUN2Rail partners have supported this task by checking the viability and accuracy of the RUN2Rail results with the developments in Regulation and Standardisation bodies in order to safeguard the project's outcomes and conformance to modern standards and regulations.

For this reason, an Advisory Group in charge of Standardization & Regulation monitoring has been established within RUN2Rail. The Advisory Group is composed of ERA, CEN/CENELEC and members of the PIVOT Project as main beneficiaries of the outcomes of RUN2Rail.

Initial contacts took place in late 2017 establishing the composition of the group.

Informal contacts with CEN occurred over the summer of 2018 regarding the “authorisation strategy” for active suspensions and steering. For this purpose a working document was prepared by RUN2Rail and shared for comments.

Similarly, a working document on RUN2Rail activities addressing Regulatory/Standardisation issues in new materials and manufacturing processes was issued in early December 2018 and

shared with the Advisory Group in preparation for its first meeting. A preliminary teleconference between PIVOT and RUN2Rail was held on 10/12/2018 to prepare for the AG meeting.

The first AG meeting took place via teleconference on 17/12/2018. The agreed topics on the table were:

#1 light-weight materials and manufacturing processes, running gear and carbody

#2 active suspension/steering

#3 health monitoring systems

#4 interior noise.

Topic #2 was declared as RUN2Rail top priority. The plan for the Task 3.3 activities on the authorisation strategy was presented and the working document was discussed, as well as a set of specific questions requiring AG expertise. The plan and initial outcomes were well received by the AG and suggestions were made that were taken into account in the further work.

On 18/04/2019 an e-mail update on RUN2Rail activities was sent to the Advisory Group, including a revised active suspensions/steering working document (version also shared with the PLASA project).

On 19/06/2019 a second teleconference was held to update the AG on the on-going activities and on preliminary results. Again, the outcomes were well received and suggestions made.

AG activities were finalised on 16/09/2019 in the project's final event in Paris, where a special R&S panel discussion took place. The group acknowledged that the regulatory and standardisation framework may contain some barriers that were identified in RUN2Rail, but also that it is best to consider this channel more as an opportunity for the project outcomes to be exploited.

As suggested by the CEN representative in the Advisory Group, the results of the authorisation strategy for active suspensions and steering were presented to CEN WG10 in a teleconference held on 15/10/2019.

2.8 INTERACTION WITH SHIFT2RAIL

A detailed analysis of the contribution of RUN2Rail towards the success of Shift2Rail was included in D5.5.

3. EXPLOITATION PLAN OF PARTNERS

#	Partner	Exploitation strategy	Achieved and potential exploitation
1	UNIFE	UNIFE will disseminate the results of RUN2Rail through its internal Working Groups, raising awareness of the relevance	UNIFE as representatives of the interests of the European rail community has acted as bridge between the European rail stakeholders and the

		of the outcomes of the projects among its members and promoting the continuation of the work done in RUN2Rail in future R&D activities.	RUN2Rail community of partners representing other transport modes. Moreover, results were disseminated throughout the project among its internal working groups. UNIFE has been a supportive partner in leading the discussion between project consortium and the main standardisation and regulation bodies, as well as a support in liaising with S2R members. It will continue to promote the achievements of the RUN2Rail project in face to face meetings with these bodies, and exploit the main results in future R&D activities.
2	POLIMI	New knowledge generated in the project will be exploited in technical seminars and in courses at the MSc and PhD level. Results from the project have potential for new patents and for commercial exploitation in cooperation with the other partners.	Some results from the project have been incorporated in lessons and laboratories for course "Rail Vehicle Dynamics and Train-Track Interaction", taught in the MSc course for Mechanical Engineering. A cooperation with LRS is ongoing to further develop and exploit the wheelset with embedded sensors
3	HUD	Improved methods of incorporating novel materials into railway vehicle running gear will be developed for more general use and included in other S2R projects. Resulting knowledge will be included in publications and teaching material as relevant.	The load cases and the outline designs for novel running gear developed in Run2Rail will be used in the NEXTGEAR project. Knowledge of standards is also supporting the acceptance process in NEXTGEAR and the UK CAFIBO project. New materials for additive manufacturing developed in Run2Rail will be used in NEXTGEAR for the production of prototype components for testing.
4	ISVR	Publish at least three conference papers and two journal papers on results of WP4 together with other partners. Through its consultancy arm ISVR Consultancy, provide services to industry using the methodology developed in the project. Contribute new case studies to regular training courses provided for the rail industry.	Two conference papers were presented at IWRN13, Sept 2019 (one led by CDH, one by ISVR). Two journal papers have been submitted and are under review. Two other journal papers are in preparation. ISVR Consulting has already worked with one client on structure-borne noise transmission. A case study on noise transmission will be added to a revision of the book 'Railway Noise and Vibration' by D. Thompson, currently in preparation.
5	KTH	KTH Railway Group seminar on the results of Run2Rail. Trafikverket, vehicle suppliers like Bombardier and operators like SJ and MTR will participate. Publish at least two conference papers and two journal papers on results of WP3 together with other	KTH has presented the concept of the single axle vehicle on a KTH Railway Group seminar with 150 participants. Results of WP3 were also presented on an international conference in Gothenburg and on the WCRR conference in Tokyo in 2019 and will be presented on the

		partners.	TRA2020. A state-of-the-art article as result of the work in WP3 has been accepted for publication. The second manuscript for journal publication will be submitted very soon.
6	DICEA	Publish at least two conference papers and two journal papers on methodology and results of the cross-cutting impact assessment and pre-certification work. DICEA Transport Area seminar on RUN2Rail results, inviting students (training & education implications), Italian railway undertakings, Infrastructure Managers, National Safety Agency, representatives of manufacturers.	One conference paper was published in September 2019 on the methodology and a corresponding journal paper is currently in press. A second conference paper and a second journal paper are currently in preparation. The DICEA Transport Area seminar is to be held at the Board of Italian Railway Engineers (CIFI) in 2020 (date yet to be finalised)
7	RINA	Publication of at least one scientific paper on the philosophy, methods, findings and conclusions from the work on novel materials for railway vehicle running gear. This will include description of the novel manufacturing processes and the results of the Life Cycle Analysis. Patenting of the findings from this task will be considered by RINA and of licensing of the solution to producers of railway components.	Achieved results were disseminated throughout the project among its internal working groups. Moreover, the findings have been discussed among RINA technical groups in order to evaluate the publication of an article or the demand of a patent. It is also intention of RINA to disseminate main results in specific workshops such as, for example, MAM (Master Additive Manufacturing).
8	LRS	Present the outcome of the work at national and international congress such as International wheelset congress, workshops on railway maintenance, CIFI conference (Italian Railway Engineering association). Exploitation at railway exhibitions like InnoTrans. Contribution to technical papers to published on international journals.	A cooperation with POLIMI is ongoing to further develop and exploit the wheelset with embedded sensors. A scientific paper was already presented at IWC2019. More scientific papers are planned, at international conferences. The dissemination of the results also includes the exposure of the prototypes at international fair trade, like the incoming Innotrans 2020 or other local events, as well as the presentation to potential customers.
9	BLUE	Internal know how improvement suitable for feature design development. Promote any possible project improvement by participate with the same partners to a feature project development. Expand our company network by the partner collaboration.	The improvement of the internal know-how, that is being used in the design of a new bogie, has certainly been achieved. As well as the expansion of our company network through collaboration and knowledge of the other partners. Our future goal is to apply the acquired know-how, in addition to the railway sector, also to the other fields of the mechanical industry in which BLUE is involved. We also know that there is a considerable development of simulation software, in particular

			to simulate the 3D printing phase and to be able to predict defects during the production process. This possibility allows us to open new scenarios in future projects.
10	VB	<p>As a consulting company, Vibratéc can leverage the results of the project and improve its commercial added-value in two ways. First, propagation of the technology and know-how directly developed during the implementation of the activities or transferred from other partner, will be turned into new business opportunities. Vibratéc will be able to extend its portfolio of services. Especially in very innovative fields of activity such as condition monitoring of deeply embedded complex subsystems, often extending the range of application of sensing technology beyond the physical phenomena initially targeted by the sensors, having specific applications as reference is essential to further sell similar approaches in a commercial activity. In a similar way, mastering acoustic models of structure-borne sound propagation to the carbody and other virtual certification processes are differentiating factors to sell consulting services in the railway industry. Secondly, participation in RUN2Rail also brings indirect benefits to Vibratéc. It positions the company as a renowned expert in the field studied: condition monitoring of the traction chain, acoustic propagation in the bogie, etc.</p>	<p>Vibratéc has been involved in WP1 (monitoring) and WP4 (Noise and Vibration).</p> <p>WP1: In 2020, the techniques developed in Run2Rail will be applied on helicopter gearbox (feasibility study for the early detection of teeth cracks inside gearbox).</p> <p>WP4 : Two conference papers were presented at IWRN13, Sept 2019 (one led by CDH, one by Vibratéc) and one at Dresden Rad&Schiene, March 2020. The research work in Run2Rail have enlarged Vibratéc's know-how for structure borne transmission. This know-how is now proposed to our railway customers for technical studies or training.</p>
11	MDM	<p>The sensing of both the wear and the wheel-rail contact has many potential benefits for a railway operator: safety increase, higher maintenance efficiency, higher passenger comfort, this is, in general terms low exploitation costs. Moreover, this trend is aligned with the 'connected train' paradigm, where the whole train will be monitored and remotely controlled from the wayside.</p>	<p>Run2Rail research activities have been considered for two main projects in MDM: Digital Train Project, which is focused on CBM and predictive maintenance activities and, requirement specifications in the tendering process for new Rolling stock to be commissioned in 2020.</p> <p>On the other hand, MDM prepared a scientific publication which was submitted to the 'Journal of Rail and Rapid Transit', and is now under review.</p>
12	UPV	<p>The main results from the project related to the advanced wheelset vibration model will be published in collaboration with other partners. At least two conference papers</p>	<p>UPV has participated in the dissemination of the project results in conferences, journal papers, MSc/PhD courses as well as in seminars with infrastructure managers and vehicle</p>

		and two journal papers are expected. UPV will exploit the new techniques and methodologies generated in the project in seminars with infrastructure managers and vehicle manufacturers, as well as in MSc and PhD courses.	manufacturers. UPV will continue to exploit the main achievements in future research activities and to promote the results of the project in next meetings.
13	CDH	The research outcome of the project will be published as conference paper and on company's Website. New methodology resulted from the project will be disseminated within CDH and its collaborators from the automobile industry for potential commercial exploitation.	CDH has mainly contributed in the WP4 of the project. A joint paper, led by CDH, titled as "The virtual test method developed during the project" has been presented in the 13th International Workshop of Railway Noise (IWRN13), 16-20 September 2019, Ghent, Belgium. For promotional activities a link of the research outcome has been highlighted on CDH website.
14	EVO	Reference designs for new sensing solutions, can be exploited by new patents, and by transferring them to possible new solutions for Assets Monitoring – One of EVOLEO main business.	Evoleo presented in the Run2Rail project acquisition and sensing solutions based on commercial and industrial products that could be tailored usage in the railway domain. These solutions are being assessed on its fully potential to integrate Evoleo's own product development for assets monitoring.
15	BOSCH	New knowledge generated in the project will be incorporated in new product / system developments and promoted at customers	Further internal know how development of active suspensions in railway applications. Currently implementation of active suspension technologies in new product / system developments not started due to overall hesitant market implementation.

Table 2: RUN2Rail partners' exploitation strategy

4. CONCLUSIONS

This report has provided an exhaustive list of all dissemination/communication activities carried out during the 25 months of project implementation. A large audience has been reached by RUN2Rail messages and the project has at the same time ensured proper dissemination towards the Shift2Rail Joint Undertaking to ensure a smooth and effective transfer of results into the Shift2Rail projects.

