

RAIL HOF – A DIGITAL PLATFORM TO IMPROVE SAFETY

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BACKGROUND

The European Union Agency for Railways (ERA) is not only the regulator which sets legislative requirements for European railways but, by working closely with the sector, ensures the harmonised implementation of the legislation through dissemination, training and guidance.

The main mission of the International Union of Railways (UIC) with its three leading values of unity, solidarity and universality is to promote rail transport worldwide by strengthening international cooperation between its members, building a coherent railway system and sharing knowledge and experience.

One of the areas both organisations are working on is Human and Organisational Factors (HOF), and ERA and UIC have decided to work together to promote HOF in the railway sector thereby creating synergies between the two organisations. The creation of a virtual HOF platform is a concrete example of this collaboration. Whereas other high-risk domains such as aviation and nuclear have their networks of subject matter experts building and sharing knowledge to improve safety and performance in their respective domains, the railway sector does not yet have free access to a similar network or platform.

Dedicated virtual platforms such as Eurocontrol's Skybrary and IAEA's Global Nuclear Safety and Security Network (GNSSN) are examples of global networks which serve to build and share knowledge with the goal of improving safety and performance in their respective domains. The RAIL HOF digital platform will be both a knowledge network and a virtual platform, allowing its members to build and share freely accessible HOF knowledge and expertise to further the goal of achieving worldwide implementation of a high level of railway safety and performance. For example, members will be able to exchange best practices and lessons learned as well as sharing resources they believe others may find useful.

This paper describes how this platform was created and describes the collaboration between ERA and UIC to bring the platform to fruition. It describes the objective of the virtual platform, the needs analysis for and development of the platform, and the content and next steps.

OBJECTIVE

The RAIL HOF virtual platform, as a knowledge network, will serve to build resources and contribute to enhancing international cooperation, collaboration and dialogue in the field of railway safety and performance focussing on the integration of HOF.

NEEDS ANALYSIS

For a HOF virtual platform to be successful, a first step is to determine the needs of users by carrying out a needs analysis. A short questionnaire was sent to all ERA database contacts who had expressed an interest in HOF issues at the beginning of 2019. The survey was composed of five questions (both tick box and free text) on what websites they currently consulted, what they liked or disliked about those websites and what type of content they would find useful in a dedicated virtual platform. The survey was open for 5 weeks, sent to 282 contacts and 52 replies were received resulting in an 18% response rate. The survey questions and replies can be found in Annexes I and II respectively.

The results were grouped as follows:

1. content
2. platform functionality
3. editorial policy

Using these groupings, the survey results were analysed and the following recommendations on the content, platform functionalities and editorial policy of the HOF virtual platform were proposed.

Content

Being **up-to-date** was one of the strongest criteria mentioned by respondents for using a website. As regards subject content, the **EU rail regulatory framework and guidance, academic papers as well as practical examples** on how the impact of human factors can be taken into consideration were indicated. **Safety culture** and **HOF in accident investigation** were specifically mentioned as well. The possibility of having a newsletter was also raised.

Platform functionalities

Ease of navigation and a **good search engine** were the top criteria mentioned by respondents as important for using a website. Other criteria mentioned were **easy login, good layout and structure, visuals and interactive** possibilities such as a **discussion forum**. Although the site will initially be in English, consideration needs to be given to whether we could include material and allow people to post items on the discussion forum in **multiple languages**. It was strongly recommended to employ the services of a **web designer** if possible.

Editorial policy

A virtual platform will be used when **the content is trusted**. In particular for HOF experts this can include evidence-based studies which have been backed up by valid statistical analysis. An editorial policy needs to be drafted in light of comments made by some respondents about wanting a website which needs to be **unbiased** and with **no commercial interest**. This will be particularly important if there is a discussion forum which will need to be moderated.


PLATFORM DEVELOPMENT

The results from the needs analysis survey carried out by ERA served as a basis to establish the structure and functionality of the IT platform and the content to be included.

UIC organises a Human and Organisational Factors Working Group (HOFWG) which meets regularly to discuss HOF issues in railways and help the railway sector integrate HOF in order to improve railway safety and performance. The HOFWG meets four times per year and is composed of rail HOF experts from all over the world, each bringing their expertise and experience to the working group. In light of the collaboration between the two organisations, and the wealth of knowledge and experience contained within the UIC HOFWG, the subsequent work on developing the RAIL HOF virtual platform was done within the HOFWG. This also guaranteed a worldwide perspective and was the best way to make use of the railway HOF expertise available to both organisations.

The HOFWG started work on the creation of the HOF virtual platform by proposing the visual and digital identity described in Table 1.

Table 1: Visual and digital identity

| | |
|---|---|
|  | Name: Rail Human and Organisational Factors |
| | Domain name: railhof.org |
| | Social media tags: @railhof; #RailHOF |
| | Visual identity: <ul style="list-style-type: none"> • Creation of a logo • Creation of a small database of visuals/photos |

The UIC HOFWG, jointly with ERA, decided that the RAIL HOF digital platform should offer the following:

- a LinkedIn group to develop the HOF community of experts and increase visibility;
- a website to act as an entry point for all which would then be differentiated to access the appropriate information depending on needs and the level of HOF expertise and experience, and;
- a private area for the members to manage events and create a forum for sharing working documents.

The digital platform had to be easily accessible and, as the needs analysis had highlighted different audiences with differing levels of HOF knowledge and experience, an exercise

segmenting the users allowing them easy access to the platform areas which would meet their needs was necessary. HOFWG participants took part in an online “jamboard” exercise where they were asked to identify the end users of this platform as well as their more specific needs in terms of content. A range of end users, from HOF specialists, through frontline and safety managers, to CEOs were identified. The group also identified potential content for each of the identified end user types. The full results of this group exercise can be found in Annex III.

Other considerations expressed by the HOFWG were the following:

- draw inspiration from other HOF digital platforms which had been mentioned in the needs analysis (e. g.: Skybrary in aviation) and share resources from other high-risk domains such as aviation and nuclear where HOF is also important for safety and performance.
- provide a starting point to help develop basic knowledge/skills/competencies on human and organisational factors and know how to address experts and non-experts.
- administration and moderation of the HOF Digital Platform (management of the level of permission of the newly registered members, access rights, copyrights, etc.).

An editorial team composed of six HOFWG members with recognised HOF expertise and experience from five countries was established to draft the text of the platform's headings and subheadings and to initially populate the site with concrete operational examples from the railway sector as well as key resources in the HOF domain. Their work will also involve ensuring that the content of the site is maintained and kept up to date through contributions from themselves and colleagues as well as the moderation of the LinkedIn group.

THE RAIL HOF PLATFORM

The RAIL HOF homepage contains information introducing the virtual platform, explaining the purpose and giving a brief overview of what can be found there. To facilitate accessibility, it has been designed so that the person using the site will be led to their section of interest from the beginning. The website has three main sections:

- “Are you interested in HOF?” including a "what is HOF?" section with brief explanations of HOF such as “Why do people make errors?” aimed at an audience who would like to find out more about HOF.
- “Are you involved in HOF activities?” with a "join us" LinkedIn group aimed at an audience such as safety managers who know about HOF but might like to enter into discussions with other safety professionals on the LinkedIn site.
- “Are you a HOF expert?” for registered members where confidential information can be shared and networking opportunities established with other HOF experts.

Figure 1 shows a screenshot of these three areas on the website homepage.

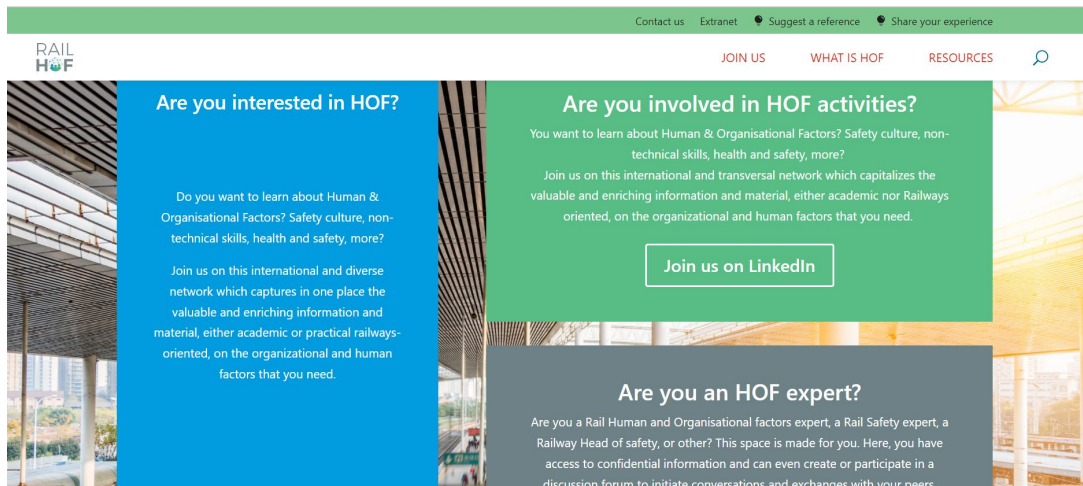


Figure 1: Screenshot of website homepage

To help navigate the platform, the “Join us”, “What is HOF?” and “Resources” links are always visible at the top of the page.

To help guide site visitors to the specific HOF topic in which they are interested the resources have been categorised as follows:

- Enhancing safety management (see Figure 2)
- HOF regulations, standards and tools
- Human Performance
- HOF in practice

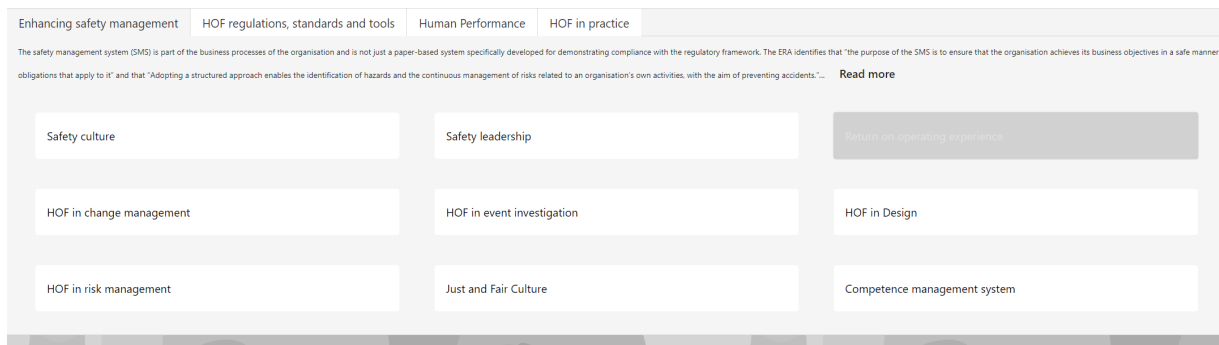


Figure 2: Enhancing Safety Management category and topics

Within each of the four main headings above, short summaries covering some of the key HOF topics have been developed to provide a definition/introduction to the topic, explain its relevance to rail, highlight existing approaches or models in rail or other sectors and give a "more information" section to provide interesting links related to the topic for those who would like to know more about it. The topics were proposed and developed by the UIC HOFWG, jointly with ERA.

The enhancing safety management category includes topics on how to integrate HOF in different management activities, such as competence management, change management, risk management, and design. Other topics include integration of HOF in event investigation and safety culture.

The regulations, standards and tools category focuses on specific tools and approaches for HOF, including the 5x5 model for HOF developed by ERA, other HOF models in widespread use, human-centred design, safety regulations, and HOF standards.

The human performance category covers specific topics relating to the management and measurement of human performance at work, and includes topics such as attention, situation awareness, stress, fatigue, fitness for duty, human error, non-technical skills, physical ergonomics, and workload.

The final category, **HOF in practice**, describes how HOF can be applied in various practical settings, including the design of alarms, the design of automation, cab design, maintenance work, SPADs, and traffic management.

Two key requirements identified in the needs analysis were that the information should be up-to-date and RAIL HOF is a dynamic virtual platform for actively building and sharing knowledge. To achieve this, the HOF community will be encouraged to share HOF references they feel useful as well as practical examples of HOF being integrated, to be shared on the platform via “share a reference” and “share your experience” links at the very top of all pages. In both cases, the proposer can tag the reference or example with the specific HOF topic for which it is relevant using the categories above; for example, “Competence Management System” under the category “Enhancing Safety Management”. These entries will be checked by the editorial team before being uploaded on the site. This platform will evolve and develop other means of connecting and sharing information in order to encourage knowledge building and sharing.

NEXT STEPS

The platform will be formally launched in October 2022, during the IRSC, and will be actively promoted by members of the UIC HOFWG working group, jointly with ERA. A series of LinkedIn posts are planned to stimulate discussion and debate and draw potential users to the site. The content will continue to be developed and refined by the editorial group to meet the emerging needs of the users, address suggested topics, and curate the content added by users.

CONCLUSION

RAIL HOF is an excellent example of how two organisations, ERA and UIC, can collaborate, actively engage the broader rail industry and make the best use of their knowledge and experience to produce an end result which will help the rail sector.

By starting with a needs analysis and engaging with the international HOF railway community RAIL HOF is both a knowledge network and a digital platform, allowing its members to build and share HOF know-how and expertise. The platform will further the goal of achieving worldwide implementation of a high level of railway safety and performance once it is launched in October 2022, during the IRSC.

The methodology applied to develop the digital platform also illustrates how a user centred approach can be applied to better capture user needs and then use these to determine design requirements, content and functionality and usability.

Applying a user centred design approach, we anticipate the benefits of RAIL HOF will be a reliable source of HOF information, easily accessible by a wide range of interested users. This in turn will help to build and connect a network of rail professionals active in the area of HOF, and to support the further development of HOF knowledge and expertise

in the sector. Ultimately, the platform will help organisations across the world to address their legislative requirements in the area of HOF, and help all organisations achieve safety and performance benefits from the application of HOF best practice and knowledge.

Keywords: collaboration; human and organisational factors; railway safety;

Annex I

Survey questions

- What websites do you use to find information on Human and Organisational Factors (HOF) at the moment?
 1. SPARKS (RSSB)
 2. International Union of Railways (UIC)
 3. Health and Safety Executive (HSE) UK
 4. The Chartered Institute of Ergonomics and the Human Factors (CIEHF)
 5. Human Factors and Ergonomics Society (HFES)
 6. Institut pour une culture de sécurité industrielle (ICSI)
 7. International Ergonomics Association (IEA)
 8. Other

- Give 3 reasons why you would consult an HOF site e.g. easy to navigate, up-to-date, etc
 - 1.
 - 2.
 - 3.

- Give 3 reasons why you would not consult an HOF site e.g. difficult to find information, etc
 - 1.
 - 2.
 - 3.

- What other information sources do you regularly use to keep up with developments in the Human and Organisational Factors field?

- What content do you think would be most useful (tick as many replies as necessary)?
 1. Interviews with leaders, managers, front-line staff, researchers - everybody affected by HOF issues
 2. Academic papers
 3. Discussion forums
 4. Frequently Asked Questions (FAQ)
 5. Explanatory videos
 6. Practical tips on incorporating HOF into work at all levels
 7. Examples of best practice
 8. Other – please specify

Annex II

Summary of survey replies

The results of the free text questions were grouped as follows:

1. Platform functionality
 - a. Free access (no fee)
 - b. Easy login
 - c. Interactive
 - d. Good structure/layout
 - e. Easy to navigate
 - f. Good search engine
 - g. Good visuals.
 - h. Available in several languages (FR and ES specifically mentioned)
 - i. Discussion forum (exchanging information becomes more powerful)
 - j. Press “room” ie news feeds?
2. General/information/media format
 - a. Trustworthy and independent (no commercial interests), good quality evidence-based scientific information with proven solutions based on valid, reliable statistical data giving the possibility to compare measures;
 - b. Wide variety of relevant railway topics from a variety of sources all in one place,
 - c. Up-to-date - “news” e.g. new ideas (to implement in the company) and new methods (in the field)
 - d. clear and concise writing style, easy to read, synthesis of information
 - e. “European” scope
 - f. Latest advances in HOF, links to research in specific cases, encourage users to read more.
 - g. Looking for potential training materials (short papers, videos with clear categories/themes easy to download) and online training (“examples to use in talks about HOF, when I need to explain something to people who have absolutely no clue about HOF”)
 - h. tools on how to apply HOF to monitoring tasks (video clips, check lists, evaluations)
 - i. best practice and access to railway company case studies and non-published railway reports otherwise not available
 - j. Information about events and working groups, networking opportunities
3. Specific content
 - a. Safety Culture - knowledge about behaviour and corporate culture
 - b. Regulatory framework, guidelines, links to key European policies, strategies etc and updates on progress on key policy areas relevant to HOF (e.g. new Common Safety Methods)
 - c. HOF in safety investigations - knowledge and understanding about the causes and patterns in accident investigation, incident root causes
 - d. Best practice, not just theory, but examples of implementation e.g. incorporating HOF in risk analysis, best practices on systematic integration of human factors in design, in writing Rulebooks, information that is easy to use in practice, adapted to professional reality.
4. Divided opinion

- a. Some respondents wanted only practical tools “something easy to understand” with no “highly academic publications that are difficult to relate to practice, too theoretical” whereas others wanted a “blend of theoretical academic papers and practical tools (best practices)”.
 - b. Another area of divided opinion was whether to include only railway-related content. Some respondents said they did not want “irrelevant” non-railway related material whereas others said they wanted information and examples from other high-risk domains such as nuclear, health and oil and gas.
5. Things to avoid
- a. Too many railway acronyms used making it difficult to understand, railway specific terms
 - b. “Anglo-centric”
 - c. “old fashioned web design”, unattractive, uncomfortable interface
 - d. Not enough information and when the information is specific to only a small section of the industry e.g. only one country or only for Railway Undertakings (RUs), When it is focussed on one industry;
 - e. not clear enough and difficult to understand especially as the subjects are in another language;
 - f. documents too extensive (too long to read), Too much text.
 - g. No links to other websites
 - h. If the sources/origins are not identified ; or there is a commercial interest, biased
 - i. slow performance, takes a long time to load
 - j. Doesn't provide a newsletter
 - k. Complex structure, unstructured contents
 - l. Lack of intuitiveness in page mapping difficult to navigate,
 - m. Poor search engine, difficult to find information;
 - n. Contains old information and is rarely updated, not maintained;
 - o. too much irrelevant information, too high level of generality;
 - p. document too extensive (too long to read), too much text;
 - q. restricted access (e.g. division into standard and premium users, paying for access, requires pre-registration and passwords to gain access)

| Annex III | Type of potential end-users who will use the HOF Digital Platform | | | | | | Common ideas |
|--|--|--|---|---|--|---|---|
| | HOF specialists /Human sciences Researchers | HOF non specialists who want to know more | Front line managers and supervisors | Head of Safety and Safety experts | Railway CEO and chief officer | Other Industrial companies who implement HOF or not | For every end-user |
| Their needs and expectations regarding HOF Digital Platform | Enrich their knowledge on HOF topics. Upload recent work. Place where they can share their work on HOF topics and exchange of HOF studies, best/good practices | HOF education HOF definitions HOF basics Illustrative concrete and easy to understand examples. Challenge: be attractive enough to make them want to know more about HOF | Change management and organisation through the development of an HOF approach | Enrich their knowledge on the strategic aspects of the role of HOF in safety | Highlight the benefits of the integration of HOF in railway organizations at European level and beyond | Exchange of good practices with railways on HOF | Dictionary: like Wikipedia. Show the interaction in between HOF / SMS/ Safety Culture. Link with the ERA guidance/ UIC guidance |
| Concretely, this could be... | Exchanges of good practices in HOF | Easy to understand and clear definitions | Exchange of best practices on change management and organisation by integrating HOF | Concrete testimony from a safety manager on the role of HOF in their organisation | Concrete testimony from other CEO on HOF integration | Exchange of cross-cutting HOF experiences | News related to HOF and Safety: news on research in railways, strategic issues, emerging topics |
| | HOF/Safety case studies | Easy to understand basics on HOF | Concrete examples of integration of HOF in management | Documents/good practices on human reliability | High level documents on HOF strategical aspects | Exchanges of HOF case studies | Highlight the benefits of the integration of HOF in railway organizations |
| | Articles/documents on various HOF topics | Easy to understand and concrete examples of HOF examples | Discussion forum to exchange with peers at global level or European level | Discussion forum to exchange with peers (think about mediation) | How to integrate HOF in Safety Management System | Exchange cross cutting on “Retour d’experience” after an accident | A magazine like HindSight, but for Rail |
| | Discussion forum to exchange with peers (think about mediation) | Questions and Answers? | Discussion forum to exchange with peers (think about mediation) | How to integrate HOF in Safety Management System (SMS) | | Practical examples (incidents, accidents, near misses) for lessons learnt purposes. | Strategies and practical examples of improving awareness and implementation of HOF |

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|--|---|---|---|---|--|-------------------------|---|
| | Guidance on how to measure HOF (questionnaires, biometrics, systems data, observations, etc) linked to case studies | Directory of relevant international and European standards | Practical examples (incidents, accidents, near misses) for lessons learning purposes. A link has to be made with CSM ASLP | Basics on regulatory framework for every end-user at European and International level. | | Cross-industry examples | (Links to) relevant literature |
| | Practical examples (incidents, accidents, near misses) for lessons learnt purposes. A link has to be made with CSM ASLP | General overview on how to measure HOF (questionnaires, biometrics, systems data, observations, etc) linked to case studies | Road map examples 2 get started (best practice). Safety culture, change process and HOF | Practical examples (incidents, accidents, near misses) for lessons learning purposes; A link has to be made with CSM ASLP, National Investigation Bodies (NIBs) | | | Testimonies (e.g. short videos) of people who are not HOF and who have become aware of their importance (example of a subject, the problem and what made them become aware of it) |
| | Road map examples 2 get started (best practice). Safety culture, change process and HOF | Discussion forum to exchange with peers (think about mediation) | Directory of relevant international and European standards | Road map examples 2 get started (best practice). Safety culture, change process and HOF | | | Documents/good practices on HOF |
| | Best practices (examples, strategies, models, toolkits...) | Practical examples (incidents, accidents, near misses) for lessons learning purposes | Best practices (examples, strategies, models, toolkits...) | Directory of relevant international and European standards | | | Engaging videos |
| | Collaborative space between experts to share | Directory of relevant international and European standards | | Best practices (examples, strategies, | | | Easy to understand and clear definitions |

| | | | | | | | |
|--|---|--|--|-------------------------|--|--|--|
| | | | | models, toolkits...) | | | |
| | Content incl. ergonomics, psychology, UCD, UX, Safety Culture, Just Culture, training delivery, HOF measures, HF Assurance, risk assessment, Non- technical Skills (NTS) non-technical coaching | | | | | | Myth-busters/common misperceptions - e.g. applying HOF is expensive, HOF is just about training and NTS, HOF only apply to safety. |
| | | | | | | | Links to working groups or expertise in different areas of HOF |