

Executive Summary:

The purpose of SKILLRAIL project is to contribute to European surface transport research program implementation and to the enhancement of the sector by fostering a better match between the human resources needs to make railways a more competitive and innovative sector and the offer of skills coming out of the different research based education and training institutions across Europe.

The development of the European Railway sector needs well managed and collaborative research and targeted research lead education. The SKILLRAIL project devoted a significant effort to design and launch a sustainable framework, EURAIL European University of Railway, for creation, dissemination and transfer of knowledge within the railway sector. In line with the SRRA of ERRAC, EURail is now to promoting interaction among its associates and to define clear and realistic objectives concerning new and innovative forms for further cooperation between industry and academia. Based on knowledge, experience and people from "real" universities in Europe, EURail, a corporate service of the Network of Excellence EURNEX, is virtual in nature and aspires to foster, at European level, excellence by gathering and networking the different relevant organizations and institutions around an educational project suitable to the needs of the European Rail sector.

An intensive activity has been carried out for the identification of the stakeholders' needs. This work comprised a questionnaire, which was designed to target all railway stakeholders. Railway operators, infrastructure management, infrastructure contractors and signalling represent the most significant contributions, with shares around 25%, 18%, 15% and 15%, respectively.

The analysis of training and educational programs and projects available inside EURNEX Universities and other relevant higher Education Institutions in Europe and outside Europe (China, India, Russia, South Africa, South Korea and United States of America) has been undertaken. More than 5 000 web places have been surveyed, 134 Institutions from the 7 countries outside EU and 157 European Institutions have been identified with relevant research and education activities in railways.

The Railway "Ecosystem" has experienced a drastic evolution during the recent decades, especially the last one: separation of operating and infrastructure activities, R&D activities shifted from the National Operators to the Industry. To take up those challenges and, in order to remain competitiveness and to deliver top-quality solutions, the Railway Manufacturing Industry has set up different types of training programs. Short training for high skilled jobs can be targeted to all kind of railway stakeholders in order develop competences standardized or recognized at international level enabling to comply with EU international requirements and legislation and also with the high tech innovations under development/implementation in railway services.

The creation and development of a portfolio of short training courses for high skilled jobs constituted a benchmark for the rail training system which mainly answers the need of creating professional profiles to operate in the technological changes and in the international legislation and market liberalization under implementation in the railway sector. Four pilot courses are organised and delivered in areas such as Asset Management Railway Dynamics, Rolling Stock and Energy Efficiency.

Gender and innovation is a new research area, and studies show that diversity breeds innovation and that the more gender balanced companies are, the more innovative they get. Gender mainstreaming is a useful strategy for the promotion of equality. Gender mainstreaming means to integrate a gender perspective into all policy and planning processes. It is used as a tool to identify imbalances and inequalities in processes where gender before has been invisible or regarded as not important.

A business plan for EURAIL has been issued including a vision statement, the main strategy and short and long term objectives, market analysis and acquisition and operational business plans and organizational aspects. UIC as a partner in SKILLRAIL is committed to support EURail developing a strategy by evolving and incorporating training and education activities and “e-learning” based technologies into both mainstream and non-traditional programmes to meet railway expectations and to enhance learning opportunities.

Project Context and Objectives:

The purpose of SKILLRAIL project is to contribute to European surface transport research program implementation and to the enhancement of the sector by fostering a better match between the human resources needs to make railways a more competitive and innovative sector and the offer of skills coming out of the different research based education and training institutions across Europe.

A partnership for innovation, skills development and jobs is envisaged to mobilize support and getting the different players to work together in a collective effort to spread ownership and excellence.

EURail - The European Railway University

The development of the European Railway sector needs well managed and collaborative research and targeted research lead education. The SKILLRAIL project will devote a significant effort to design and launch a sustainable framework, EURAIL for creation, dissemination and transfer of knowledge within the railway sector. By addressing the needs of the sector the European University of Railway-EURail will provide the conditions to disseminate the social and industrial benefits of training and education in the railway sector and to develop, at European level, high quality training and education activities for the railway community of tomorrow.

In line with the SRRA of ERRAC, EURail is expected to promote interaction among its associates and to define clear and realistic objectives in view of the establishment of new and innovative forms for further cooperation between industry and academia. Based on the appraisal of offered training and education programs and the required skills and also on the potential for knowledge transfer from on-going research, EURail aims to disseminate the social and industrial benefits of training education in the railway sector and to develop new and innovative forms for further co-operation with industry.

Stakeholder's needs

An intensive activity has been carried out for the identification of the stakeholders' needs. This work comprised a questionnaire, which was designed to target all railway stakeholders. Railway operators, infrastructure management, infrastructure contractors and signalling represent the most significant contributions, with shares around 25%, 18%, 15% and 15%, respectively.

High contribution of training (on-the-job training and Short term specialization) for all competences is stressed. Training accounts for 61% of the acquisition process on the average, University courses and curricula are unequally participating to specialization, with values ranging from 0% to 57%. The contribution of universities is most significant for competences in the category Economics, Business and regulations.

PhD holders or holders of multiple degrees are unsurprisingly under 10% for the majority of the respondents (88%). 38% even respond that there are no PhD holders in their company.

In-house and external training are considered, where the first is normally dedicated to specialized and sometimes proprietary matters while the second falls under more general considerations, which can be taught externally. To give some specialists the opportunity for skills development through postgraduate studies increasing client competences in Transport Administration and even the attractiveness of the Transport Administration as an employer,

Training and education offers in Universities and Research Institutes

The analysis of training and educational programs and projects available inside EURNEX Universities and other relevant higher Education Institutions in Europe and outside Europe (China, India, Russia, South Africa, South Korea and United States of America) has been undertaken. More than 5 000 web places have been surveyed, 134 Institutions from the 7 countries outside EU and 157 European Institutions have been identified with relevant research and education activities in railways.

Most striking remarks about the countries and data collected are now referred:

- i) Russia, is the only country, among the seven analysed outside Europe, that has railway universities;
- ii) USA offers the highest number of courses railway related, most are under the umbrella of Civil Engineering subjects;
- iii) South Africa is offering core courses complemented with research work, graduation projects and post-graduation courses to give the adequate skills to railway professionals;
- iv) The most common keywords railway related among the data collected are: Transportation Engineering, Traffic Engineering and Planning.

In Europe, about 30% of the railway related courses are offered at MSc level; 1/3 of the railway related offers are presented in short training courses, seminars and special courses, which do not award any diploma; BSc and Dipl. Ing. academic degrees related with the railway system, are less offered to the students than MSc courses.

Training requirements

European railways are facing fundamental legal, technological, demographic and market changes that the railways need to deal with in the coming years.

The main changes include:

- Introduction of new European legislation (interoperability and common standards).
- Technological developments affecting the professional requirements related to the operation of trains and networks as well as the maintenance of rolling stock and infrastructures.

- The need to recruit a considerable number of staff for the railway sector.
- New railway undertakings are emerging as a result of the opening of rail markets.

Such changes create a 'skills gap' that European railways need to bridge in order to stay in business. However, there is a lack of knowledge about future training needs, i.e., what types of professional skills will be needed in the coming years.

Meeting the manufacturers challenges

The Railway "Ecosystem" has experienced a drastic evolution during the recent decades, especially the last one: separation of operating and infrastructure activities, R&D activities shifted from the National Operators to the Industry. To answer those changes, the Railway Manufacturing industry has evolved from manufacturing focus to engineering focus incorporating more and more R&D activities. Railway Projects/Contracts are complex ones with the ultimate case of the turn-key project delivered to a customer.

As Technical Courses are using the manufacturer's products as concrete examples, it appears that outsourcing the courses to Academia is essentially concentrated on the scientific and technological basis of the topic/domain that are taught.

During the last few years, several companies in France came to the conclusions that there was a need to provide railway expertise to freshly recruited graduate students before their recruitment by Industry. For this purpose a Special Master degree has been set up: Systèmes de Transports Ferroviaires et Guidés (Railway and Guided Railway Transport Systems). Under the leadership of founding Industry Companies, several Engineering/Universities as well as Industry Engineers are offering courses this Master Course.

Research Projects with strong potential for T&E education activities

SKILRAIL is indeed based on the assumption:

- i) that in several areas, the academic courses will in the short run fail to meet the needs of practitioners, and
- ii) that there is a rather consensual opinion that, when arriving the industry, the students tend to have a rather shallow knowledge on the real world problems and how to tackle these, which evidences the lack of adequate competences.

These difficulties, although with a negative connotation, do open a window of opportunity for research based technical courses to be developed in a more tailored or, better said, industry-orientated way.

From the survey on the research projects best practices in science and research based innovation have been identified and treated for knowledge transfer processes and subsequent dissemination purposes.

Training and Education Activities for High Skilled Jobs

Short training for high skilled jobs can be targeted to all kind of railway stakeholders in order develop competences standardized or recognized at international level enabling to comply with EU international requirements and legislation and also with the high tech innovations under development/implementation in railway services.

The creation and development of a portfolio of short training courses for high skilled jobs constitutes a benchmark for the rail training system which mainly answers the need of creating professional profiles to operate in the technological changes and in the international legislation and market liberalization under implementation in the railway sector.

Four pilot courses are organised and delivered with the titles:

1. “Rolling Stock” directed to students starting a post-graduate degree
2. “Railway Dynamics” directed to students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments.
3. “Asset Management and Key Performance Indicators for Railways: from superior technical performance to an optimized management of physical infrastructure” directed to Managers in rail companies, Regulators and/or transport ministries (local and national) with an economic remit and PHD/post-graduate students, young researchers in the railway economic studies.
4. The attendees should have prior knowledge on railway infrastructure costs and operations
5. “Energy Efficiency Calculator and Energy Efficiency Technical Requirements” an e-learning course targeted to railway engineers, technicians, specialists working in e.g. engineering, planning, environmental or maintenance departments or staff preparing proposals for economic decision making within these technical systems.

According to the organisational and cost models established for courses 1 and 4 and considering the different educational instruments used, which are an e-learning tool for the pilot course 4 and a seminar including interactive lessons for the pilot course 1, an international training management system has been generally defined derived by a preliminary agreement between EURAIL and UIC International Training Centre.

Gender issues, equality and education

The representation of women in the transport sector is rather low compared with the labour market as a whole. In 2005, only 20.5% of the EU27 transport workforce was women, compared with 43.5% of the total employment. The representation of women in the railway sector is less than 18%. Also the division of labour is clearly gendered.

There are a number of arguments for why we need to achieve gender equality in the rail industry:

- The resource argument: Women might have different experiences from men and can add new perspectives and themes to the agenda.
- The interest argument: Women's interests should be represented in the railway sector. This will benefit both customer and workforce interests.
- The justice argument: Women have a right to participate on an equal footing with men, both individually and as a group. Education.

Gender and innovation is a new research area, but both Scandinavian and international studies show that diversity breeds innovation and that the more gender balanced companies are, the more innovative they get.

Gender mainstreaming is a useful strategy for the promotion of equality. Gender mainstreaming corresponds to integrating a gender perspective into all policy and planning processes. It is used as a tool to identify imbalances and inequalities in processes where gender before has been invisible or regarded as not important.

Gender mainstreaming consists of integrating of gender and equality perspectives in all policy and decision making processes and focus on an equal balance and representation of both women and men in all areas, including decision making functions.

Project Results:

Work Package 1 - Higher Education for the Railway Community of Tomorrow

WP1 is organised to establish the foundations for the establishment of the EURAIL concept. Activities are envisaged in order to foster and disseminate the idea that the railway sector needs advanced engineering education connected with research and technological development.

A networking process is crucial and requires a detailed knowledge of the industry needs to explore ways to satisfy these needs through identified competences landscape.

Four major tasks were carried out, addressing:

1. Competences for Education in the Railway Sector
2. Current Industry Internal Practices in Skill and Career Development and Training needs
3. Research based training and education
4. EU Railway University.

Competences for Education in the Railway Sector

The main aim of the Competences for Education in the Railway Sector task1.1 comprises the characterization of currently available training and educational offers in Universities and Research Institutes and other training agencies. Rail related training and education activities currently offered across Europe have been compiled. The analysis of training and educational programs and other relevant higher Education Institutions in Europe and outside Europe (China, India, Russia, South Africa, South Korea and United States of America) has been undertaken. More than 5 000 web places have been surveyed, 134 Institutions from the 7 countries outside EU and 157 European Institutions have been identified with relevant research and education activities in railways.

Enquiry to stakeholders

An intensive activity has been carried out for the identification of the stakeholders' needs. This work comprised the following:

- Design of a questionnaire to target railway stakeholders;
- Collection of stakeholders' contacts and responses and an analysis of stakeholders needs.

The universe of stakeholders is distributed by domains of activity. Railway operators, infrastructure management, infrastructure contractors and signalling represent the most significant contributions, with shares around 25%, 18%, 15% and 15%, respectively.

Competences needs

Respondents were asked to check the competences required for their railway activities according to the qualification level at which they are exerted.

The evaluation of the stakeholders' needs also takes into account the early work carried out within the EURNEX Network of Excellence project. Within this project several railway stakeholders in Europe were identified and their needed competences were defined based on a questionnaire. These results are recapped it here in summary in figure 5 for the importance it has in the definition of priorities for training courses.

A similar survey was conducted in 2010 within the scope of the research project TUNRAIL –Tuning Transatlantic Cooperation in Rail Higher Education. TUNRail is a policy oriented measured project founded under the EU-US Atlantis Programme.

A survey was conducted in the last quarter of 2010, targeting rail industry professional working around the globe. A total of around 550 responses were obtained. Due to the nature of the project respondents have been clustered into three groups: Europe, United States and Rest of the World.

One part of the survey inquired on the current needs of competence for the following two categories: Engineering, and Operations and Management. Each category was sub-divided into a set of subcategories.

Comparing with the initial EURNEX results, and starting with the undergraduate level, we may conclude that only the subcategory "Testing, verification and qualification" is not considered important in TUNRAIL survey, the other two are still considered important. Comparing now the results for the postgraduate level, we may conclude that all EURNEX subcategories are still considered relevant, which evidences that the key issues remain fairly the same.

TUNRAIL survey also inquired on the level key success factors for working in the railway industry. Three categories of keys to success were proposed, being:

- The educational background - related with the academic history and other complementary education;
- The personal profile - related with the working characteristics of the student/employee;
- The skills - related with the intellectual characteristics of the student/employee.

Current Industry Internal Practices in Skill and Career Development and Training needs

Specific training activities within Industry were also identified and the corresponding practices were disseminated. Skills and career development strategies and practices undertaken in different industrial settings in the railway area have been characterized and fully discussed with the relevant stakeholders. Two enquiries were designed and launched across the sector with the aim to identify in a systematic manner the industrial practices and needs.

European railways are facing fundamental legal, technological, demographic and market changes that the railways need to deal with in the coming years.

The main changes include:

- Introduction of new European legislation that, among others, promotes cross-border interoperability and common standards in the railway sector.
- Technological developments affecting the professional requirements related to the operation of trains and networks as well as the maintenance of rolling stock and infrastructures.
- The demographic situation implying that a significant number of railway staff have to be replaced in the coming years creating a need to recruit a considerable number of staff for the railway sector.
- New railway undertakings are emerging as a result of the opening of rail markets.

Such changes create a skills gap that European railways need to bridge in order to stay in business. However, there is a lack of knowledge about future training needs, i.e., what types of professional skills will be needed in the coming years.

Competences

Ideally, the competence we demand is based on good understanding of what is needed to fulfill goals and that competence is delivered at the educational institutions. And the worksite is organized in a way to make it possible for the factual competence to be used.

A real and important learning issue for companies or the public sector is to develop factual competence. That implies further education in a worksite in order to be successful must be based on a thoroughly analysis of needs.

Doctoral studies

To give some specialists the opportunity for skills development through postgraduate studies increasing client competences in Transport Administration and even the attractiveness of the Transport Administration as an employer, employees in the Transport Administration have the opportunity to pursue doctoral studies in part-or full-time, funded by the Transport Administration, provided that:

- There is a well-defined area of concern, goals and expected results, conforming to the Transport Administration's plan for development. A positive opinion from the head of concerned activity must be attached.
- The applicant has received approval from a university institution that they are willing to accept the applicant as a PhD student. Certificate from the named responsible examiner shall be reported.
- The applicant's personnel manager's approval.

Meeting the manufacturer's challenges

The Railway Ecosystem has experienced a drastic evolution during the recent decades, especially the last one: separation of operating and infrastructure activities, R&D activities shifted from the National Operators to the Industry, etc. To answer those changes, the Railway Manufacturing industry has evolved from manufacturing focus to engineering focus incorporating more and more R&D activities.

Railway Projects/Contracts are complex ones with the ultimate case of the turn-key project delivered to a customer.

To take up those challenges and, in order to remain competitiveness and to deliver top-quality solutions, the Railway Manufacturing Industry has set up its own training programs.

The objective is to provide to graduates freshly recruited from school and majored in one domain as well to engineers recently recruited after having pursuing their career in another industrial sector, the necessary technical knowledge in other domains that are at the core of the railway business.

In a Company like ALSTOM, both types of courses are taught.

As Technical Courses are using the ALSTOM Products as concrete examples, it appears that there is little possibility for outsourcing the courses to Academia. However, in each course, the scientific and technological basis of the topic/domain is taught. That part can be outsourced.

To tackle the very important issue of keeping/developing expertise/knowledge, ALSTOM and ALSTOM Transport, its Railway Sector, has developed two internal training programs, one dedicated to Non-Technical aspects and the other one for Technical aspects. The first type is operated by ALSTOM University, a cross-sector entity within the ALSTOM Group. The Second type is operated through the Transport Academy with an objective to nurture and develop technical skills.

The first part of those courses is quite generic and might be outsourced to Academia. As the number of Master Experts able to deliver those courses is limited and because they are quite busy at working on bids preparation and solving hot issues on contracts, there is a clear opportunity for Academia to intervene.

During the last few years, several companies in France came to the conclusions that there was a need for specialized introductory courses on Railway to develop skills within Industry employees and to provide railway expertise to freshly recruited graduate students before their recruitment by Industry.

A Special Master degree has been set up: Systèmes de Transports Ferroviaires et Guidés (Railway and Guided Railway Transport Systems). Under the leadership of founding Industry Companies, several Engineering/Universities as well as Industry Engineers are offering courses this Master Course.

The Engineering Schools/Universities are: Ecole Nationale des Ponts et Chaussées (PARISTech), ENIAME (Engineering School at the Université de Valenciennes et du Hainaut Cambrésis) as the two pilots and Université de Technologie de Compiègne, Ecole Nationale des Travaux Publics de l'Etat, les Ecoles Centrale de Paris et de Lille as Academia Members.

The founding members of the Master, are: ALSTOM Transport, ANSALDO-STS, BOMBARDIER Transportation, SIEMENS Transportation Systems, Fédération des Industrie Ferroviaires, le Groupe SNCF, la RATP, RFF, l'Etablissement Public de Sécurité Ferroviaire.

The objectives of the Master targeted at railway engineers and managers as well as other sectors willing to move into the railway sector is to provide a comprehensive training on railway and guided transport systems while covering the technical, economical and normative/regulatory aspects. The Master tackles the intercity, urban, suburban passenger transport as well as the freight transport.

One workshop covering the results obtained in the questionnaires was organized and carried out.

Research based training and education

SKILRAIL is indeed based on the assumption that:

- i) in several areas, the academic courses will in the short run fail to meet the needs of practitioners, and
- ii) there is a rather consensual opinion that, when starting their industrial careers, the students tend to have a rather shallow knowledge on the real world problems and how to tackle these, which evidences the lack of adequate competences.

These difficulties, although with a negative connotation, do open a window of opportunity for research based technical courses to be developed in a more tailored or, better said, industry-orientated way.

The Research based training and education task 1.3 aims to cluster projects around thematic areas where research exists and there is potential to develop short-run training courses. In this task the thematic areas as defined in the EURNEX Network of Excellence project are adopted.

This information helps to define major themes for advanced training courses. In return the information digest was much richer and was used on a more long term sustainable basis well beyond SKILRAIL project.

The research projects were assessed along a set of 8 knowledge areas, which were further decomposed in a total of 66 research sub-domains.

A quantitative classification based on the available amount of projects was then elaborated to cluster the research domains. The clusters provide valuable information on the likely availability of information to later on feed the courses' contents.

The classification³ includes three groups, accordingly the number of research projects, being:

- No research project - when no research project has been found on the specific research domain and, consequently, no information is available to feed the courses' contents;
- Few research projects - when a maximum of five research projects have been found of the specific research domain. In this cluster the reduced amount of projects raises some doubts on the availability of enough information to feed the courses' contents. This does however not mean that (enough) information is not available to feed the courses, but simply, that a deeper analysis on the actual contents is required, before proposing the course.
- Enough research projects - when the amount of research projects is more than five. In this cluster, and owing to the amount of projects, we may be confident of the likely availability of information to feed the courses. In this case, we may already launch the courses.

The assessment work was based on the previous analysis undertaken in the EURNEX Network of Excellence (NoE) project. This project conducted an exhaustive collection of concluded and on-going research projects yielding a total of 629 projects. The list includes projects funded by the European Union, European National Members and Third Countries.

In SKILLRAIL project, this list was updated to include newly funded projects and to identify existent projects that might have not been identified. The search process was mainly conducted on the web, resorting to the known databases, including: CORDIS (<http://cordis.europa.eu>), Transport Research (<http://www.transport-research.info>), Transportation Research Board (<http://www.trb.org>), etc. This new search yielded a new set of 88 new projects ending up with a total amount of 717 research projects.

EU Railway University

The “EU Railway University” task aims to design and implement the basic framework and structure of EURAIL including the preparation of dissemination activities namely two workshops in Advanced Topics in Transversal and interdisciplinary areas which are described now.

Specific training activities within Industry were identified in “Current Industry Internal Practices in Skill and Career Development and Training needs” task and the corresponding practices were disseminated within this task. Skills and career development strategies and practices undertaken in different industrial settings in the railway area have been characterized and fully discussed with the relevant stakeholders.

Eurail

Based on knowledge, experience and people from "real" universities in Europe, EURAIL is virtual in nature and aspires to foster, at European level, excellence by

gathering and networking the different relevant organizations and institutions around an educational project suitable to the needs of the European Rail sector.

The Mission of EURAIL

EURAIL aims to disseminate the social and industrial benefits of training education in the railway sector and to develop new and innovative forms for further co-operation with industry and support and disseminate the idea that the railway sector needs advanced engineering education connected with research and technological development.

EURAIL provides access to a range of professional and academic groups in Europe active in railway related research and education activities. A networking process is crucial, and requires a detailed knowledge of the industry needs.

EURAIL Objectives

The following short term objectives for EURAIL are identified:

- Enhance and expand educational access to railway courses
- Enhance educational quality in the railway area (academic, stakeholders)
- Create mechanisms to put forward courses not offered by existing institutions
- Develop e-learning based courses and promote the production of course materials
- Adopt quality assurance procedures of railway courses and award titles
- Promote Joint PhDs using bilateral and multilateral programs
- Promote joint international MSc programs in different rail related areas
- Develop and deliver short training courses (STC).

EURail should support a strategy for incorporating “e-learning” into both mainstream and non-traditional programmes to meet public expectations and to enhance learning opportunities. Regarding this, EURail will set forth a vision for distance learning market in EURNEX community. Throughout the SKILLRAIL project major milestones are proposed to implement EURAIL and start operations on a regular and sustained basis.

Given the EURAIL Project characteristics, EURAIL is likely to be progressively dependent on the use of internet tools. Specific ITC technologies and competencies to support this initiative in all his development steps are mandatory: Vision and Strategy, Implementation and Operation.

Work Package 2 - Advanced Training for European Railway stakeholders

WP2 “Advanced Training for European Railway stakeholders” aims at completing the identification of the needs and requirements of railway stakeholders but also at designing advanced training courses model refining the demand/offer compliance by using pilot courses as case studies.

Review of Training needs in the relevant railway areas

In the establishment and implementation of EURAIL the Virtual “European University of Railway” an area is devoted to the development and promotion of short training courses for high skilled jobs in the railway sector.

In task 2.1 the analysis of training needs and requirements for the upcoming railway community merged the outcomes of previous research made on training requirements and educational techniques collected from a questionnaire and phone interviews from:

- EURNEX FP6 Network of excellence (2004- 2007)
- Rail training 2020 a research made in 2007 by Danish Technological Institute, (DK), CAS (UK), Lloyds Register Rail Europe B.V. (NL)
- The UIC Workshop held in Budapest on 29-30 November, 2007 where Austria, Bulgaria, Czech Republic, Finland, France, Great Britain, Hungary, Latvia, the Netherlands, Norway, Poland, Romania, Sweden, Serbia and Spain took part
- The Hungarian good practice guide for e-learning safety material development
- The Dutch good practice guide for e-learning safety material development
- SKILLRAIL workshops
- Best practice guide for developing e-learning modules “Refresher tool on the basics of safety on or along tracks” a Project financed in the frame of the European Leonardo da Vinci Programme June 2010
- Inputs requested to UIC and UNIFE members and Alstom and Trafikverket as internal partners of SKILLRAIL.

UIC and EURAIL/ EURNEX Association are ready to provide the demand and their offer respectively, due to the collected and organised information acquired and centralised, but a stronger involvement of suppliers and manufacturers is requested to complete the definition of requirements.

Major Railway integrators are developing and delivering internal courses in Europe EU and non EU countries for qualification or for improving specific competences but there is no a centralised knowledge about them.

Few experiences in the e-learning techniques have been developed and only a list of general requirements/needs have been collected by experiences exchanged among some railway companies driven by UIC (“Safety along the track” e-learning courses).

Design of advanced training courses

Universities and research centres working together with railway manufactures and railway operators and infrastructure managers at international (EU projects) or national (national programmes) levels, have developed methods, tools instruments, test specifications and sometimes test facilities as well as any kind of scientific activity tailored for the railway sector.

Several times and in several national or international projects a know how transfer from other industrial sectors or other transport modes have been used and specified for the railway sector introducing new technologies or new techniques in

technological and in the economic and legislation areas. This opportunity and the outcomes of projects are often not well disseminated and exploited while they can be suitably introduced in high level training courses and related tools and instruments.

EU universities and research centres already developed a Knowledge Management system (KMS) in order to analyse and to compare the existing competences, tools and facilities for railway education and research. An EURNEX pole of excellence “Education & Training” created the EURAIL Virtual University which is providing a centralized Learning Management System.

The first critical objective is to join the efforts of the different railway stakeholders seeking to share information and training. EURAIL is oriented to periodically collect the research results and educational options provided by the associated 65 institutions (universities and research centres).

UIC, acting in the same way, has created the UIC International Training in order to provide a wider knowledge and know-how transfer of member best practices and research outcomes.

Now inside SKILLRAIL in a pilot phase four courses have been prepared and delivered.

Courses 1 and 2 resulted from initiatives of EURNEX members whereas courses 3 and 4 stemmed from two cooperative activities between EURNEX and UIC involving course design, development and delivery.

1. Railway Dynamics

The first edition of the Railway Dynamics Course was held in Lisbon, Portugal, from 4th November to 9th December 2010, with Prof. Jorge Ambrósio and Dr. João Pombo, both from Instituto Superior Técnico - Technical University of Lisbon, as the organisers.

The School was held in the form of an intensive course, with 54 hours duration, directed to students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments. The lectures were given by experts from university and industry guests, speaking on topics related to their expertise and experience.

The School was held in Lisbon, Portugal, at Instituto Superior Técnico. Lectures were given in a classroom of the university. In addition, a technical visit was organized to the workshop of EMEF (Portuguese Company for Maintenance of Rolling Stock), as depicted in Figure 1. During this technical visit, also the railway vehicle used by REFER (Portuguese Railroad Company) to monitorize the track geometry, including its irregularities, was visited.

Out of the total of 14 attendees, 4 were industrial R&Ds from REFER, 4 from EMEF, 2 from ALSTOM and the other 4 were from other institutions.

2. Rolling Stock Summer School

The first edition of the Rolling Stock Summer School was held in Cracow, Poland, from 13th to 17th September 2010, with Prof.s Marek Sitarz (The Silesian University of Technology), Simon Iwnicki (Manchester Metropolitan University) and Stefano Bruni (Politecnico di Milano) as the organisers.

The School was held in the form of an intensive short course, with one week duration, directed to students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments. The lectures were given by experts from Universities across Europe and industry guests, speaking on topics related to their expertise and experience.

The School was attended by 24 students from 8 different European countries: Spain, Italy, Sweden, Great Britain, Germany, France, Holland, Poland. The gender split was 20male and 4 female participants.

Out of the total of 24 attendees, 3 were industrial R&Ds from Alstom and CAF, 7 were PhD students coming from government funded research centres (CEIT, DLR), and 14 were PhD students from Universities

3. Asset Management and Key Performance Indicators for Railways: from superior technical performance to an optimized management of physical infrastructure

This pilot course has been planned and developed in UIC Headquarters in Paris on October 17-19 October 2011 in the form of a short training course with interactive lessons. The organizing team included Nathalie Amirault Head of Unit Expertise Development of the UIC International Training Service, Marina Fracchia as EURAIL / EURNEX Association responsible for Training Courses, Teodor Gradinariu UIC Senior Technical Advisor, Manuel Pereira Director of EURAIL and coordinator of Skillrail.

Over the years, and as the need for infrastructure managers (IMs) to adopt a more commercially-oriented attitude has developed, it has proven to be vitally important for every IM to understand the link between accounting and charging, requiring the adoption of a business logic ensuring that cost drivers are properly identified and controllable and that investments are made taking into account future needs.

To this end, railway infrastructure cost accounting frameworks should deliver more than just important background information for setting charges - crucial for good business management is the ability to produce a cost and revenue comparison by market segment. This can then underpin decisions as to which services business activities should focus on and what levels of public funding are required to fulfil Public Service Obligation (PSO) agreements in the scope of multi-annual contracts with predefined levels of service.

The registered learners were 20 coming from 13 countries but only 16 persons attended at the course plus an invited young researcher from the EURNEX Association.

A questionnaire was distributed and filled in by the attendees: a set of simple questions were proposed. The results from the questionnaires pointed out that the course was in line with the expectations and the score given is between 4- 6.

There are also some improvements requested and a review is needed concerning the requested increased time for discussion and for understanding better the lessons on the statistical methods and on the bottom up benchmark proposed. In order to provide an international view and an equal balance among different stakeholders (experts, academics, managers) the number of teachers cannot be reduced and in this case seven teachers are defined.

A part from 2 experts identified inside UIC, five teachers accepted were involved in the different lectures.

4. Energy Efficiency Calculator and Energy Efficiency Technical Requirements

The organizing team has been established on March 2011 and it is composed of:

- Nathalie Amirault, Head of Unit Expertise Development of the UIC International Training Service,
- Marina Fracchia, EURAIL / EURNEX Association responsible for Training Courses and Railenergy partner,
- Henning Schwartz, UIC Environmental Platform Coordinator till July 2011,
- Enno Webe, UIC Railenergy partners,
- Mads Bergendorff, IC consultant for Railenergy,
- Manuel Pereira, Director of EURAIL and coordinator of Skillrail.

The Railenergy project (2006-2010) developed an online analysis and screening tool for energy consumption and investment decision making. This so-called Railenergy Calculator is freely available on the project website (<http://www.railenergy.eu>) since the end of 2010. In the Railenergy project there was no budget for funding any targeted training of the Calculator. EURAIL and UIC inside EU project SKILLRAIL analysed the opportunity to create an e-learning tool which is related to the Railenergy Calculator. In this way four major goals are reached:

1. International training on the outputs of a recent EU project (ended on December 2010)
2. Cooperation of the scientific and technical partners in EURAIL and UIC involved both in the EU project
3. Development of an e-learning module to test the efficacy and the penetration of the e-learning means in the railway training sector
4. Identification of the e-learning costs to be compared with conventional seminars or workshops.

The target audience is primarily railway engineers, technicians, specialists working in e.g. engineering, planning, environmental or maintenance departments or staff preparing proposals for economic decision making within these technical systems.

The course is focussed on persons with 3-10 years' experience with the railway system (mid level) but also engineers recently employed or PhD students in the railway sector could profit from attending this e-learning module. Specialists with longer experience would benefit if they never worked with the system effects of energy (typically component and subsystem specialists). It has been decided to implement the e-learning application directly on <http://www.railenergy.eu> since users of the Railenergy Calculator software are the main target group.

It should also be possible to export the e-learning modules into a SCORM compliant enlarged e-learning environment/platform. However, the conditions (which platform, which format, which additional topics, what kind of structure/navigation) have to be clarified by EURAIL.

The structure of the e-learning module comprises: the development of the navigation and the website structure in which the content has to be embedded, the design of the workflow, storyboarding and the template/web design.

The e-learning module includes videos with screen capturing, quizzes and explaining text for the web pages. This work is done by a software consultant small company Join and Share placed in Berlin with support from NITEL and UIC.

The content elements are:

- Text modules for “voice over” to the videos/tutorials
- Quiz setup and content
- Additional (minor) text content to complement the E-learning packages.

The content elements are embedded into a web page structure with a hierarchical navigation. Cross references (hyperlinks) enable the user to open related topics. The different elements (videos, quizzes, explaining text) are offered on several subpages in a didactical way. The goal was to create interactive pages so that the user can navigate easily and open the various elements according to his/her needs and interests. The main software was the e-learning software Adobe Captivate: the video and quizzes are produced in Flash-format (.swf).

An e-learning module, designed for the training on the “Use of Energy Efficiency Calculator and related TecRec 100_01“ and derived by the RAILENERGY outcomes, has been developed and delivered as first cooperation between EURAIL and UIC International Training in the e-learning tools. The e-learning course funded by SKILLRAIL is available from 30th November 2011 on the web site <http://www.railenergy.eu> (UIC Energy website) and will be also implemented in the future EURAIL platform.

The results and the feedback for the evaluation of the Course were provided by means of an online form to be filled in by the trainees. The forms are redirected to UIC and EURAIL by a suitable automatic e-mail address. Since the course has been available

from 30/11/2011, at present only five forms have received confirming that the information expected were provided in an efficient and effective manner.

In some countries for other types of courses, information regarding upcoming training courses and available resources is being disseminated via mobile phone and this can be used also for a large dissemination /promotion of the courses among UIC members and EURAIL students.

Online discussion forums can be developed in the future allowing trainees to exchange ideas and gain feedback on different approaches in skills development while online databases will enable the dissemination of research and the sharing of training modules and teaching resources as pointed out through the development of the second pilot course and the establishment of EURAIL.

A course evaluation questionnaire was distributed and filled in by the attendees: The results pointed out that the course was in line with the expectations and the score given is between 4- 6 (good – excellent) There are also some improvements requested and a review is needed concerning the requested increased time for discussion and for understanding better the lessons on the statistical methods and on the bottom up benchmark proposed.

The courses prepared and delivered within SKILLRAIL are now summarised in tabular form.

Rolling Stock -Poland, Cracow
13 – 17 Sep 2010

The Rolling Stock Course was held with Prof.s Marek Sitarz (The Silesian University of Technology), Simon Iwnicki (Manchester Metropolitan University) and Stefano Bruni (Politecnico di Milano) as the organisers. The Course was held in the form of an intensive short course, with one week duration, directed to students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments.

Railway Dynamics- Portugal, Lisbon
Nov – 4 Dec 2010

The Railway Dynamics Course was held in Lisbon, Portugal, with Prof. Jorge Ambrósio and Dr. João Pombo, both from Instituto Superior Técnico - Technical University of Lisbon, as the organisers. The School was held in the form of an intensive course, with 54 hours duration, directed to students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments.

Asset Management and Key Performance Indicators for Railways - UIC, Paris, France
17-19 October 2011

The Asset Management Course was held in Paris, France, with Nathalie Amirault (UIC), Marina Fraccia(EURNEX), and Theodor Gradinariu (UIC), as the organisers. A three-day intensive course provides case studies, materials and in-depth analysis of instruments for more efficient and effective management of railway infrastructure in

future and directed to Managers in rail companies and regulators and/or transport ministries (local and national) with an economic remit.

Energy Efficiency Calculator and Energy Efficiency Technical Requirements November 2011

E-learning course: The Energy Efficiency Calculator Course launched in the internet, with Nathalie Amirault (UIC), Henning Schwartz (UIC), Enno Webe (UIC), Mads Bergendorff (UIC) and Marina Fraccia (EURNEX), and Theodor Gradinariu (UIC), as the organisers.

The objective of the course is to provide the target audience with knowledge and practical guidance for improving the energy behaviour of the total railway system mainly based on the results and the experience coming from the EU project Railenergy as well as other related UIC and EU funded projects and activities.

The target audience is primarily railway engineers, technicians, specialists working in e.g. engineering, planning, environmental or maintenance departments or staff preparing proposals for economic decision making within these technical systems.

Work Package 3 - Skill jobs in the railway sector. Dissemination and Communication. Gender issues

Gender Helpdesk

European research policy needs to reach out to all potential contributors. This is especially important with regard to female scientists - given the substantial gender unbalance in science where women make up half of the student population, but on average only hold 15% of senior academic positions, with the percentage being much lower in some countries and in some subjects such as engineering and physical sciences.

SKILLRAIL Gender Helpdesk operating at <http://skillrail.eu> provides knowledge on gender equality in the railway sector. The focus of the Help Desk in particular is on the low representation of women in the sector, whether in education, labour market or in decision making. The Help Desk presents good practices, a tool box and a range of recommendations for gender equality actions.

The Gender Helpdesk is providing an overview of crucial elements for equality such as gender mainstreaming and innovation. It contains analyses of education, labour market and decision making areas and identifies barriers for a gender equal railway sector.

A good practice illustrates how previous actions have already promoted gender equality in the rail sector. By describing good examples of interventions, the Helpdesk aims to inspire and promote future actions. The tool box and the set of recommendations present the concrete aspects to be aware of, before initiating the work for a gender equal rail sector.

Task 3.3 provides an introduction to the field of gender and transport as well as methods and strategies to achieve gender equality and good examples of actions. It was organized into four actions: An introductory action presenting good practices, a tool box section and a final section with a range of recommendations. The introductory part describes the railway sector from a gender perspective while providing an overview of crucial elements for equality such as gender mainstreaming and innovation. It takes a look at education, labour market and decision making areas and identifies barriers for a gender equal railway sector. The section presenting good practices illustrates how actions have already promoted gender equality in the rail sector. By describing good examples of interventions, the report aims to inspire and promote future actions. The tool box and the set of recommendations present the concrete aspects to be aware of before initiating the work for a gender equal rail sector.

Dissemination and Communication:

The dissemination and exploitation activities were focused on actions to support the founding of EURNEX EURAIL University the EURNEX Virtual European University of Railways. All actions were dedicated to gain information from potential partner on their needs of training and educational course and to promote EURAIL University in the community.

The dissemination activities were vital for the SkillRail project and the further development of EURAIL University. Dissemination management continuously identified results out of the targeted project actions to prepare and to organise targeted dissemination activities towards the exploitation in a EURAIL University.

The Description of Work (DoW) outlines the objectives of the dissemination and exploitation WP3:

- To establish the close information link between demand (rail industry and operators) and providers (Universities) of academic education and training
- To build up a knowledge base on offered training and education courses for dissemination and exchange of information
- To provide information on training and education courses and facilities to the stakeholders on regularly basis
- To organize an events to appraise and disseminate actions towards the “Railway Skills of Tomorrow”
- To organize events to attract young people for academic jobs in the railway sector
- To promote SKILLRAIL courses in the Railway sector
- To support awareness on gender perspective and related opportunities.

Potential Impact:

Workshops in SKILLRAIL project

Best Practices in Skill development for the future rail professionals, Germany, Berlin
1 Jun 2010

Identification of specific actions at European level for disseminate the railways vision and the intense on-going change process and dissemination of good practices.

RAILWAYS: A sustainable and competitive solution for mobility, Portugal, Lisbon
8 Nov 2010

The workshop contributed for the dissemination of a vision of development of the railway sector on an ongoing process of change with a clear improvement of the society appraisal of the sector.

Training and Education in advanced topics in transversal and interdisciplinary areas, Brussels, Belgium

27 Apr 2011

The aim of this workshop was to present and promote the need to identify ways to develop training and education activities in transversal and interdisciplinary areas such as environment, safety and security, competitiveness of transport. These transversal and interdisciplinary areas will be an integral part of the EURAIL training and education offers on top of the more specific technical topics. To foster a fruitful brainstorming discussion this Workshop gathered in a relaxed atmosphere ERRAC representatives, especially ERRAC roadmap CSA partners, EURNEX, UNIFE and UIC members, ERA, universities).

SKILLRAIL Final Workshop on Education and Training Actions for high skilled job opportunities in the railway sector, Brussels

20th October 2011

This workshop aims to address the educational and training needs of the railway sector and provide the conditions to develop, at European level, high quality training and education activities for the railway community of tomorrow. In line with the SRRA of ERRAC, EURail, a EURNEX corporate service, is expected to promote interaction among its associates and to define clear and realistic objectives in view of the establishment of new and innovative forms for further research cooperation between industry and academia. This event is organised under the SKILLRAIL project in collaboration with the European Commission, the European Rail Research Advisory Council – ERRAC, and its major umbrella organizations UNIFE, UIC, UITP and the European Railway Network of Excellence, EURNEX.

Short Training Courses

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E-learning course: The Energy Efficiency Calculator Course launched in the internet, with Nathalie Amirault (UIC), Henning Schwartz (UIC), Enno Webe (UIC), Mads Bergendorff (UIC) and Marina Fraccia(EURNEX), and Theodor Gradinariu (UIC), as the organisers. The objective of the course is to provide the target audience with knowledge and practical guidance for improving the energy behaviour of the total railway system mainly based on the results and the experience coming from the EU project Railenergy as well as other related UIC and EU funded projects and activities. The target audience is primarily railway engineers, technicians, specialists working in e.g. engineering, planning, environmental or maintenance departments or staff preparing proposals for economic decision making within these technical systems.

- Press Release
- Websites SKILLRAIL and EURAIL University
- Newsletters
- Skillrail Poster at INNOTRANS

Exploitation of Results:

The SKILLRAIL dissemination activities assured that the project has been visible and it will permanently address the public in order to demonstrate its progress. Activities included:

- Creation and maintenance of the website, with emphasis on the external part as the project show case. The web site will promote the activities and results of the project. It will be dedicated to different target groups: the general public (“informative section”), relevant stakeholders, students and graduates with potential interests in railway careers, and project partners.
- Organization of visibility of the project at public events.
- Layout and production of printed information material namely newsletters and brochures.
- Other two important chances for an effective dissemination of project results are publications and the Workshops and the Final Conference, in which invited speakers, user group members and other stakeholders have been involved.
- Project result is a basic working tool that will have a more appealing reading for potential stakeholders.

A business plan has been issued including:

- a vision statement,\
- the main strategy and short and long term objectives
- market analysis and acquisition and
- operational business plans and
- organizational aspects.

UIC as a partner in SKILLRAIL is committed to support EURail developing a strategy by evolving and incorporating training and education activities and “e-learning” based technologies into both mainstream and non-traditional programmes to meet railway expectations and to enhance learning opportunities.

With UIC capabilities and as an umbrella organization for railway operators, the development of a strategy will enable EURail to define their needs and prepare a business plan that will drive priorities, strategies, and resource decisions.

Regarding this, UIC will support EURail to develop a plan that will set forth a vision for training and education market in the EURNEX community. UIC and EURAIL can work together in assessing market opportunities, threats and internal competences needed and potential target audiences.

The resulting strategy and implementation plan will include details on target audiences, products/services, governance and organization structure, alliance partners, costs and revenues, marketing, funding, processes, policies and technology.

Furthermore, it will be created a vision for operating model technology, and recommended a funding approach to provide courseware, support staff, training support, strategies for supporting programme development and promoting teaching

and learning with technology, collaborative services, and a program to ensure on-going assessment, planning, and accountability of educational technology initiatives. UNIFE, CER and UITP as umbrella organizations in the railway sector are potential partners for developing bi-lateral agreements with EURAIL.

Potential Impact:

A number of impacts are expected:

- Contribution for the dissemination of the railways vision and the intense on-going change process and for the change of the public image of railways
- New concepts and skills for young people across sectors have been identified and will be provided by offering disciplines based on Basic Sciences and recent research results, such as Materials sciences, Applied Dynamics
- Demonstrate and disseminate the need of advanced high technology engineering in the future of railways
- Demonstrate and disseminate the need of additional domains of knowledge that should complement engineering, such as economics, management, sociology, human factors, etc.

By placing research information where it is most needed SKILLRAIL will help bridging the past and future of the railways sector in Europe:

- Between staff generations;
- Between old and new processes;
- Between past and future technologies;
- Between decision level within and beyond the railways sector.

The two areas in which the action of SKILLRAIL most impact are:

- Universities: all the EURNEX Association universities were informed about the project and its contents. In addition also other technical universities involved in the railway sector were involved in the activities by means of the organization of the dissemination activities;
- Industrial partners: stakeholders and railway managers were aware of the SKILLRAIL project and its contents. Moreover, they now are aware that the EC is supporting actions for developing a new qualified knowledge that will allow reforming the railway sector and fulfilling the challenges of the sector in the next years.

A networking process has been initiated and has to be pursued requiring an increased detailed knowledge of the industry needs to explore ways to satisfy these needs through the already identified competences landscape across Europe. It is crucial to guarantee a sustained close interaction with the relevant stakeholders at European level and worldwide. It is now perceived by ERRAC, UNIFE, UIC and EURNEX that joint activities have to be fostered and are currently being planned in Training and Education issues.

This project is primarily devoted to the foundation of the EURAIL University.

New bi-lateral agreements are being prepared with UIC to continue activities in training and education and a 2 year program of activities is under development including definition of themes, exploitation plans, cost models and customers.

It is foreseen to open these activities to the other umbrella organizations such as UNIFE, UITP and CER.

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