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Barriers to eLearning in rail

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Abstract

This article is one in a series of papers tackling the issues of eLearning in the global rail industry.

Little research has been conducted into the learning approaches and methodologies undertaken by rail education and training providers in preparing the rail workforce for the digital revolution. An online survey probed rail education and training providers' 'opinion' on digital learning so that further research could be conducted in the future on the issues and challenges identified. The resulting paper focuses on the results of the survey conducted in April - May 2018 of 31 individuals mainly from the Higher Education sector and representing 15 countries.

Analysis showed the majority of respondents had some eLearning experience, either as a course organiser or as a participant, with levels of digital proficiency being wide-ranging.

Five different barriers' categories are investigated in this paper. The results suggest that the greatest obstacles in developing an eLearning portfolio of courses in rail relate to the appropriate course to develop in an online format, the types of technology to be used and cost/benefit analysis related barriers. Issues related to interpersonal barriers were seen as the least problematic.

Based on the results presented in this paper, suggestions for overcoming the barriers to eLearning in rail are recommended with some specific actions for decision makers when upgrading staff eLearning skills.

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1. Introduction

Staff shortages in the railway sector are well documented in Europe and beyond, mainly due to skills shortages and ageing workforce (NSAR, 2017; Engineers Australia, 2009). A number of projects, such as Skillful (2017) or Railway Talents (2017), are being supported by international organisations and funding bodies to explore most effective ways of addressing the change. On one hand skills shortage presents a great challenge to the railway sector, but on the other hand emerging technologies and digitalisation of railway provide tools for upgrading peoples' skills and catching up on innovation. Tech initiatives, such as transport hackathons (Hacktrain, 2017; UITP, 2017; TSC, 2017) encourage 'out of the box' thinking and invite start ups to join in the journey of modernising the railway sector of the future. In consequence the railway landscape is changing and digitalisation is touching upon all aspects of the railway systems. Simulation modeling techniques are being used to facilitate train operations (Marinov and Viegas, 2011), virtual reality and gaming is being employed to entertain rail customers (e.g. Eurostar, 2017), digital learning is being introduced to educate and upskill the existing and potential rail staff (e.g. EdX, 2017).

However, the digital learning approach in rail is very slow, especially when compared with other sectors, such as finance, management or education, which causes potential delays in attracting to and retaining talent in the rail industry. Therefore, the paper investigates barriers to digital learning in rail, as perceived by rail education and training providers, and gives a set of potential solutions for overcoming them. These solutions could assist future course providers when preparing digital learning in rail offer to clients from both academia and industry. The paper also suggests a number of actions (a check list) for transport decision makers when considering upgrading rail staff skills using digital learning tools. The outcomes of the paper should be of primary interest to employers considering eLearning in rail offer. However, the outcomes presented could be also of interest to individual learners and the railway industry as a whole, who are provided with a warning on barriers experienced by the providers of digital courses in rail as well as informed on potential solutions to the barriers identified. This way the outcomes of the paper have the potential to facilitate their decisions when considering purchase of or involvement in digital learning activities with rail content.

The paper is organised as follows. Firstly, a background to the topic of eLearning in rail research project is explained in Section 2. Next, methodology applied to collect a new set of data is presented in Section 3. Section 4 displays the new set of data analysed using quantitative methods where specific barriers to eLearning in rail are identified and analysed in detail. In addition, opinions of rail educators and trainers are shared, including quotes and advice to other providers when dealing with comprehensive challenges that digital learning creates. Next, Section 5 focuses on conclusions on the material presented in the previous four sections. Section 6 presents solutions for overcoming barriers to eLearning in rail, where actions for rail education and training employers (considered as decision makers) when deciding on strategies for upgrading rail staff eLearning skills are listed. Finally, Section 7 suggests next steps for eLearning in rail research.

2. Background

Digital learning has many synonyms, such as: eLearning, online learning, mLearning or distance learning, but they all mean a similar type of learning: out of the classroom and using technology. Digital learning could be performed, for example, on a stationary computer at work, on a tablet at home, on a phone in transit, online or offline.

Digital learning is slowly coming to the rail sector. Some Higher Education Institutions (HEIs) started offering short courses in rail via eLearning platforms, some international organisations are getting involved in the process, too. But overall the speed of (r)evolution in rail from a traditional to a digital based learning is very slow.

This paper is one in a series of papers tackling eLearning in rail issues. In Fraszczyk and Piip (2018) eLearning courses in rail were evaluated. The paper included pros and cons of eLearning. It was found that very few courses in rail are available online. One of the examples given was an eLearning course titled "Railway Engineering: An Integral Approach" offered by TU Delft via EdX.com platform, which acted as a free teaser to their full time stationery Master programme in rail (EdX, 2017). Another example was a partly free and partially paid course on Rail Asset Management delivered by a consortium of three partners: International Union of Railways (UIC), Oxand and La Sapienza University using an internal UIC online platform. This course was in the first instance designed for UIC members, but it was also

open to external learners (Railway Talents, 2018). Various other eLearning courses and platforms were identified, but mainly in non-rail related topics of business, fashion, education, etc.

Next, the authors designed an online survey targeting rail education and training providers in order to investigate their perspectives on barriers to development and delivery of eLearning courses in rail. Methodology applied in the data collection process and analyses of the collected data are presented in the next sections of this paper.

In addition, follow-up interviews were conducted with selected individuals who participated in the online survey. The purpose of the interviews was to develop in-depth knowledge of the barriers and respondents' individual points of views when considering involvement in eLearning in the rail context. Outcomes of this part of the work are presented in Fraszczyk and Piip (2019).

3. Methodology

An online survey aimed to investigate barriers to eLearning in rail was developed. The survey's objective was to collect a primary data on barriers to eLearning in rail from academics and training providers' point of view. Therefore, the Survey was addressed to education and training providers specialising in rail courses across the world. Participation in the Survey was voluntary and anonymous, but respondents could leave their name and contact details if they expressed an interest to be involved in follow-up interviews or receive the results of the study.

3.1 Questionnaire design

The Survey was conducted using an online questionnaire. The questionnaire was divided into four sections, as follows. Section 1 focused on personal details and included 12 questions related to:

- Age;
- Gender (Male, Female, Prefer not to say);
- Nationality;
- Organization represented (Higher Education Institution, Training provider or Other);
- Country organisation based in;
- Position (from Professor to Assistant or Other; or equivalent);
- Employment status (Full time, Part time or Other);
- Online education experience (None, As Participant or As Organizer; plus details);
- Level of digital proficiency with technology required for online teaching (self-assessment);
- Feelings related eLearning (two open questions).

Section 2 of the questionnaire was related to respondent's organisation and included five questions:

- Any online courses offered by an organisation (in any subject; Yes, No, I don't know);
- Type of transport courses offered by an organisation (Short courses, Undergraduate, Postgraduate, Courses on-demand, Other);
- Format of these courses (Stationary, Online, Blended);
- Platform used for online course delivery;
- Other comments related to online courses at an organisation.

Section 3 referred to respondent's opinions and preferences related to eLearning and included 6 questions:

- Statements related to: interpersonal, training and technology, institutional policy, cost/benefit analysis and other barriers (based on Lloyd et al., 2012);
- List of 22 statements related to eLearning with attitudinal scale answers (Totally Disagree, Disagree, Agree, Totally Agree);
- List of nine online course tools which could be used to maximize student's learning experience;
- Preferred model of online courses (Free course + paid certificate, Paid course + free certificate);
- List of 14 subject-specific courses in rail and assessment of difficulty in converting them from a stationary to an online format (Very Difficult, Difficult, Easy, Very Easy);

- List of organisations which should be involved in promotion and delivery of eLearning in rail (UIC, CER, ERRAC, ECTRI, National state railways, Other);

Final section, Section 4, asked respondents whether they would be willing to participate in follow-up interviews (Yes, No), and if positive then to leave their email contact. All Survey questions are available in Appendix.

3.2 Data collection

The online questionnaire was available via Google Forms platform from 9th April to 14th May 2018 and advertised via email (individual and thematic groups), UIC e-News newsletter (UIC, 2018) and social media channels (LinkedIn, Twitter, ResearchGate). 31 individuals responded to the survey and analysis of their responses are included in Section 4.

4. Results

4.1 Respondents personal details

A targeted sample size was 30 rail academics and rail trainers. Overall, 31 individuals representing academia and industry organisations based in 15 countries completed the online survey and their responses were analysed using MS Excel and IBM SPSS software. Since the sample is small, but still meaningful for the purpose of this research, results are presented first in numbers, but in later sections percentages are applied.

23 out of 31 respondents provided their age, where the youngest was 27 and the oldest 72 years old, with an average age for the sample being 48. There are 9 females and 22 males in the sample, and the female sub-group is on average 7 years younger than the male sub-group (average age 43.3 vs. 50.1, respectively).

The respondents represented institutions from 15 countries, including 10 individuals from the UK (eight British, 2 Bulgarian and 1 Spanish individuals), four from Germany and Australia each, two from Brazil, and one each from 11 other countries: Austria, China, Croatia, Denmark, Egypt, India, Poland, Portugal, Thailand, Turkey and the USA. The majority of individuals represented HEIs and were employed full time as lecturers (n=23), from assistant to professor level (or equivalent), where senior lecturers formed the largest sub-group (n=11). Respondents employed in other organisations (n=8), such as private companies, research centres or national railways, held various positions, from director to quality manager to strategist.

The respondents' online education experience and digital proficiency varied (Fig. 1 and Fig. 2). 11 respondents participated in online education while 9 organised such a course and 2 were involved in eLearning from both perspectives. 6 respondents had no experience at all and 3 mentioned some other experience, such as Instructional Designer or Consultant. Overall, the self-reported level of digital proficiency with technology required for online teaching was very high. On a 5-point Likert scale, where 1 – “not comfortable at all” and 5 - “very comfortable”, 15 respondents (half of the sample) judged their level of digital proficiency with technology required for online teaching as “very comfortable” followed by 10 respondents (third of the sample) being at “a little comfortable” level. Only 4 respondents reported their digital literacy as “neutral” and 1 as “not comfortable”.

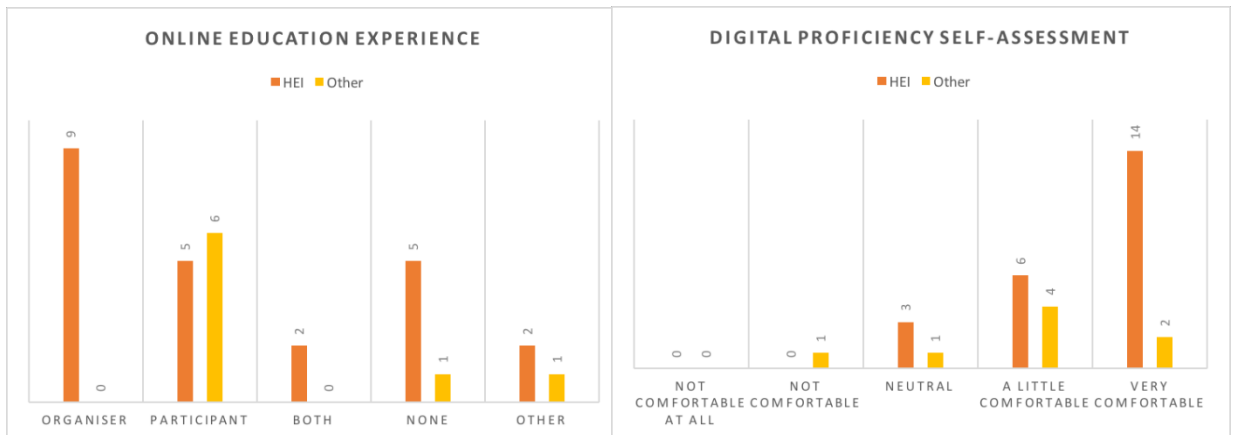


Fig. 1. Respondents' online education experience [count]. Fig. 2. Respondents' digital proficiency self-assessment [count].

eLearning is associated with mixed feelings among the respondents. Some respondents have positive views, some express negative opinions, but still many agree that eLearning could be a positive add-on to a traditional way of teaching and learning. A selection of specific comments is extracted and presented below.

Positive feelings' quotes touched upon opportunities eLearning brings:

- "I use online education as an add-on to my classroom teaching to support self study but not to replace my face-to-face teaching completely." Male, university reader, Germany
- "It may shift the market for higher education institutions dramatically as MOOC's present much more economies of scale." Male, university lecturer, Brazil
- "I feel bad that I don't engage more with digital technologies in my own teaching." Female, university assistant lecturer, UK
- "[eLearning is] complicated at starting but comfortable later." Male, senior lecturer, Thailand

However, some negative feelings' quotes highlighted the fact that an extra effort required might not always balance the positive outcomes:

- "This form of training does not always give a good result." Male, university professor, Poland
- "Good idea, but huge effort to design and implement eLearning effective, user-centric and didactical useful." Male, university reader, Germany
- "A lot of talking about it. Little real and common understanding and doing." Male, quality manager, Austria
- "My feeling is that eLearning may be unsatisfying." Female, railway engineer, Turkey

Overall, as professional educators, the respondents highlighted that eLearning enhances rather than undermines their status as experts in the rail field. More specifically, some respondents said:

- "I do not have fear of that [eLearning]. Even eLearning needs a guiding person (professional educator) and the students need someone to reflect and discuss their learning." Male, university professor, Germany
- "The eLearning gives me the opportunity to send my voice and my material not only inside the classroom but to other continent." Male, senior lecturer, Egypt
- "It enhances my status as long as I'm proficient for the use of the required tools to develop and manage eLearning platforms." Male, university lecturer, Brazil
- "eLearning gives opportunity to educators to provide online support to more varied groups of individuals (...). Students should value the opportunity to receive education/training/personalized feedback from internationally recognized experts via the online platforms." Female, researcher, UK

- “I think there is a lot of resistance because tutors and students can be scared or unsure of the platforms. Sufficient training, support, and development is thus essential to successful implementation.” Female, university lecturer, UK

4.2 Respondents’ organisations

31 respondents represented 30 different HEIs and other organisation, where some were associated with more than one organisation by for example delivering a short course at various HEIs.

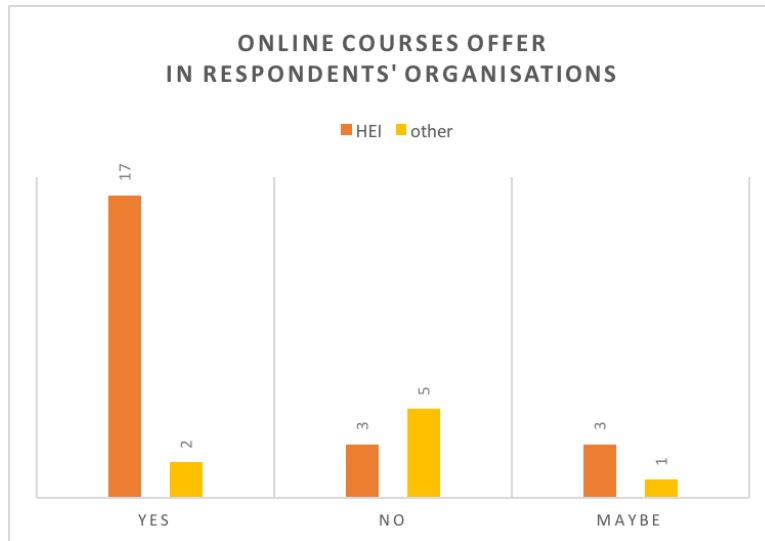


Fig. 3. Online courses in any subject offer in respondents’ organisations [count].

17 HEIs and 2 other organisations represented in the sample offered some online courses (in any subject), but still there were 3 HEIs and 5 other organisations that did not have any eLearning offer at all (Fig. 3).

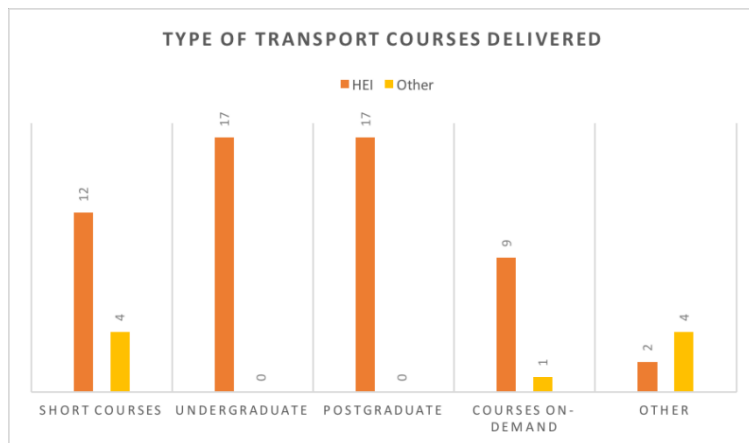


Fig. 4. Type of transport courses offered by respondents’ organisations; multiple choice question [count].

In terms of transport education and training offer, other organisations tend to provide short courses only, while HEIs specialise in undergraduate and postgraduate level education, which is often enriched with short- and on-demand courses (Fig. 4). Not all HEIs included in the survey provide degrees in transport though, as sometimes transport

modules are incorporated into more general degrees and are taught as part of for example mechanical or civil engineering curriculum.

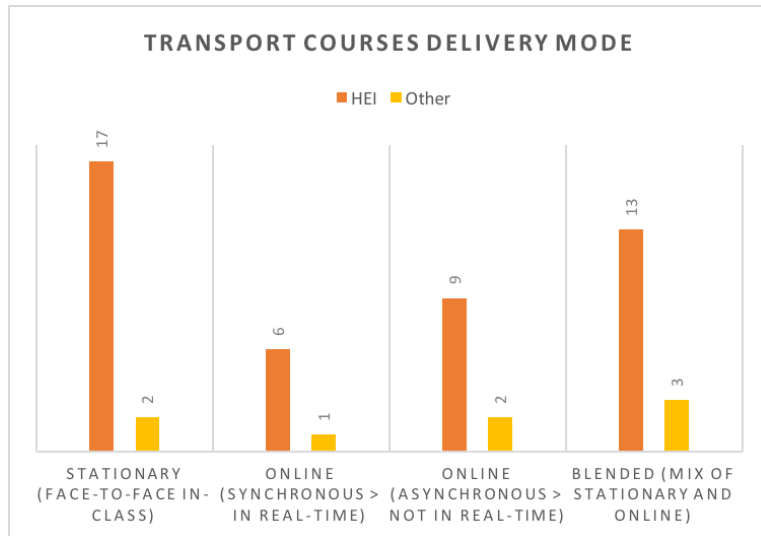


Fig. 5. Mode of transport courses offered by respondents' organisations; multiple choice question [count].

Stationary courses (classroom based) delivered face-to-face in a classroom are a domain of HEIs and only two organisations from the sample also use this method of training. However, online courses also have a visible presence, but slightly more in an asynchronous (not in real-time) than in synchronous (in real-time) mode (Fig. 5).

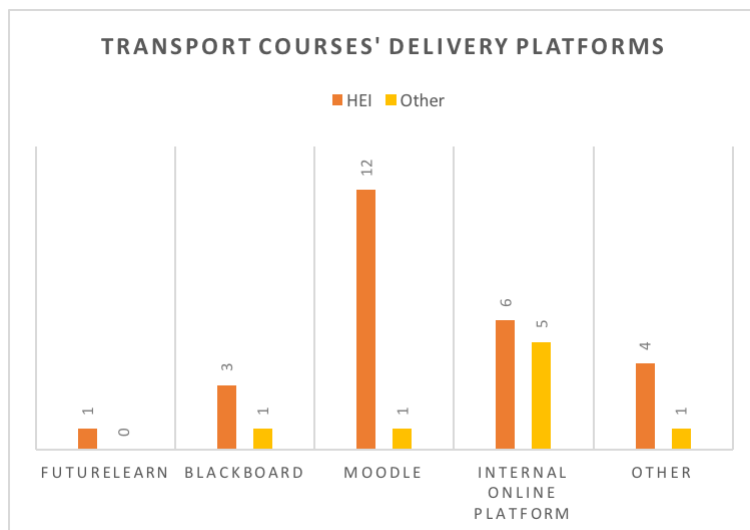


Fig. 6. Platforms used to deliver online courses in transport in respondents' organisations [count].

The online courses offered by HEIs and other organisations represented in the sample are managed mainly via Moodle or other internal online platforms (Fig. 6). Blackboard is used less often in the sample, but overall is a common tool at HEIs applied for various other teaching and learning tasks that have been digitalised in the past two decades (e.g. material sharing, student-professor contact). The results show that it is not common for the sampled organisations to use open access platforms, such as FutureLearn.com (1 case) or EdX.com or Coursera.com, to deliver transport courses.

The respondents made some additional comments in relation to eLearning offer at their organisations, selected responses are presented below:

- “Moodle is mandatory for all courses at Central Queensland University” Male, senior university lecturer, Australia
- “I work for different universities and they have different approaches.” Male, organisation’s lecturer, UK
- “Time allocated for lecturers to interact with students online is abysmal (...) [and there are] still limitations regarding allowance of hours for lecturers.” Female, senior university lecturer, Australia
- “[My university] offers one-to-one support and advice about building blended and online learning elements into courses, using technology in the classroom and online marking and feedback.” Male, senior university research associate, UK

4.3 Opinions and preferences

Next, respondents were asked to rate specific statements as barriers or not to eLearning in a rail context. Five main barrier categories have been identified, as originally suggested by Lloyd et al (2012). Each category included from 4 to 8 sub-categories. For example, ‘interpersonal’ barrier category included seven sub-categories, such as ‘Lack of personal relationship with students’ or ‘Lack of control over student cheating/plagiarism’, etc. Fig. 7-11 display results of data analysis for different groups of barriers.

4.3.1 Interpersonal barriers

Out of seven interpersonal barriers suggested, the most significant were related to the lack of personal contact (55%) and personal relationship (46%) between students and lecturers. A cheating and plagiarism issues were recognised by 29% of the sample but overall were not seen as a very significant barrier. The remaining barriers regarding course quality, impersonal and lack of enrolment limits were not seen as barriers by majority of the sample.

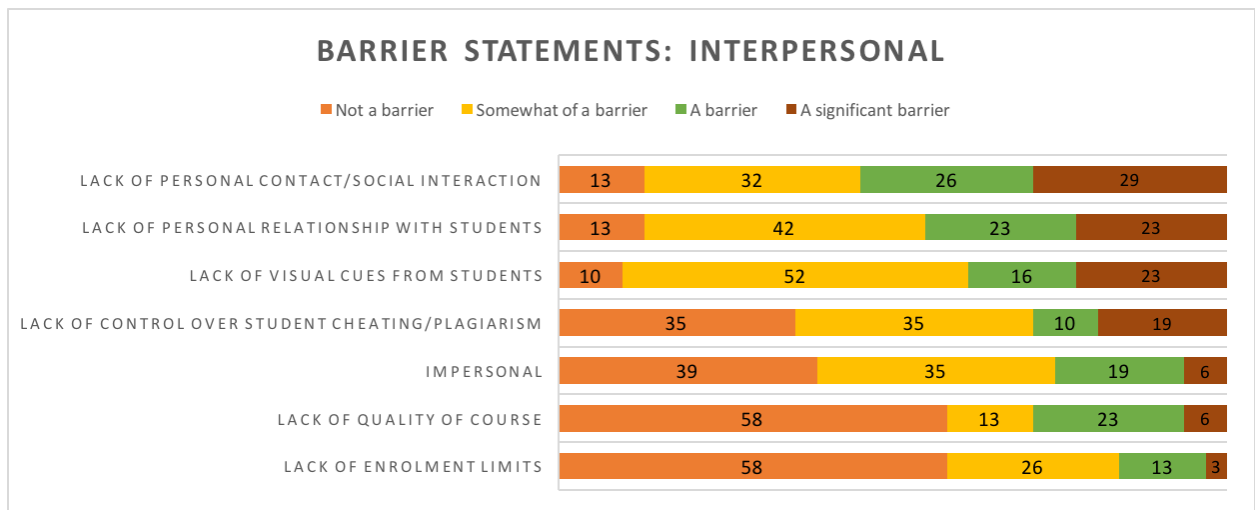


Fig. 7. Respondents perception of interpersonal barriers [%].

4.3.2 Institutional policy barriers

The top three barriers in terms of institutional policy were related to the facts that: eLearning work is not valued for promotion (57%), commoditising of education (42%) and lack of policies or standards for an online course (42%). The remaining three statements were seen as barriers (‘a barrier’ or ‘a significant barrier’) by a third of the sample only.

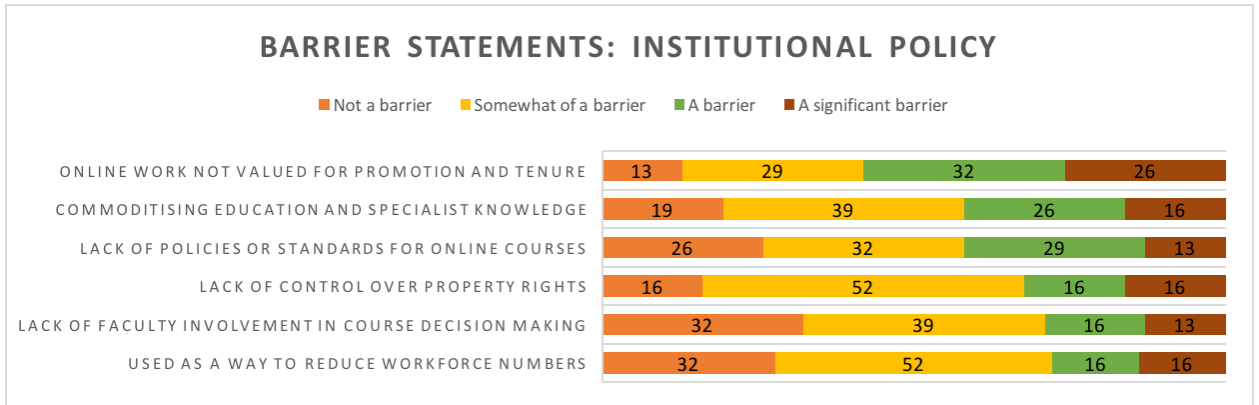


Fig. 8. Respondents perception of institutional policy barriers [%].

4.3.3 Training and technology barriers

In terms of training and technology barriers, the top four issues identified were related to: inadequate pedagogical skills (71% - the highest value out of all statements in the five categories), inadequate instructor training (64%), frequent technology failures (61%) and low digital literacy among teaching staff (49%). The least important barriers identified in this category were related to: staff anxiety with technology (39%), and rapid changes in software (39%).

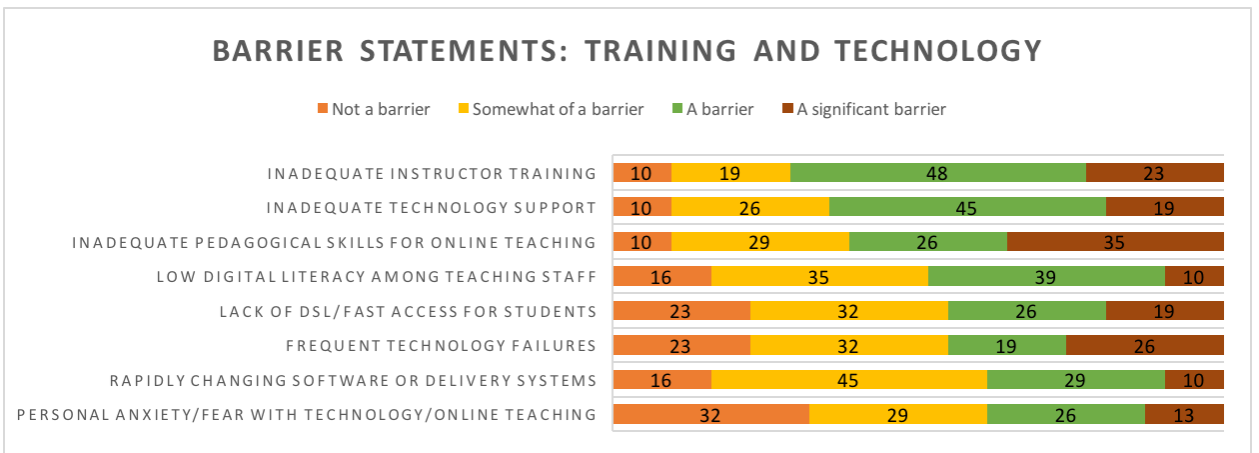


Fig. 9. Respondents perception of training and technology barriers [%].

4.3.4 Cost/benefit analysis barriers

eLearning is seen by respondents as an extra activity, which requires extra effort, therefore in terms of costs/benefit analysis the top three barriers identified are: inadequate compensation for instruction (55%), time commitment (55%) and increased workload (49%). However, it must be noted that approximately half of the sample stated ‘Not a barrier’ or ‘Somewhat a barrier’ for all the four statements, which overall weakens the confidence in the weight of this barrier category in the group of the five barrier categories.

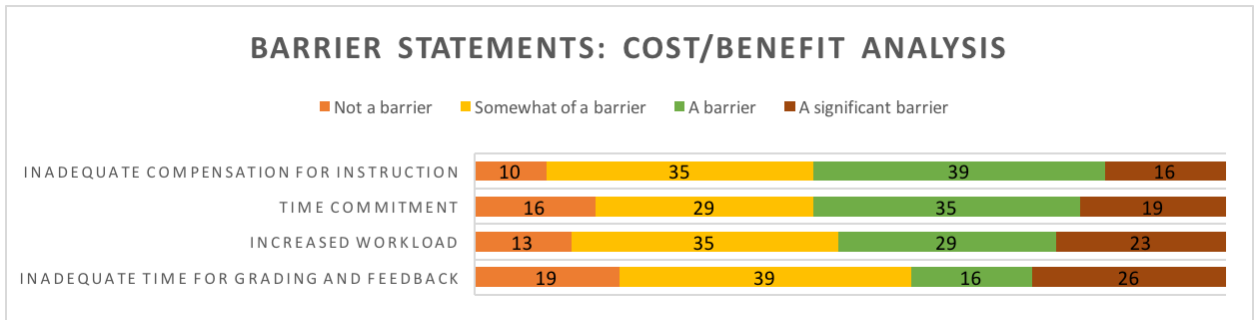


Fig. 10. Respondents perception of cost/benefit analysis' barriers [%].

4.3.5 Other barriers

Top three barriers statements in the 'Other' category relate to: staff unwillingness to engage in eLearning (58%), language barriers (55%) and cultural barriers (42%). Interestingly, respondents had no problem with online evaluation of students, which was identified by 39% as 'Not a barrier' at all and only 22% saw this issue as a barrier.

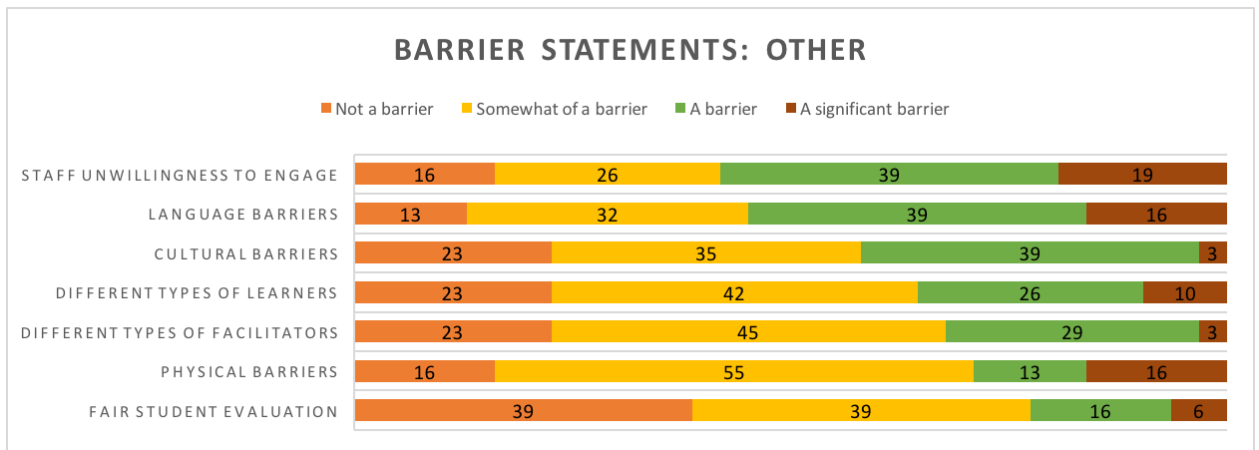


Fig. 11. Respondents perception of other barriers [%].

4.4 eLearning statements

The respondents were asked to evaluate 22 eLearning-related statements using a 4-point scale, from 'Totally disagree' to 'Totally agree', as presented on Fig. 12. A full list of statements is available in question 3.2 in Appendix. An overwhelming majority of 97% agreed that online courses are a great addition to traditional learning. But they also recognised that online courses require a team of media experts (93%) and declared that they would like to work with them to develop an eLearning course in rail (90%). In addition, 78% declared that they would be interested in a CPD course to upgrade their eLearning skills. Also, majority of the sample did not agree with negative statements that: value of online education is lower than traditional education (52% disagree), online courses are inferior to face-to-face courses (58%) or too expensive to produce (58%). Over 70% of the sample disagreed with statements that: they are not convinced that digital technology helps to enhance student learning (74%), that they don't like online courses (80%) or that they are not familiar with digital tools that could facilitate an online course. Nearly three quarters of respondents clearly recognise the fact that that online learning is important for their organisations (71%) and only slightly less agree that rail courses should move into eLearning mode (65%).

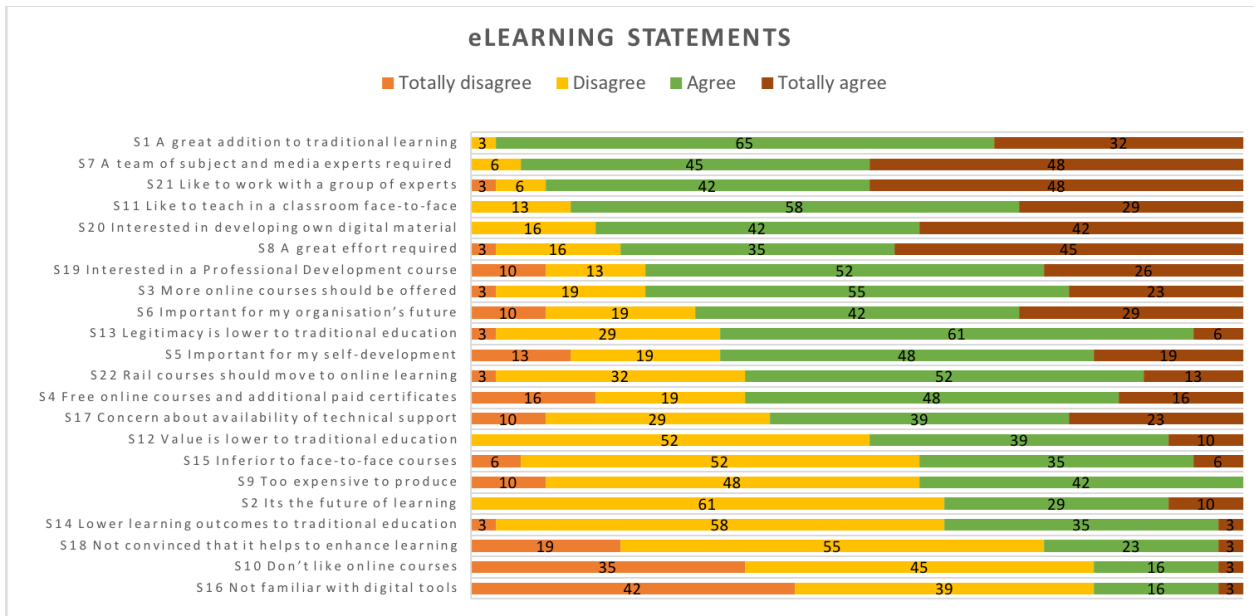


Fig. 12. Respondents attitudes to eLearning-related statements [%].

4.5 Conversion of stationary courses into eLearning

Next, respondents were asked about conversion of stationary rail courses into eLearning mode. 14 different rail-related courses were listed, from rail policy to rail operations to rail vehicles and results of their evaluations are presented on Fig. 13. Generally, courses perceived as not very technical (e.g. policy, energy, statistics, ITS) were classified as ‘easy’ converters. Therefore, 75% of respondents agreed that the easiest topic for conversion into eLearning would be a course on rail policy. Next, 65% identified rail environment and energy and 58% rail statistics and big data as ‘very easy’ or ‘easy’ to convert into eLearning. Digital railways and ITS courses were also seen as ‘easy’ converters by over 50% of the sample.

An equal split for ‘easy’ and ‘difficult’ approach to conversion was seen for rail freight and logistics and rail planning and timetabling. The most difficult topics for conversion were identified as rail vehicles (64%), rail safety and security (61%) and other not specified in the list (61%).

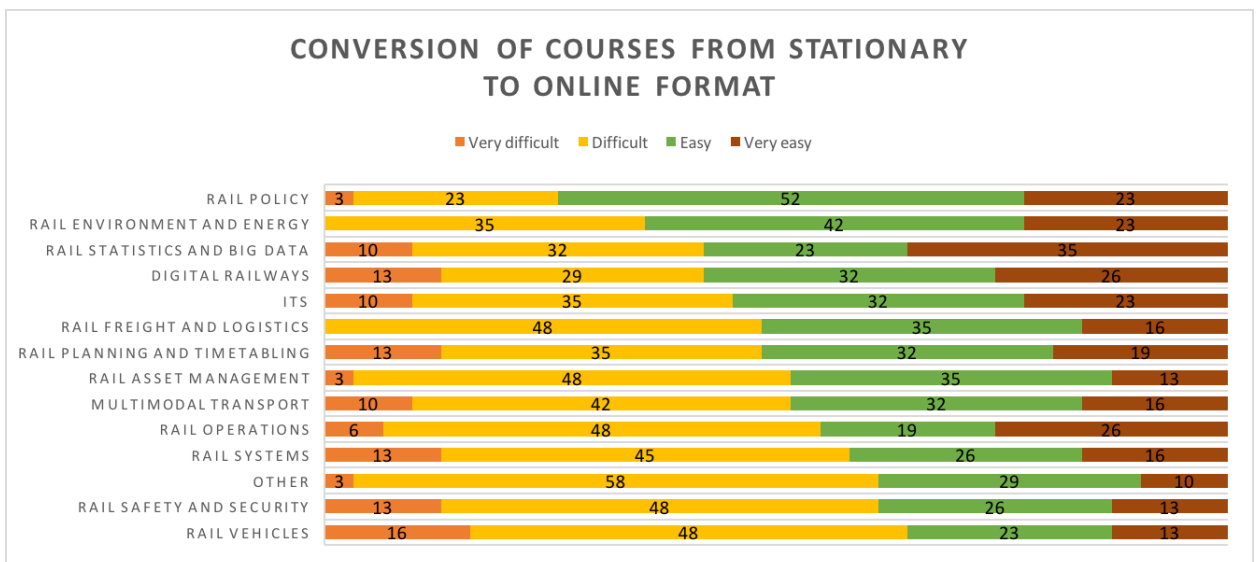


Fig. 13. Respondents' attitudes to conversion of rail-related courses from a stationary to eLearning format [%].

4.6 eLearning tools

Respondents were given a list of nine tools, typically used in eLearning, and were asked to mark best tools suitable for teaching rail online. Fig. 14 displays results, where videos are recognised as best option by 94% of respondents. All other online course tools are ranked as best by over 70% of the sample, with an exception of games (52%) and assignments (58%). Overall, all tools listed were positively ranked by respondents.

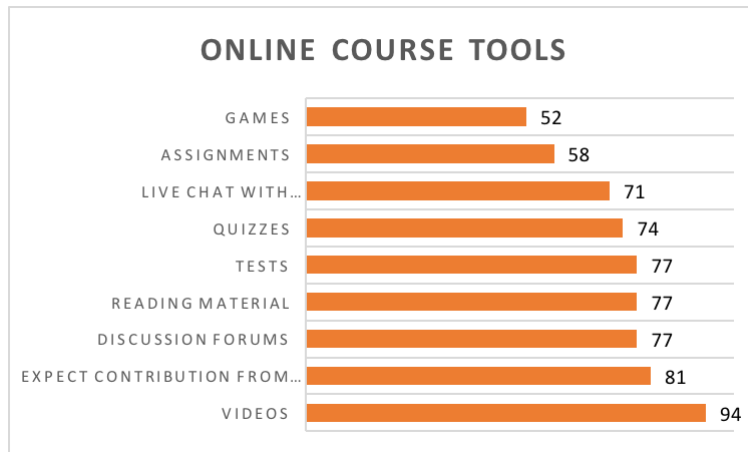


Fig. 14. Respondents' opinions about best tools used for eLearning; multiple choice [%].

4.7 Rail organisations supporting eLearning

There are various organisations at national and international levels, which potentially could support eLearning in rail efforts. As presented on Fig. 15, the top two organisations recognised by respondents as key players were UIC and national state railway companies. The remaining three organisations listed were recognised as significant in promoting eLearning in rail by approximately third of the sample only.

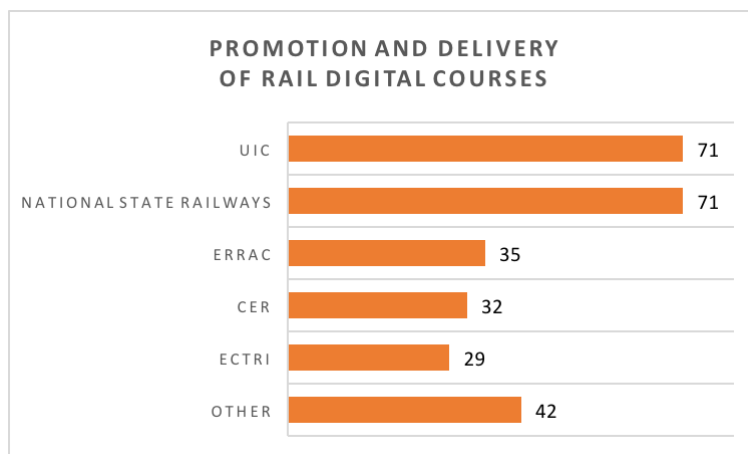


Fig. 15. Respondents' opinions about rail organisations which should be involved in promoting and delivering rail eLearning; multiple choice [%].

5. Conclusions

The paper presented results of a survey on barriers to eLearning in rail. 31 rail education and training providers shared their experience with eLearning and opinions related to specific barriers. The results showed that the majority of the respondents had previously been involved in digital learning and self-assessed their digital proficiency at a comfortable level.

Five categories of barriers were identified and the highest scores for barriers were given to training and technology issues. Respondents clearly highlighted that staff are lacking technical (71%) and pedagogical (64%) skills, and overall digital literacy, to delve into online teaching in rail. In addition, it was emphasized that, from a policy point of view, online work is not recognised as valuable contribution to promotion (57%), and from a cost/benefit perspective, inadequate resources, such as lack of compensation and time (55% each), could altogether contribute to staff's unwillingness to engage in eLearning (58%). The majority of the remaining issues were recognised as barriers by less than half of the sample.

Overall, respondents feelings regarding eLearning were mixed, but skewed towards a positive perception of digital learning as an add-on to a traditional learning approach. The respondents recognized benefits of eLearning and its importance in the context of their organisations as well as an opportunity for their personal development. The majority expressed an interest in upgrading their skills to be able to deliver eLearning courses in rail, although they recognized that some rail topics might be difficult to convert into an eLearning format. This also might be the reason why rail, but also other engineering disciplines, move to eLearning with a slow speed when compared with e.g. social sciences. In a traditional engineering approach a lot of time and resources are dedicated to students' manual work (workshops, projects, etc.) and contact with real life railway environment (train depots, rail vehicles, control rooms, workshops, etc.). Therefore, suggestions were made to start with 'easy' converters' topics, which could be investigated for eLearning shift first, such as rail policy, rail environment or big rail data related issues, as traditionally they do not require much out-of-classroom activities and potentially offer a smoother transition to an eLearning mode.

6. Solutions

The analysis presented in the paper allows us to draw solutions for overcoming the identified barriers to eLearning in rail. Therefore, this section presents a set barriers identified earlier in the paper matched here with a new set of potential solutions for overcoming them. This approach could help to facilitate organisation and delivery of eLearning activities offered by rail education and training providers. These recommendations should be of particular interest to transport decision makers interested in upgrading rail staff skills using digital learning tools.

A package of four steps (or components), which for a comprehensive strategy for eLearning approach, is proposed to address the various issues of barriers to eLearning in rail presented in the paper. Each stage is enriched with a list of concrete actions for rail education and training staff employers (a check list).

The four steps include:

1. Policy;
2. Training;
3. Development; and
4. Support.

Firstly, an updated organisation's policy on teaching and learning, including staff rights to continuous professional development in and via eLearning, should be updated. Policies and regulations that encourage staff to actively and regularly evaluate their digital skills and identify room for improvements and upskilling should be supported with incentives that recognise the extra efforts undertaken when staff update their skills. Provision of suitable assessment tools and solutions can provide staff ways to evaluate their skill gaps. Professional development plans should be designed in a close collaboration with an employer to ensure that the required skills meet an organisation's goals. Therefore, the checklist includes the following actions:

- revise an internal eLearning teaching and learning policy,

- include digital skills in teaching staff's personal development plans,
- provide staff incentives for upgrades in digital skills.

Secondly, adopting a 'Train the Trainer' approach across HEIs and other organisations delivering rail education and training enables those more competent in using digital tools and methodologies the opportunity to learn from others skilled in this area. People delivering education and training to others should themselves be up-to-date with recent technologies used in the rail sector as well as up-to-date with pedagogical and teaching approaches to various types of learners. This strategy will allow trainers to be real or expert authorities in their subject-specific topics as well as well-trained educators.

The checklist includes:

- initiate sustainable collaboration with eLearning experts (academic and professional) to train staff,
- provide access to suitable eLearning tools to staff.

Thirdly, development of new eLearning modules in rail would encourage academia-industry collaboration settings. Adapting this way of collaboration will provide benefits to both parties in terms of mutual understanding and a wider knowledge transfer between the sectors. This in a longer term will help to train a skilled workforce, at vocational, university and other levels, suitably trained for the future needs of the rail industry.

The checklist includes:

- identify (funding, internal and external) opportunities to set up industry-academia collaborations to develop eLearning courses,
- involve staff and students at different stages of new course design and delivery (constructive feedback, active involvement, incentives, etc.),
- select 'easy' converters' topics for first eLearning course developments.

Finally, rail education and training providers need technical support before/during/after eLearning course delivery as well as feedback and guidance on how to constantly improve their teaching and learning materials for the benefit of sharing knowledge in the best possible way. Collaboration between various departments within an HEIs and other organisations is to be actively encouraged, especially with IT and communication teams, who clearly can have an advisory role on recent trends in both IT-related tools and best ways of using them to promote learning in rail.

The checklist includes:

- identify available eLearning resources and gaps within an organisation,
- facilitate knowledge and experience exchange between staff (e.g. internal support groups, leaders),
- provide technical and promotional support to staff and students before/during/after an eLearning course delivery.

7. Next steps

Based on the outcomes of the study the following avenues for further research in eLearning in rail are suggested:

- Investigate examples of blended approach in rail education and training with the use of modern technology and eLearning. This could include evaluation of existing teaching and learning policies at HEIs, training organisations and industry and extent to which eLearning tools are employed for a course delivery,
- Study barriers to eLearning from a rail industry perspective. This could include demand analysis and willingness to move education and training activities from a traditional to a digital mode,
- Explore how to design and deliver a successful eLearning course in rail. This could include a direct contact with staff and students involved in an eLearning course or development of a new test course in a rail topic with evaluation of feedback from staff and students.

Notes

All quotes were amended to read eLearning if other forms, e.g. e-learning, were used.

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Appendix. Survey Questions

Barriers to Digital Learning in Rail: Academic and Training Perspective Survey

Section 1 Personal details

1.1 Age

1.2 Gender

- Male
- Female
- Prefer not to say

1.3 Nationality

1.4 Organization represented

- Higher Education Institution
- Training provider
- Other, please specify

1.5 Country organization based in

1.6 Position (or equivalent)

- Professor/chair, distinguished professor
- Reader, full professor
- Senior lecturer, principal lecturer, associate professor
- Lecturer, assistant professor
- Assistant lecturer, associate lecturer, teaching assistant
- Other, please specify

1.7 Employment status

- Full time
- Part time
- Other, please specify

1.8 Your online education experience is as a:

- None
- As Participant
- As Organizer

1.8a Please give details:

- Subject
- Platform
- Year
- Comments

1.9 Your level of digital proficiency with technology required for online teaching (self-assessment):

- 1 – not comfortable at all
- 2 – not comfortable
- 3 – neutral
- 4 – a little comfortable
- 5 – very comfortable

1.10 What is the feeling you get when you think about eLearning?

Comment:

1.11 How do you feel about eLearning as a professional educator? Do you think it enhances or undermines your status as an expert in the field?

Comment:

Section 2 Your organisation

2.1 Is your organization offering any online courses (in any subject)?

- Yes
- No
- I don't know

2.1 What type of transport courses does your organization offer:

- Short courses
- Undergraduate
- Postgraduate
- Courses on-demand
- Other, please specify

2.3 Are any of these courses offered as:

- Stationary (face-to-face in-class)
- Online
- Blended (mix of stationary and online)

2.3a If any of the above courses are offered online, which platform your organization uses to deliver them?

- EdX.com
- Coursera.com
- Futurelearn.com
- BlackBoard
- Moodle
- Internal online platform
- Other, please specify

2.4 Other comments related to online courses at your organization

Comment:

Section 3 Your opinions and preferences

3.1 Please answer the following barrier statements

Barrier category	Barrier statement	Not a barrier	Somewhat of a barrier	A barrier	A significant barrier
Interpersonal	Lack of personal relationship with students				
	Lack of quality of course				
	Lack of visual cues from students				
	Lack of personal contact and social interaction within the class				
	Impersonal				
	Lack of control over student cheating/plagiarism				
Institutional policy	Lack of enrollment limits				
	Lack of policies or standards for online courses				
	Commodotising education and specialist knowledge				
	Lack of control over property rights				
	Lack of faculty involvement in course decision making				
	Online work not valued for promotion and tenure				
Training and technology	Some staff unable to transition as well so used as a way to reduce workforce numbers				
	Inadequate instructor training				
	Low digital literacy among teaching staff				
	Inadequate technology support				

	Inadequate pedagogical skills for online teaching Frequent technology failures Rapidly changing software or delivery systems Lack of DSL/fast access for students Personal anxiety/fear with technology/online teaching
Cost/benefit analysis	Increased workload Time commitment Inadequate time for grading and feedback Inadequate compensation for instruction
Other	Fair student evaluation Cultural barriers (international learning environment) Language barriers (e.g. if in English only) Different types of learners (introverts vs. extroverts) Different types of facilitators (introverts vs. extroverts) Staff unwillingness to engage Physical barriers (some things should be seen and touched)

3.2 Please answer if you disagree/agree with the following statements

No	Statement	Totally disagree	Disagree	Agree	Totally agree
1	Online courses provide a great addition to traditional learning				
2	Online courses are the future of learning				
3	Universities and training providers should offer more courses online				
4	Online courses should be free and additional certificates could be paid				
5	Online learning is important for my self-development				
6	Online learning is important for my organisation’s future				
7	Online courses require a team of subject and media experts to deliver a good quality product				
8	The amount of effort required to prepare an online course is much greater when compared with a stationary course				
9	Online courses are too expensive to produce				
10	I don’t like online courses				
11	I like to teach in a classroom face-to-face				
12	Value of online education is lower to traditional classroom based education				
13	Legitimacy of online education is lower to traditional classroom based education				
14	Learning outcomes of online education are lower to traditional classroom based education				
15	Online courses are inferior to face-to-face courses				
16	I am not familiar with digital tools that could facilitate an online course				
17	I am concerned about availability of technical support when delivering online course				
18	I am not convinced that digital technology helps to enhance student learning				
19	I would be interested to take a Professional Development course in online learning				
20	I would be interested in developing my own digital material for an online course				
21	I would like to work with a group of experts on a digital course in rail				
22	Rail courses should move to online learning				

3.3 In your opinion, which tools an online course should use to maximize student’s learning experience:

- Videos

- Games
- Reading material
- Quizzes
- Tests
- Assignments
- Discussion forums
- Live chat with educators/trainers
- Expect contribution from students

3.4 In your opinion, which model of online courses would work best (tick one):

- Free course + paid certificate
- Paid course + free certificate

3.5 In your opinion, how difficult it would be to convert the following stationary courses into online courses:

Topic of a rail course	Very difficult	Difficult	Easy	Very easy
Rail asset management				
Rail operations				
Rail planning and timetabling				
Rail vehicles				
Rail policy				
Rail systems				
Rail freight and logistics				
Rail statistics and big data				
Rail safety and security				
Rail environment and energy				
Digital railways				
ITS				
Multimodal transport				
Other, please specify				

3.6 Which rail organisations should be involved in promoting and delivering rail digital courses:

- UIC
- CER
- ERRAC
- ECTRI
- National state railways
- Other, please specify

Section 4 Follow up

4.1 We would like to conduct in-depth interviews with selected respondents of the survey to understand barriers to digital learning in rail better. Please state if you would like to be contacted for a follow-up Skype or a face-to-face interview (format to be agreed):

- Yes, please state your email address:
- No

Thank you!

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