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BARRIERS TO
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DIGITAL LEARNING
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IN RAIL
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ACADEMIC AND TRAINING PERSPECTIVE
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FINAL REPORT
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January 2019
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Executive summary

The report aimed to:
1. investigate barriers to digital learning in rail focussed courses in higher education and
2. suggest potential ways to overcome them.

31 rail academic and training experts from around the world took part in an online survey. Six of them participated in further in-depth interviews. The resulting report has been created based on respondents' opinions related to digital learning (or eLearning) in rail.

The principal types of barriers* identified in the report, put in the order of importance, are:

1. ## Training and technology issues
   Three out of eight statements with highest barrier-scores** in this category were linked to educator's skills and organisation's support, identified as:

• Inadequate instructor training	71%
• Inadequate technology support	65%
• Inadequate pedagogical skills for online teaching	61%

2. ## Cost/benefit analysis issues
   Three out of four statements with the highest barrier-scores** in this category were:

• Time commitment	55%
• Inadequate compensation for instruction	55%
• Increased workload	52%

3. ## Institutional policy issues
   One out of six statements with highest barrier-score** in this category was:

• Online work not valued for promotion and tenure	58%

4. ## Interpersonal issues
   One out of seven statements with the highest barrier-score** in this category was:

• Lack of personal contact/social interaction	55%

5. ## Other issues
   Two out of seven statements with highest barrier-scores** in this category were:

• Staff unwillingness to engage	58%
• Language barriers	55%

* the barrier categories and statements are based on Lloyd et al. (2012)
** total votes for 'A barrier' or 'A significant barrier' options

Based on the analysis of data collected via questionnaires and interviews, a 5-step cycle is suggested to challenge the eLearning barriers identified and help academic and training providers to embrace a new mobile and flexible approach to learning railways.

The 5-step eLearning environment set-up cycle includes:

1. Policy
   Development of institutional policies supporting and actively encouraging an eLearning approach to rail education and training.

2. Training
   Development of 'Train-the-Trainer' style training programmes for trainers and educators to equip them with the skills needed to increase their confidence and efficiency in using modern technologies in a classroom and beyond.

3. Development
   Develop a new eLearning content within an organisation in collaboration with colleagues from various departments, including engineering, operations, media and marketing and external partners, so that the final tools used for education and training purposes meet the highest professional standards.

4. Support
   Develop an internal support system for educators and trainers within an organisation, where they can exchange and test new ideas, trial new solutions and provide feedback to colleagues.

5. Review
   Review components of the cycle and effectiveness of the system within an organisation on a regular basis and suggest improvements, if necessary. Improvements will be incorporated into new policies.
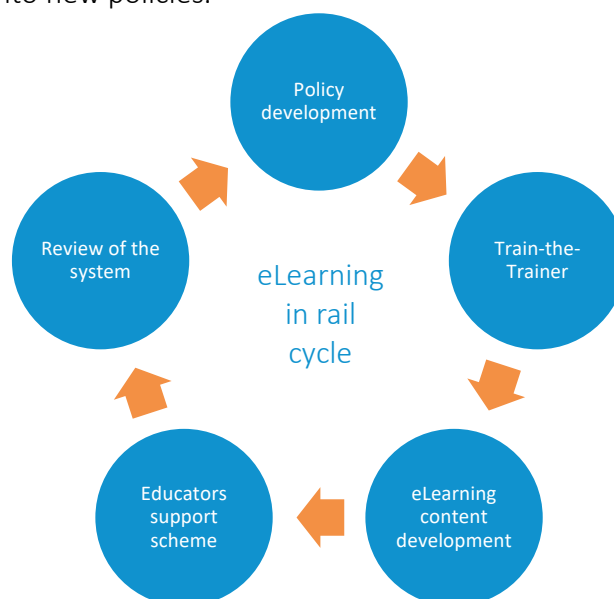
Figure 1.1. The 5-step eLearning in rail environment set-up cycle

Part 1: Introduction

In the 21st century, the railway sector is facing different challenges on different continents. North America's railways are dominated by private rail freight companies, with very few passenger lines. At the same time, some of the metro systems in the US (e.g. New York Subway) are the oldest in the world. In Europe, the well-developed railway networks span the continent regarding infrastructure and operations, but the systems are getting older. Additionally, ageing rail workforces and staff shortages are becoming an issue (NSAR, 2017). In Australia, similar scenarios with ageing workers and skills shortages, cause a threat to the sustainable development of the sector (Engineers Australia, 2009).

The European railway sector has addressed workforce attraction and retention issues with new schemes for (potential and current) employees. One such an example is the Railway Talents (2017) project initiated by the International Union of Railways in 2015. Supported by various international organisations, this project promotes careers in the sector via its website and 'Railway Talents Ambassadors' located across the globe. Another example is an EU-funded research project titled "Skillful" (2017), which looks at knowledge and skills of transport workers at all levels to influence curricula and training courses with suitable content responding to needs of the future.

While skills shortages present a significant challenge to the railway (and the transport as a whole) sector, emerging technologies (such as AI or progressing automation) and the digitalisation of railways (regarding e.g. operation and resources) provides a way to upgrade peoples' skills in new and innovative ways. Tech initiatives, such as transport marathons or hackathons (Hacktrain, 2017), gain popularity in Europe (TSC, 2017) and beyond (UITP, 2017) as they encourage a fresh approach to old and new challenges the railway sector is facing. Hackathons, in addition to transport experts, often involve IT geeks, software developers, graphic designers and start-ups who want to use their skills and knowledge to contribute to the development and modernisation of the future railway sector. Gradually, the railway sector is evolving, and digitalisation is reaching all aspects of the railway business.

Advanced IT tools are not new to the railways, and they have been used to, e.g. facilitate train operations (simulation modelling techniques in Marinov and Viegas, 2011) or entertain rail customers (e.g. virtual reality and gaming tools used on Eurostar service; Eurostar, 2017). Also, digital learning tools are now being used to provide (formative) rail education (e.g. edX, 2017).

However, incorporation of digital learning in rail focussed courses in higher education is still rare and slow, especially when compared with other non-engineering sectors. Today's students demand contemporary learning methods in their studies, and the image of rail is impeded by traditional learning approaches. Thus, the report explores barriers to digital learning in rail, as seen by rail academics and training providers, and suggests ways for overcoming them. The proposed solutions will assist future course developers to prepare eLearning offerings with some actions suggested.

The outcomes of the report should be of primary interest to individual learners, rail academics and trainers and their employers as well as rail sector employers with findings assisting in decisions about courses, purchase of content or involvement in digital learning activities with rail content.

Organised in five main parts, the report is as follows:
- Part 1: Introduction;
- Part 2: Background: eLearning courses in rail;
- Part 3: Methodology;
- Part 4: Analysis of results and conclusions;
- Part 5: Recommendations;
- and Appendices.

Part 2: Background

2.1 eLearning definition

eLearning is defined as:

"Learning conducted via electronic media, typically on the Internet"

Oxford Dictionaries, 2018

or

"Learning done by studying at home using computers and courses provided on the Internet"

Cambridge Dictionary, 2018

Both definitions are similar, as they highlight the use of electronic media (e.g. computers, but also tables, smart phones) and the Internet. However, eLearning can be undertaken in two modes: online as well as offline. While we are referring to eLearning in this report, many synonyms of this terminology are all around us, and some, with their definitions, are presented in Table 1.

Table 2.1. Some of the synonyms of eLearning with their definitions

Synonym	Oxford Dictionaries	Cambridge Dictionary
open learning	"Learning based on independent study or initiative rather than formal classroom instruction"	"A way of studying that allows people to learn where and when they want, and to receive and send written work by mail or email"
m-learning (mobile learning)	"Education or training conducted by means of portable computing devices such as smartphones or tablet computers"	"Learning done using electronic devices, such as smart phones, laptop computers and tablets"
distance learning	"A method of studying in which lectures are broadcast or lessons are conducted by correspondence, without the student needing to attend a school or college"	"A way of studying, especially for a degree, where you study mostly at home, receiving and sending off work by post or over the Internet"
Virtual Learning Environment (VLE)	-	"A system for learning and teaching using the Internet and special software"
MOOC	"A course of study made available over the Internet without charge to a very large number of people"	"Massive open online course, a course of study that is made available over the Internet and that can be followed by a large number of people"

Sources: Oxford Dictionaries (2018) and Cambridge Dictionary (2018)

eLearning word and its synonyms, as presented in Table 1, can be associated with learning using technology, often taking place outside of the classroom. eLearning also includes a just-in-time 'microlearning', which is:

"a short, focused learning nugget (often 3-5 mins long or shorter) that is designed to meet a specific learning outcome"

Pandey, 2016

6

Fraszczyk and Piip (2019) Barriers to digital learning in rail. Final report.

Overall, eLearning could be experienced in different environments and using various electronic devices, e.g. at home on a stationary computer or a smart phone while on a bus. A technology component in this type of learning is crucial, and it could be delivered online or offline, asynchronous (with no timeframe for learning) or synchronous (real-time learning) (Lautala et al., 2015; Articulate 2018).

eLearning as a concept started evolving in the early 2000s when access to computers and the Internet was becoming more accepted (Becker et al., 2012). In many societies in addition to traditional skills, such as reading, writing and Maths, digital fluency became a must (Becker et al, 2012). As people use their digital skills in daily life, when accessing computers or mobile phones, an evolution of learning in eLearning seems to be natural. However, people's improved digital literacy does not always translate into the use of more formal forms of eLearning. It appears that although technology is evolving fast and can offer a new learning experience, people are not embracing this route at the same pace. Traditional classroom-based learning is still very much dominant across the globe, as there are still many challenges in embracing eLearning into its full capacities. Explored in the next sections, these challenges might have different origins and nature.

2.2 Pros and cons of eLearning

eLearning literature distinguishes many positive, as well as negative, views related to this learning concept. Table 2.2 summarises the pros and cons of eLearning, including suggestions by authors looking at eLearning in rail (e.g. Lautala et al., 2015).

Table 2.2. Advantages and Disadvantages of eLearning

Advantages of eLearning	Disadvantages of eLearning
• taking learning outside of a classroom (or workplace); • offering flexible learning adjusted to learners' individual needs (Whitaker and Sorensen, 2007); • being independent of geography (Lautala et al., 2015; Becker et al., 2012); • reaching more participants at one time (Lautala et al., 2015); • accessing a more diverse rail workforce (Lautala et al., 2015); • developing and sharing teaching material collaboratively (Lautala et al., 2015); • being more efficient and cost-effective than traditional classroom-based courses and training (Becker et al., 2012); • enhancing learning and increasing motivation (Becker et al., 2012); • increasing affordability since many of the digital courses are free to attend (edX, 2018; Coursera, 2019; FutureLearn, 2019); • offering a way into formal courses as a taster (TU Delft, 2018).	• an individual and independent learning approach is not always suitable for all learners (Adams Becker et al., 2017); • isolation of digital natives from digital immigrants and digital dinosaurs who (might) face skills challenges while using new technologies (Prensky, 2001; Becker et al., 2012); • cultural barriers (Becker et al., 2012); • technical complexity which requires a team of people to design a course material in an interactive format, such as videos, podcasts, texts, discussions, assignments, texts, etc. (Becker et al., 2012); • skills for instructional design increase in complexity as technology develops (Articulate, 2018).

Source: Based on the compilation presented in Fraszczyk and Piip (2018)

The literature identifies many advantages to eLearning including that it is a cost-effective method of offering learning, especially where large numbers of people need to acquire the same knowledge, for example, a workplace induction, safety knowledge or a particular skill. The learning can be developed before a scheduled course and delivered anywhere or at any time. Costs of course development are minimised, as the material is able to be repurposed for differing learner needs and audiences. Learners can revisit the subject matter many times to achieve competency or gain understanding of a theoretical concept. However, there are also disadvantages for eLearning. The main barrier cited by those who view learning as a social activity (Bandura, 1977), is that eLearning is an isolating experience for many learners and not suitable for everyone. In the higher education environment, validity of who is undertaking eLearning courses and exams causes lecturers to fear that students will cheat if the subject or course is in an eLearning format. Course development is the responsibility of individual lecturers or academics who may not have the time, technical skills, knowledge, interest or experience to develop their courses into an online or eLearning format.

2.3 Types of barriers

Stoffregen et al. (2016) studied barriers to eLearning in public administration organisations in Europe. They suggested that public sector organisations, including educational institutions, are delayed with adopting eLearning due to risks of unknown and preference for 'business as usual' operations. They identified three groups of barriers presented in Table 2.3.

Table 2.3. Types of barriers to eLearning

Barrier dimension	Categories
Contextual	• lack of resources, • managerial practices, • management by law (policy coordination), • perceived technological fit.
Social	• characteristics at the national level, • value of information, • digital divide, • characteristics at the organisational level, • quality of information, • cognitive backgrounds, • individual concerns, • ICT skills, • lack of knowledge.
Technical	• availability, • technical and conceptual differences, • perceived functionality, • interoperability, • privacy and security, • usability and system quality.

Source: Based on Stoffregen et al. (2016, p. 203)

The three barriers to eLearning identified by Stoffregen et al. (2016) relate to contextual, social and technical barriers. While these barriers related to embracing eLearning enthusiastically in public administrative organisations in Europe, they could are equally applied to higher education organisations.

2.4 Examples of eLearning courses in rail

Railway education, since its beginnings, followed a very traditional route of vocational, engineering and hands-on training. However, railway sector includes not only people who work on a train (train drivers, ticket inspectors, maintenance engineers, etc.), but also a variety of other roles behind the scenes, in traffic control centres, safety departments, vehicle design studios, and many other places. With more extensive use of technologies in this variety of roles, digital learning started slowly entering the rail sector.

In recent years, some HEIs started developing and promoting eLearning courses in rail via online platforms. Besides, some international rail organisations are getting interested in this type of learning, too. Table 2.4 presents three examples of eLearning courses in rail, offered by universities but also in collaboration with other organisations, open to international participants via the Internet. The three eLearning courses organisers are:
- TU Delft, Netherlands (Europe) – a university specialising in rail research and education;
- NUCenter/Michigan Tech (US) – a consortium of rail universities;
- UIC/La Sapienza/Oxand (international) – a collaboration between the International Union of Railways, an Italian university with a strong transport focus and a consulting company.

Table 2.4. Characteristics of selected online courses in rail

Title	Railway Engineering: An Integral Approach	Railway Asset Management	High-Speed Rail Learning System
Length	Seven weeks	Four weeks	Various
Effort	4 to 6 hours per week	8-22 hours per week	Various
Price	Free	Two modules free, 2 x 300 Euro	FREE trial
Certificate	$50 USD	Not specified	Not specified
Institution	TU Delft/Europe	UIC, Sapienza University, Oxand/Europe	Michigan Technological University/US
Subject	Engineering	Management	High-Speed Rail
Level	Introductory	Introductory	Introductory
Language	English	English	English
Instructor	1	1+	Various
Tools	videos, game	course material, assignments	course material, assignments
Editions	2+	1	TBC
Link	https://www.edx.org/course/railway-engineering-anintegral-approach	http://www.railtalent.org/all-courses/rail-assetmanagement/	http://raillearning.mtu.edu
Reference	edX (2018)	Railway Talents (2018)	Lautala et al. (2015)

Source: Fraszczyk and Piip (2018)

When looking at these three eLearning courses materials available online, there is a noticeable difference in the level of their advancement and presentation. Firstly, each course is hosted on a different platform. The TU Delft course is available on an open-source edX platform, where many US and global universities deliver their online content (edX, 2018). Two editions of this course have been completed. The MIT courses are available via a customised platform

developed in partnership with Harvard University in 2012, where partnerships with more universities advancing eLearning in rail education are visible. Currently, the platform offers access to 15+online resources, from conference materials to basic courses in high-speed rail. The UIC course delivered once so far, used a customised platform developed in a partnership with Sapienza University and Oxand. Overall, one of the visible advantages of using an existing platform for eLearning is that, in addition to offering variety of tools for the course delivery, it also collects students' data (e.g. demographics, behavioural information, statistics). This strategy enables further curricula research and course developments (edX, 2018). As expected, high quality and positive eLearning experience is an essential consideration for edX (and other similar eLearning platforms), so that learners are actively engaged in a course and return for more than one learning encounter.

Secondly, the scale of the engagement and targeted audience for the three courses was different. The first course was addressed to beginners interested in learning about the fundamentals of railways and was open free to anyone interested. The second course targeted a more specific audience with interest in rail asset management, most likely UIC members and contacts at a managerial level. Finally, the third platform offers courses focused mainly on high-speed rail topics (but not only) addressed primarily to their US-based university network but open to a broader audience as well. Fraszczyk and Piip (2018) present further details of two other courses.

Overall, in addition to the three courses presented, very few education courses in rail are found in an online mode. Observing the rapid speed of the digital (R)evolution in other aspects of the railway business, the change in rail education approach, from a traditional classroom-based to a hands-on engagement to digital-based learning, is surprisingly slow.

Part 3: Methodology

Two ways of data collection were employed:

- A survey addressed to rail academics and trainers around the world;

The study collected new quantitative data on barriers to eLearning in rail. Academics and trainers involved in rail courses delivery were invited to participate in the survey via an open call promoted online. All participants were guaranteed anonymity. However, they could leave their contact details to take part in the follow-up interviews and receive the final report of the study.

The questionnaire was divided into four parts:
- Personal details;
- Your organisation;
- Your opinions and preferences (barrier categories and statements in Q3.1 were based on the work presented in Lloyd et al. (2012));
- Follow up.

Questions included in the online questionnaire are available in Appendix 1.

- Selected volunteers who had completed the questionnaire participated in individual in-depth interviews;

The follow-up questions probed other insights through qualitative data on barriers to eLearning in rail. Selected academics and trainers who completed the online survey and left their contact details were contacted to schedule individual interviews. As agreed with all participants, identities of the interviewees were known to the researchers, with their responses anonymised in the report. A standard set of questions asked during the interviews is available in Appendix 2.

Data collection

Table 3.1. Data collection techniques applied in the project

	Questionnaire	Interviews
Collection mode	Online	Skype and face-to-face
Promotion method	Emails UIC e-News newsletter (UIC, 2018) Social media (LinkedIn, Twitter, ResearchGate)	Follow-up after questionnaire Volunteers
Timeframe	9/04-14/05/2018	27/04-18/05/2018
Number of respondents	31	6
Number of records removed during data cleaning	0	0
Total sample size	31	6

Overall, the sample size includes 31 individuals who responded to the online survey and six respondents who took part in the interview.

Part 4: Analysis of results and conclusions

4.1 Characteristics of the sample

Thirty-one respondents completed the online questionnaire with their characteristics displayed in Table 4.1. Next, six individuals who completed the online survey were invited to follow-up with an interview, with their characteristics presented in Table 4.2.

Overall, 22 males and nine females completed the online survey, while three males and three females attended an interview session. Regarding age, the span across the sample is from 27 to 72 years old participants, while the male sub-sample is, on average, seven years older (average age of 50.1) than the female sub-sample (average age of 43.3). 74% of respondents work at Higher Education Institutions (HEIs), while the remaining 26% represent private companies, research centres or national railways, collectively grouped as 'Other' employer.

Online education experience varies across the sample with 29% of respondents having some experience as an online education organiser and 36% as a participant. 19% of respondents declared no experience at all. 52% of the sample feels 'Very comfortable' with the level of their Digital Proficiency, followed by 32% who feel 'A little comfortable', which overall forms a vast majority of respondents who are generally comfortable with their digital.

Table 4.1. Characteristics of the online sample

Characteristics	Male	Female	Total
Sample size			
[count]	22	9	31
[%]	71	29	100
Age			
Age range	27-72	29-60	27-72
Age average	50.1	43.3	48.0
Employer [%]			
Higher Education Institution	82	56	74
Other	18	44	26
Online education experience [%]			
Organiser	32	22	29
Participant	23	67	36
Both	9	0	6
None	27	0	19
Other	9	11	10
Digital proficiency self-assessment [%]			
Not comfortable at all (1)	0	0	0
Not comfortable (2)	5	0	3
Neutral (3)	14	11	13
A little comfortable (4)	36	22	32
Very comfortable (5)	45	67	52

Table 4.2. Characteristics of the interviewees' sample

| Characteristics	Male	Female	Total
Sample size			
[count]	3	3	6
[%]	50	50	100
Age			
Age range	30-55	30-60	30-60
Age average	3	3	6
Employer			
Higher Education Institution	3	2	5
Other	0	1	1
Online education experience			
Organiser	2	3	5
Participant	3	3	6
Both	3	3	6
None	0	0	0
Other	0	0	0
Digital proficiency self-assessment			
Not comfortable at all (1)	0	0	0
Not comfortable (2)	0	0	0
Neutral (3)	0	0	0
A little comfortable (4)	1	1	1
Very comfortable (5)	2	2	4
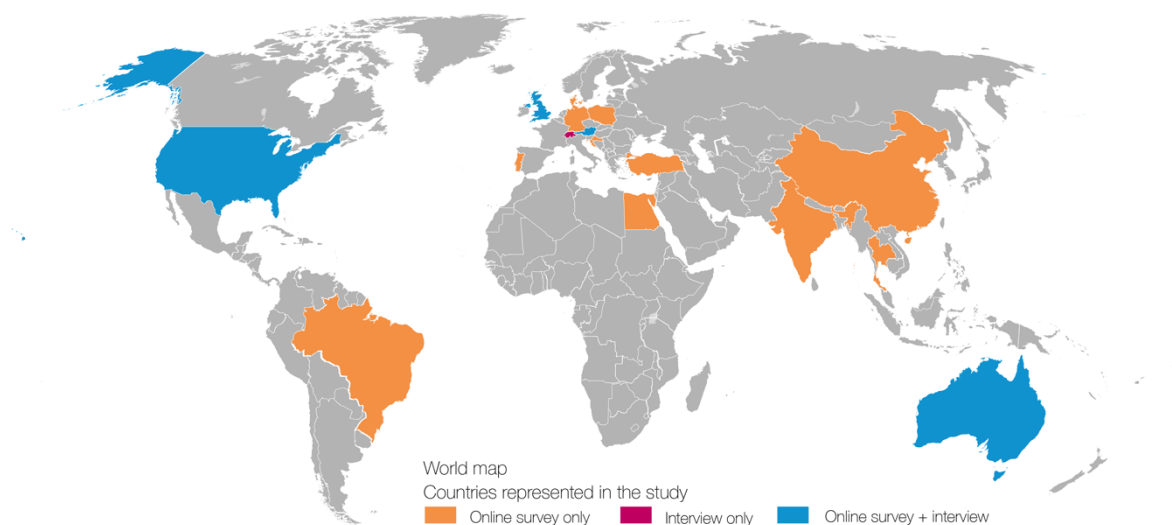
Figure 4.1. World map with countries represented in the sample highlighted
Source: see References section for details

Figure 4.1 shows World map with countries included in the study highlighted. Participants came from 16 countries***. Respondents who completed the online survey (11 countries in orange), and those people involved in both – the online questionnaire and an interview (4 countries in blue) were topped up with one interviewee from Switzerland. Overall, the UK had most representatives (10 respondents), followed by Germany and Australia (4 representatives each), Brazil (2 representatives), and Austria, China, Croatia, Denmark, Egypt, India, Poland, Portugal, Switzerland, Thailand, Turkey and the USA.

*** respondents' country of work, not nationality

4.2 Results and conclusions on types of barriers

As the report presents academic and training perspective on barriers to eLearning in rail, the results in this section are divided between respondents representing Higher Education Institutions (HEIs) and other organisations (rail consulting and research companies, etc.). However, the split between HEIs and Other sub-samples is far from equal with 23 individuals representing HEIs and the Other category with 8 respondents only. Due to small sub-sample sizes the results are presented in numbers.

Barriers: training and technology

Figure 4.2 displays numbers of responses to the set of eight statements related to training and technology issues in eLearning. Results are presented on a 4-point scale, where:

- 1 – not a barrier,
- 2 – somewhat of a barrier,
- 3 – a barrier,
- 4 – a significant barrier.

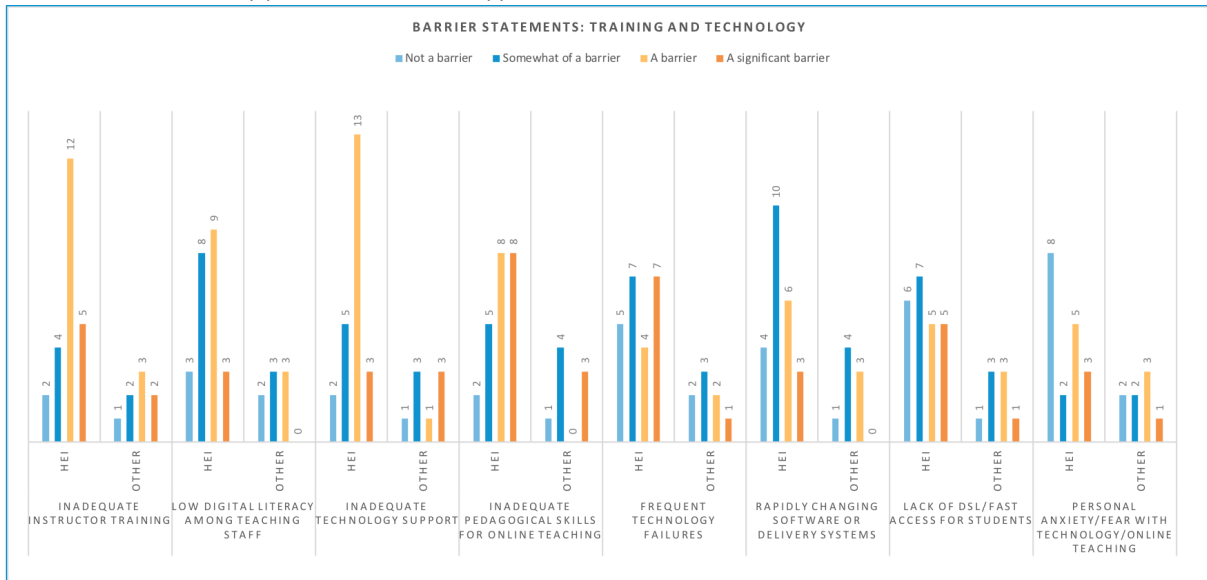The same scale is applied to the five types of barriers listed in this section.

Figure 4.2. Barriers to eLearning related to training and technology issues

Firstly, the results are not statistically significantly different between HEIs and Other sub-samples. Most of the results follow a similar pattern, although some visible differences occur. For example, inadequate technology support is seen as a barrier by majority of HEIs sub-sample (a total number of responses for 'a barrier' and 'a significant barrier' categories, n=16) while in the Other sub-sample this view is supported by half of the sub-group (n=4) .

Secondly, when results for HEIs and Other sub-samples are combined and converted from numbers to percentages, and values for the 3rd and 4th points on a scale are added, it is clear that three statements receive over 50% of respondents' votes. Three out of eight statements with highest barrier-scores** in this category are linked to educator's skills and organisation's support, and are identified as:

• Inadequate instructor training	71%
• Inadequate technology support	65%
• Inadequate pedagogical skills for online teaching	61%

Barriers: cost/benefit analysis

Figure 4.3 displays numbers of responses to the set of four statements related to cost and benefit analysis issues in eLearning.
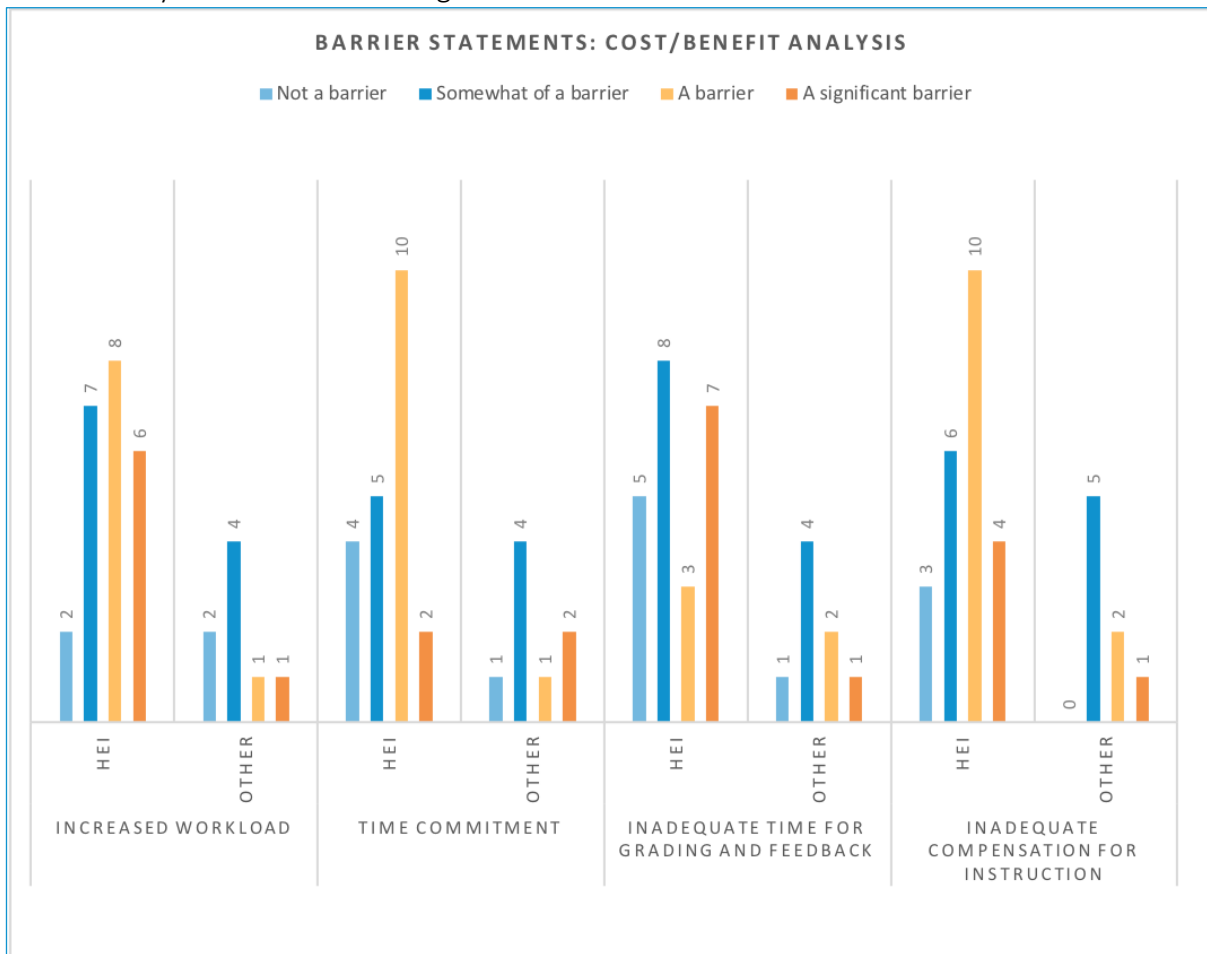

Figure 4.3. Barriers to eLearning pertaining to cost and benefit analysis issues

In terms of cost and benefit analyses differences in responses between HEIs and Other sub-samples are not statistically significantly different. However, it is visible that HEIs see three out of four statements listed as barriers while half or more of the Other sub-sample tends to agree on a 'somewhat of a barrier' response.

Results combined for HEIs and the Other sub-samples and converted from numbers to percentages, and values for the 3rd and 4th points on a scale, show three statements receive over 50% of respondents' votes. Three out of four statements with the highest barrier-scores** in this category are:

• Time commitment	55%
• Inadequate compensation for instruction	55%
• Increased workload	52%

Barriers: Institutional Policy

Figure 4.4 presents numbers of responses to the set of six statements related to institutional policy issues in eLearning. Results for one statement look outstanding. This is linked to a lack of control over property rights, viewed as 'Somewhat of a barrier' by 16 respondents and totals to half of the sample.
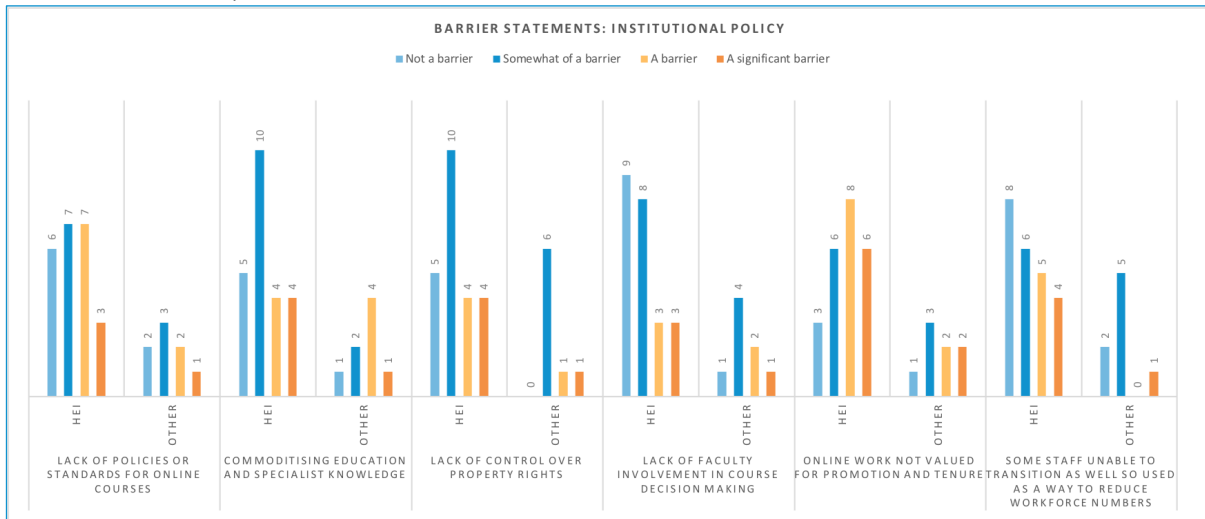

Figure 4.4. Barriers to eLearning related to institutional policy issues

Institutional policy issues are recognised by majority of HEIs and the Other sub-samples as a 'somewhat of a barrier', but they are far from naming these statements as solid barriers to eLearning.

Results combined for HEIs and the Other sub-samples and converted from numbers to percentages, and values for the 3rd and 4th points on a scale, show that only one statement receives over 50% of respondents' votes. One out of six statements with highest barrier-score** in this category is:

• Online work not valued for promotion and tenure	58%

Barriers: Interpersonal

Figure 4.5 shows numbers of responses to the set of seven statements related to interpersonal issues in eLearning. Two statements linked to a lack of courses' quality and a lack of enrolment limits are not considered as barriers by 18 out of 31 respondents, which is the highest results for 'Not a barrier' category.
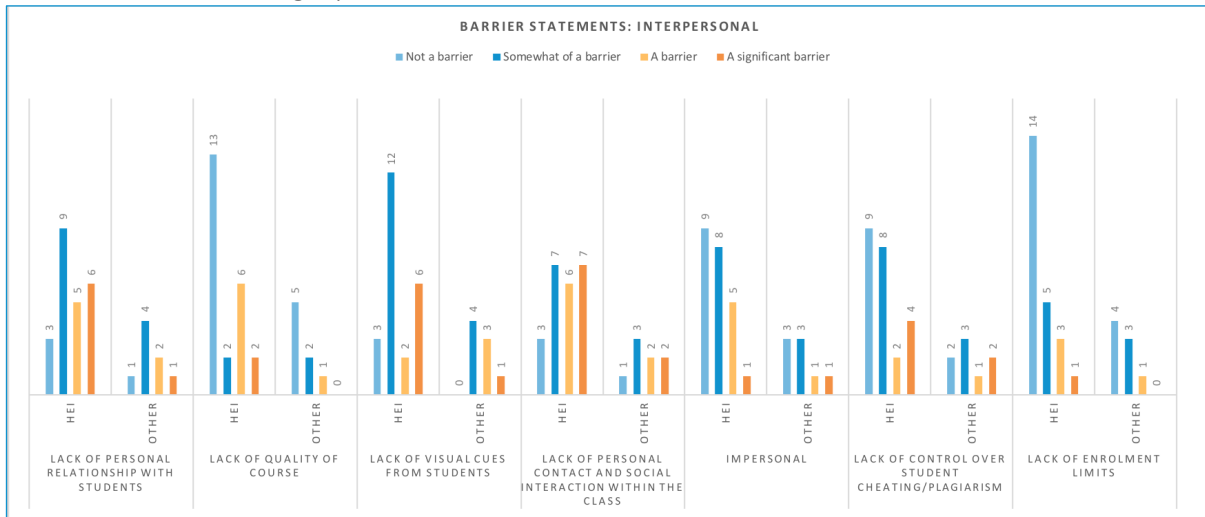

Figure 4.5. Barriers to eLearning related to interpersonal issues

In terms of interpersonal issue differences in responses between HEIs and Other sub-samples are again not statistically significantly different. Results for two statements regarding lack of personal relationship (12 vs. 11 for HEIs and 5 vs. 3 for Other) and lack of personal contact and social interaction (10 vs. 13 for HEIs and 4 vs. 4 for Other) are most equally spread between the four answer options and most similar between HEIs and the Other sub-sample in this barrier category.

Results combined for HEIs and the Other sub-samples and converted from numbers to percentages, and values for the 3rd and 4th points on a scale, show that only one statement receives over 50% of respondents' votes. One out of seven statements with the highest barrier-score** in this category was:

- Lack of personal contact/social interaction   55%

Barriers: Other

Figure 4.6 presents numbers of responses to the set of seven statements related to interpersonal issues in eLearning. Results for one statement look outstanding. This finding is linked to physical barriers in eLearning following the belief that 'some things should be seen and touched', seen as 'Somewhat of a barrier' by 17 respondents and totals to over half of the sample.

Figure 4.6. Barriers to eLearning related to other issues

Perception of the other barrier issues listed in seven statements are again quite similar between HEIs and the Other sub-samples with an exception of a statement regarding different types of facilitators (introverts vs. extraverts), which is the only statement with statistically significantly different answers between the sub-samples. Interestingly, issues with fair student evaluation or physical barriers are perceived as 'not a barrier' or 'somewhat of a barrier' only. Results combined for HEIs and the Other sub-samples and converted from numbers to percentages, and values for the 3rd and 4th points on a scale, show that two statements receive over 50% of respondents' votes. Two out of seven statements with highest barrier-scores** in this category were:

• Staff unwillingness to engage	58%
• Language barriers	55%

Barriers: Statements

32 additional eLearning statements were included in the survey and were divided in the analyses process into four groups:

- Positive, e.g. 'Online courses are the future of learning';
- Negative, e.g. 'I don't like online courses';
- Skill-related, e.g. 'Online learning is important for my self-development';
- And Other, e.g. 'I like to teach in a classroom face-to-face'.

Figures 4.7-4.10 display numbers of responses presented on a 4-point scale, where:

- 1 – totally disagree,
- 2 – disagree,
- 3 – agree,
- 4 – totally agree.

Positive eLearning statements

Six additional positive eLearning statements were evaluated by respondents and results split between HEIs and the Other sub-samples are displayed on Figure 4.7. It can be seen that most of the respondents 'agree' or 'totally agree' with statements, which overall support the online learning approach in rail. However, the statement that 'Online courses are the future of learning' was rejected by majority within both sub-samples and shows that respondents disagree with this approach. Also, no significant differences are recorded between HEIs and the Other respondents.
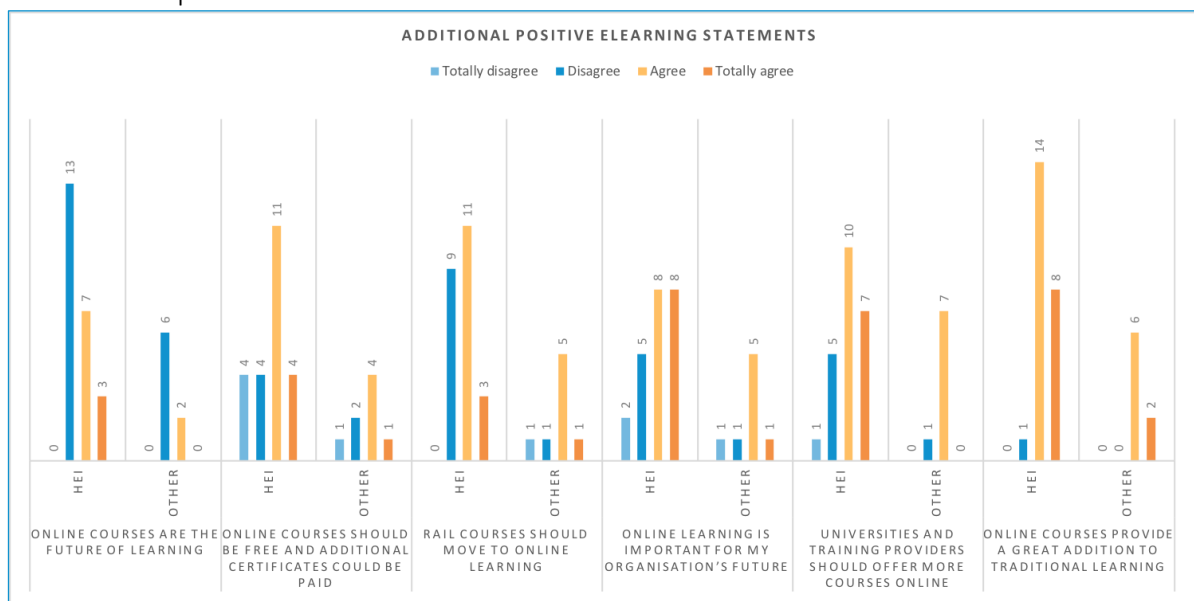

Figure 4.7. Additional positive eLearning statements

Negative eLearning statements

Eight additional negative eLearning statements were evaluated by respondents. As Figure 4.8 shows, majority of the respondents disagree with these statements, which overall means that their evaluation of digital learning is positive. One exception is noted for the statement: 'Legitimacy of online education is lower to traditional classroom based education' where 14 HEIs and 7 Other respondents 'agree' or 'strongly agree'. Moreover, a statistically significant difference is recorded between the sub-samples when evaluating the statement: 'Value of

online education is lower to traditional classroom based education' where 15 HEIs tend to disagree and 7 of the Other agree. This shows an interesting difference between the two sub-samples in perceiving eLearning.
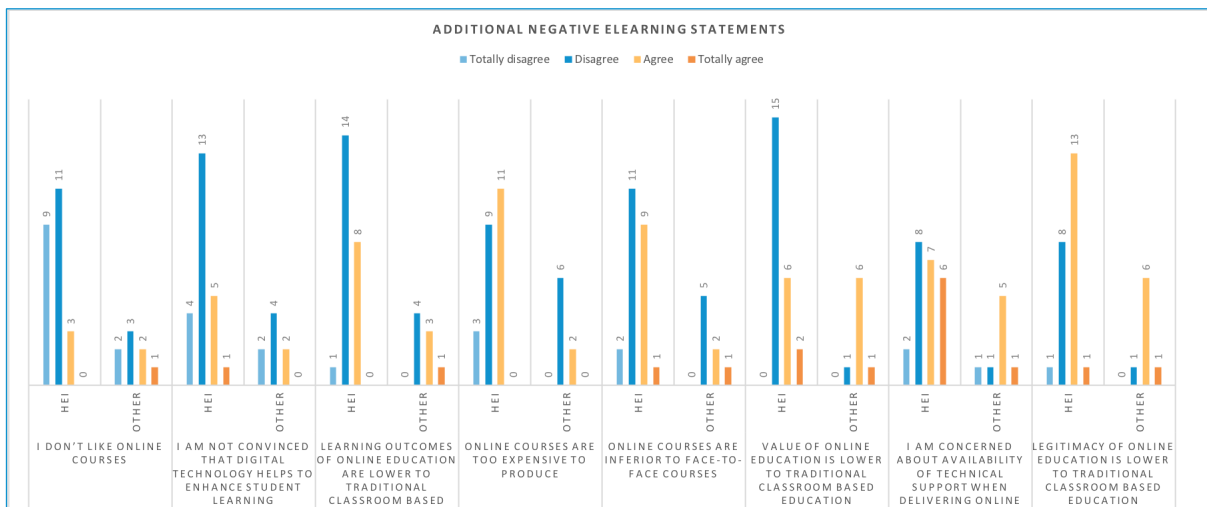

Figure 4.8. Additional negative eLearning statements

Additional skills related eLearning statements

Five additional skills related eLearning statements were evaluated by respondents. As displayed on Figure 4.9, majority of the respondents in all the statements recognise the importance of online learning for their self-development and show interest in developing their digital learning skills further. They would like to take a professional development course in online learning and work with experts in order to develop their own online teaching materials in rail subjects.
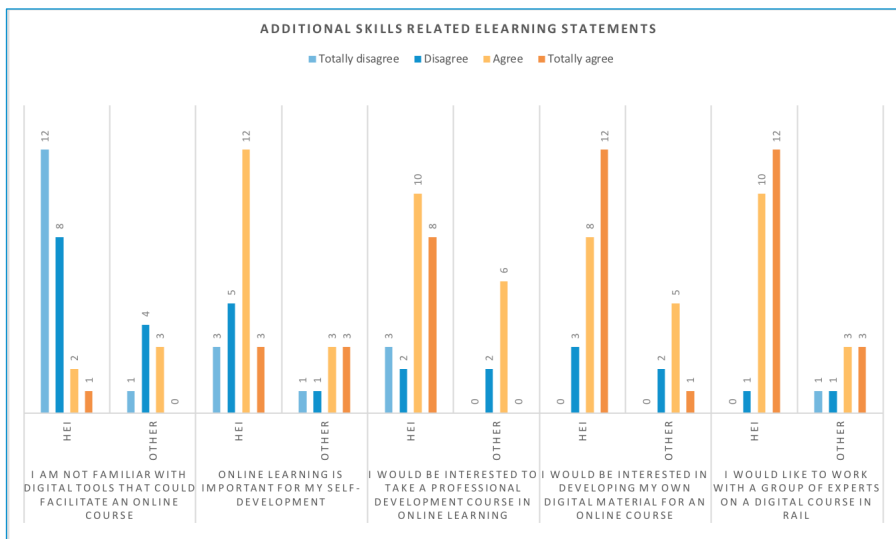

Figure 4.9. Additional skills related eLearning statements

Other statements

Three additional eLearning statements related to other issues were evaluated by respondents and Figure 4.10 displays results. Majority of the respondents from both sub-samples agree or strongly agree with the statement that effort required to prepare an online course is much

greater than when dealing with a stationary course. Even greater support is expressed for a statement that an online course preparation requires a team of experts to deliver a good quality product. In addition, the respondents also admit that they like to teach face-to-face in a classroom.
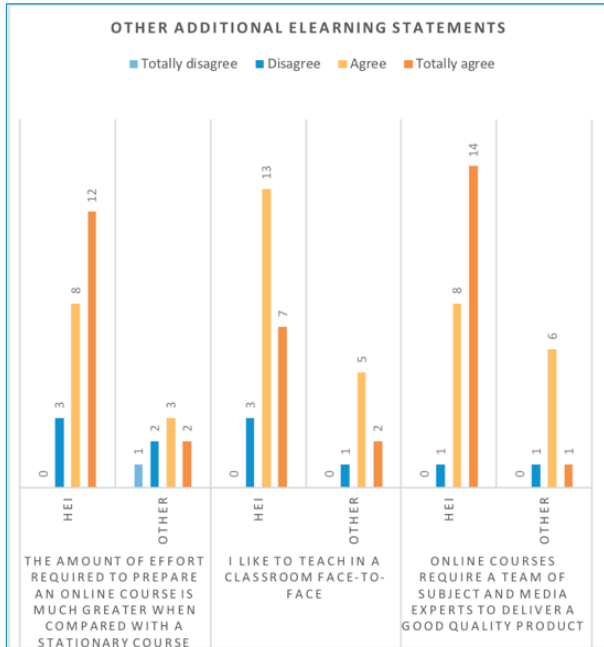

Figure 4.10. Other additional eLearning statements

Overall, these statements show how realistic the perception of eLearning in rail education is. The respondents show a positive perception of digital learning and possibilities for applying online tools into rail courses. However, if academics and trainers lack confidence in their digital skills, have inadequate experience and poor support in delivering online learning their perceptions and views are unlikely to change.

4.3 Interviews' outcomes

What interview said regarding a potential 5-step eLearning cycle
Results of the six interviews were analysed, and responses were grouped into similar topics. As an outcome, a potential 5-step eLearning in rail cycle was developed. The cycle includes the following steps:
- Policy,
- Training,
- Development,
- Support,
- Revision.

Details of the steps with quotes from interviews are listed below.

1. Policy
Development of institutional policies supporting and actively encouraging eLearning approach to rail education and training.

Compared to the US, Europe has few rail courses in an online format
> "What I can compare is myself taking courses in the US, and they're extremely good in eLearning. They combine very effectively with the course content, your self-learning, your tutorials and exams." AJ

Low Priority within European universities
> "In my organisation, to be honest, it is not visible. I would expect it to be more transparent, but it seems that eLearning is not a priority of my organisation if I compare it with other institutions. We are still a classroom-based institution, eLearning is not incorporated into the educational process." MM

and
> "No, they [Lecturers] are interested; some lecturers say they are interested in doing that [teaching online], but few, only a few, very few, are using digital learning." HG

Higher Education rail courses are slow to embrace new learning approaches
> "Actually, other departments are using digital technology more than our department, for example, with technology. Moreover, in our case, we started to ask instructors if they would like to start digital learning and so on, and we have got a reply from some of the people, from the instructors, but it's really [applying] innovation to the other methodology that we find, [where] they're limited." HG

Strategy on paper but not implemented
> "Yes, yes, but they wrote it [have a strategy] but I don't know how old, maybe three years or four years, I don't know [whether they have pursued it] but it's on paper." HG

There is no direction for the business unit or staff
> "Yes, they [staff] can decide. They are allowed to decide for themselves [how they teach the course]… they should inform others [about]… what they are doing, but how they do it, they can do it any way they like…" HG

2. Training

Development of 'Train-the-Trainer' style training programmes for trainers and educators to equip them with skills needed to increase their confidence and efficiency in using modern technologies in a classroom and beyond.

Traditional teaching skills and methodologies

"When I was a student, which was about ten years ago now, one thing I noticed was that it really did vary between different lecturers. For example, some lecturers it was still blackboard and chalk, others it was overhead projectors, and then a few others had adopted more modern methods, using interactive whiteboards within lectures but there was little kind of purely online material. The extent was more or less, for example, PowerPoint slides from lectures would be uploaded to the Blackboard system, which I am not sure if you're familiar with." JP

Status of eLearning

"Because I think the value of eLearning is not understood and it does not get rated as much [highly] as face to face learning does. I mean, I know it from other companies where you ask them could you take a course from US, for example, because they have higher technical courses. There was some acceptance, but it didn't get rated as 'proper learning'." AJ

Innovation needs direction when there is freedom to use different methodologies

"My impression was that it is down to the individual lecturers as to how they want to deliver the material. I'm not sure it specifies it at a higher level as to "you must do it this way"; I think it's more freedom for the individual lecturers." JP

When there is no direction, staff are reluctant to innovate

"Again, my experience is that it just isn't even there. They don't seem to have any digital learning in any level of the business, as far as I can see, from what I have heard about." JR

There is lecturer uncertainty about teaching performance with no direction

"Lecturers will tell the department head, for example, what they're doing, how they are doing, and they will be evaluated by students at the end of the semester so that the department head would get feedback from the students." HG

Any strategy needs to include the development of lecturers' foundation digital and teaching skills

"There is one course where you should know how to organise your lectures and to make sure how students access it and how the work gets rated and where the documents get put, etc. I think it's pretty standardised in Germany. It's called Moodle, and that one is, they have eLearning courses on that, and that seems to be a little more successful than maybe something more technical." AJ

Lecturer skills

"Well, based on the experience with undergrad, as I mentioned earlier with some lecturers only using blackboard and chalk whereas others were using interactive

whiteboards with overhead projectors in the middle, yes there is an extensive range of skills between different lecturers. Like, some are very, very up-to-date, others less so. So, yes, there is a big difference between different people in that respect." JP

Pedagogy

"I think that people definitely need to be taught how to develop eLearning programs. A lot of people think you can just take an existing in-person program or course, topic, and convert it to an eLearning online. You can to some degree, only in as much as, say instead of having an in-person lecture, you can put lecture notes and lecture information online for people to read or you can record it and then people can watch it at their own leisure. That happens a lot at university now, at all levels of the university." JR

and

"But then there has to be; if it's entirely online, there has to be a lot of other things to get the interest. It's really boring for students to go online and read a heap of stuff and then do an assignment. If it's boring, then you're even more likely to have them disengaged. You've got to make it interesting; you've got to have videos, you've got to have some funny stuff, some good examples, have a bit of a laugh; you want to do recorded lectures. I used to have a debate going on, forum discussions; keep the variety going, and again, as I said before, you also need to be careful how you do your assignments so that you don't get contract cheating or try to avoid it as much as possible. I think eLearning, as I say, also goes hand-in-hand with in-person teaching but I think people definitely need to learn skills on how to develop online courses." JR

Didactic, pedagogy or andragogy

"No, actually there are very, very few. We have a department which, for example, teaches … the different methods of teaching… didactic and so on, but this department, I can say… is …very limited [in eLearning instruction]." HG

3. Development

Develop a new eLearning content within an organisation in collaboration with colleagues from various departments, including engineering, operations, media and marketing and external partners, so that the final tools used for education and training purposes meet the highest professional standards.

Where there is a demonstrated need outside technical skills, universities used purchased or standardised products for non-technical skills

"Yes, soft skills, … and project management and when a part of that is also soft skills. For example, conflict management, … the setting of goals, for example. So, how do you deal with employees? They're already standard products available in the market and suppliers in the market, and they tailor it for your needs. I did that [purchased a product] for one of the companies earlier, so the entire system of setting goals and performance management… was a complete eLearning course for people who joined the project or wanted to revise their skills.

We developed the product - there was a company that had a standardised product, but our concept was apparently a little different to what they had to offer. So, we used the product, customised it and could use some components of text they had, and then we changed it to ours, and they made a completely new set of audio and visual sessions for us." AJ

With a strategy, eLearning content can be developed further

"We already have some content online. The university has an online learning management system called Desire To Learn (D2L), and we use that platform for online instruction. You can upload videos, narrated lectures, just PowerPoint slides, additional material, additional reading, anything like that, and we're planning to use that platform to build further on that experience for the students." AH

Strategy on learning content

"And there should be some kind of guidelines on the basis of railways legislation. Not in every detail but sort of the direction should make it consistent for everyone." AJ

and

"Let me give you a quick example, if I may. For instance, if you're doing track diagnostics, so there are certain principles which are seen everywhere, but the geographical locations have their specific handling; there's mud which is wetter, or it is very dry, this could be very different. So maybe this requires special training, but the rest could be done pretty consistently." AJ

Quality of materials

"It depends on how eLearning is presented. It could be very powerful, because you can access the material using your smartphone and then you can learn something while you are in transit, on the bus, on the train… You can better utilise your time. It depends on the quality of the material and how motivating this material is. This could be quite a stimulation and encouraging. You can get inspired by people, but it can have a negative effect as well." MM

4. Support

Develop an internal support system for educators and trainers within an organisation, where they can exchange and test new ideas, trial new solutions and provide feedback to colleagues.

More thought about how eLearning will be used and barriers

"Incorporating something else that uses a computer and online, you know, doesn't receive a high priority. If the class is already scheduled, it's easier perhaps to just leave the workplace and go to the class, so that they're focused on the learning, so it would be interesting to hear the feedback about that." AH

and

"I think the other part, particularly in the rail industry where online learning can be powerful and should be made available, is people doing things (learning) on their mobile devices so something like tablets or a mobile phone. Moreover, our learning platform is, in theory, designed for that, but it could also be improved." AH

Student understanding of the material

> "I did a couple of training courses while I was in industry, some face-to-face and some digital ones as well. By and large, the digital courses were perhaps for smaller things, like maybe an hour or two in total." JP

and

> "One example was ethics, business ethics which was rolled out for all the staff members, all employees were expected to complete the training, but it was a slightly shorter one, so say an hour or two, I think; whereas the face-to-face training courses took several days typically. So, depending on what topic you were learning, training was either delivered via eLearning or face-to-face and depending on, I think, for the more detailed engineering topics, I did several days training, that benefited more from being able to discuss the topics with the person training, so there is a lot more back and forth, and interactive exercises where you can get the one-to-one guidance from the trainer, as required." JP

and

> "…the shorter ones were via eLearning and there's kind of less scope for discussion around it, it was very much here is the information to learn, here is a test to show that, to demonstrate that you've mastered it. It didn't necessarily need that kind of discussion element to help with the understanding." JP

Need to be able to interact and get feedback

> "… the main element of it for me was that, say if there was something that you didn't understand, there was something you wanted to learn more about, you could discuss it immediately with the person delivering, like face-to-face, with the person delivering the course. Now that's not precluded by eLearning if you have said a live session, but it is potentially more difficult, especially if there's a large number of people in different places doing a live course at the same time perhaps. So, I think that was the key difference for me, that opportunity for discussion during the training." JP

5. Review

Review components of the cycle and effectiveness of the system within an organisation on a regular basis and suggest improvements, if necessary, which then can be incorporated in new policies.

The mindset about changing methods

> "At the moment, there are such factors; they [our department and lecturers] don't see; we have not offered some digital learning so they accept … [the] traditional [approach] because most courses are taught traditionally [face to face]…" HG

and

> "However, in my opinion, … digital learning might … [solve some problems] … if I am in the classroom, … I can go immediately to the computer … when they [students] do simulations… I can go to the computer if they have a problem…[and] consult with them [students immediately] . But … I've not tried… but I [think I could] go to their desktop for instance and go just look at what the problem is… and sort it out …in a few seconds or minutes." HG

and

"Moreover, … I don't know [what] works well for some courses [as most] courses [are] theory [based]… if we have, for example, exercises … in the classroom, e.g. life-cycle cost and analysis of bridges [I don't know all the eLearning alternatives]. I would like to know [more] about [eLearning and digital tools] … These things are just hanging in my head." HG

Evaluation

"I would like to know how user-friendly the tools are. I would like to know whether they are accessible. I would like to know how many people have shown interest." MM

Metrics in evaluation and student engagement

"Some metrics about how long people are spending on particular parts of the content could be useful to show "Okay, people are spending a lot of time here, this looks; or revisiting this particular section a lot, does that mean that it's difficult to understand or does that mean it's useful?" So, that could perhaps be some useful feedback, or likewise, if there are parts where people look at it briefly once and then never return to it, that suggest okay they're not engaged with this. So, if it could measure the sort of student engagement with different aspects of the course, I think that could be useful." JP

and

"I would want to do it myself to see how many people are taking this course for example, and how do they rate it. If there is anything which is not clear to them, can something be made better? I do that firstly by asking them then and there but maybe people are more comfortable if they also get a chance to write that anonymously for example. You get that feedback generally after the course.
Q. Yes, but after a course is sometimes too late isn't it?
A. Yes, exactly, that's my point.
Q. You want to have it in the course or before the course.
A. For the next time.
Q. Yes, you don't want to go through the whole course, and nobody knew what you were talking about. You could have done that in the beginning to find out if they didn't know anything.
A. Yes." AJ

Different methods and feedback from students

"I started introducing new ways of [teaching]… like some virtual classrooms and the feedback from students was really [positive], they absolutely loved it. Not all of them could attend at the time, but it was recorded so they could watch it afterwards and there was always a few people attending the [virtual] classroom." JR

and

"So, I think just trying to find new ways… of engaging students more and more… people who were joining in were all around Australia, so I had to pick a time that would work for most people. I like the idea of introducing more of those sorts of things; things that are a little bit different, things that are more interesting and

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Fraszczyk and Piip (2019) Barriers to digital learning in rail. Final report.

getting away from the reading. The feedback I got from students was very much along those lines." JR

Learning transfer and eLearning

"Okay, so I'd like to know about the uptake [engagement with eLearning]; I'd like to know how much the participants and students get out of it and another big part of it is, I'd like to assess their learning." AH

and

"In class, again, when [delivering by face to face] the body language and the interaction with people [is easy to read] … I can often tell if they're paying attention." AH

and

"… [with] online learning that's much harder; they might just let it run in the background. So, to check if they actually learn what they're meant to be learning, I think there have to be more assessments, and there might have to be kind of an in-class instruction [like online tutorials, where an instructor is present and can answer questions]." AH

and

"…from my personal experience in taking some of the online classes, I find it more difficult to retain information from what would usually be the case in an in-classroom setting. However, that might just be me; I don't know if that is a general trend or not, but I have also heard other people talk about that. So, basically, did the learning transfer? It is important that people know those things [content of the lesson] afterwards. Moreover, that is regardless if that is online or in person." AH

Teacher and student enjoyment using different online methods

"It was great having the debate [online]; they loved that because it didn't require them to go and do ten hours of research to answer a question online which they had on other courses; it was more a case of 'okay what do you think about this?' and now you have to argue with these people." JR

and

"…I gave them their side; I told them that 'you're for the affirmative' or negative so I was forcing them to think on a particular side but they really enjoyed that and they enjoyed the fact that they didn't have to, spend hours searching for answers to just one question … because they learnt a lot from each other." JR

and

"So, I think that sort of thing is the most important thing, that variety. Moreover, I enjoyed teaching more doing those things, I found it more enjoyable as the person doing the teaching online, and the students said that they just loved some of those courses where there were variety and a bit of fun thrown in sometimes as well." JR

Part 5: Recommendations

5.1 5-step cycle

Based on the analysis of data collected via online questionnaires and the in-depth follow-up interviews, a new process is suggested to be implemented in environments interested in eLearning in rail. The process aims to challenge the eLearning barriers identified in the report and help academic and training providers to embrace a new mobile and flexible approach to learning railways. The proposed 5-step cycle includes stages from policy development, through staff training. The cycle could be applied in new environments interested in developing eLearning approach or modified to fit the existing academic and training arrangements with some digital learning experience. Figure 5.1 displays the concept of the 5-step eLearning in the rail environment set-up cycle.

The 5-step eLearning environment set-up cycle includes:

STEP 1: Policy

Development of institutional policies supporting and actively encouraging an eLearning approach to rail education and training.

STEP 2: Training

Development of 'Train-the-Trainer' style training programmes for trainers and educators to equip them with the skills needed to increase their confidence and efficiency in using modern technologies in a classroom and beyond.

STEP 3: Development

Develop a new eLearning content within an organisation in collaboration with colleagues from various departments, including engineering, operations, media and marketing and external partners, so that the final tools used for education and training purposes meet the highest professional standards.

STEP 4: Support

Develop an internal support system for educators and trainers within an organisation, where they can exchange and test new ideas, trial new solutions and provide feedback to colleagues.

STEP 5: Review

Review components of the cycle and effectiveness of the system within an organisation on a regular basis and suggest improvements, if necessary, which then can be incorporated into new policies.
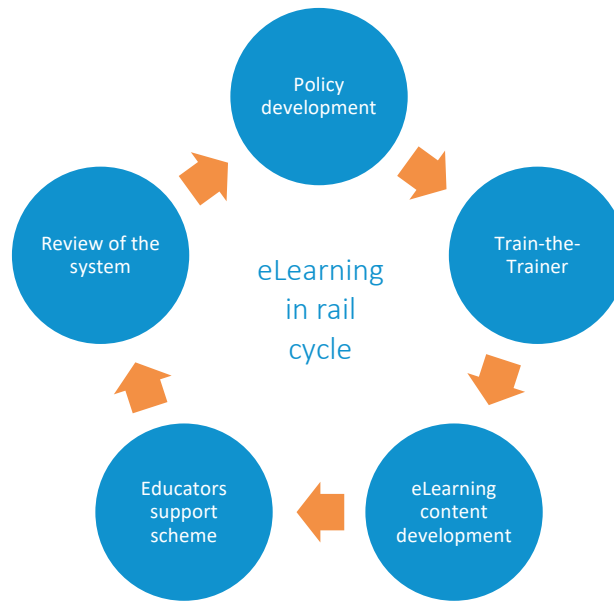
Figure 5.1. The 5-step eLearning in rail environment set-up cycle

5.2 Supporting organisations

In addition, some organisations potentially interested in supporting eLearning in rail, were identified. Next, the online survey respondents were asked to prioritise the organisations regarding their involvement in promotion and development of eLearning in rail. The respondents prioritise the organisations as follows.

Firstly, at a national level state railways (metros and other railway systems) should look at the educational needs of people involved in the railway sector from their local country-wide perspectives and enhance educational and training offer to meet employers' and employees' needs. Collaborations between education and training providers and the industry are compulsory to meet the expectations of the employers and deliver the content that is relevant at a local scale.

Secondly, at an international level, organisations such as International Union of Railways (UIC) and many others (e.g. ERRAC, ECTRI, CER) at a European, global or local scale, which promote the use of railways as a sustainable alternative to other transport options, could and should lead the way in promoting rail education and training in the area of railways worldwide. Through their international contacts and influence they have the power to shape the way new rail workforce is educated and trained today and lead the rail education (r)evolution in the future.

New and emerging technologies can help us to facilitate the change and transition into more effective ways of learning. eLearning is one of the avenues which should no longer be ignored. Although not perfect and not fit-for-all, this approach does offer opportunities to democratise rail education and bring it to the next widely accessible and creative level at a global scale.

5.3 Next steps

A follow-up study is planned in 2019 to investigate barriers to digital learning in rail from the employers' perspective. A new set of questions will be designed to reflect employers' point of view on education and learning in the rail sector. The primary aim of the study will be to investigate education and training programmes delivered by rail companies to upskill their employees as well as initiatives they are involved in to attract talents to the sector. Tools used for delivering these activities as well as challenges and opportunities related to new technologies, including eLearning, will be investigated. Also, employers' expectations and readiness for collaborations with academics and training providers in order to deliver most efficient (digital or other) learning in rail approach will be explored.

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Map source
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- Fraszczyk, A. and Piip, J. (2018) eLearning courses in Rail. The International Seminar for Railway Education and Training 2018. 16-18 April 2018. Birmingham, UK.
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Appendices

Appendix 1

List of questions in the online questionnaire

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 organisation 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
- 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 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 Lack of enrollment limits				
Institutional policy	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 Some staff unable to transition as well so used as a way to reduce workforce numbers				
Training and technology	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!

Appendix 2

List of interview questions

1. How does Digital Learning sit in relation to other learning methodologies/ priorities in your organisation?
2. How is Digital Learning embedded at the business unit level, where managers determine what happens?
3. Who decides on whether to use/develop Digital Learning and what is the process?
4. Would your organisation support a consistent approach to the development of Digital Learning for the industry? How?
5. Do you think Digital Learning should be separated from other learning approaches and given its own priorities to develop the competencies of people designing and developing the programs?
6. How does Digital Learning align with other organisational development learning in your organisation?
7. In an industry traditionally grounded in jurisdictions, rules and regulations, how does the Digital Learning provide opportunities for people to become more empowered about their own learning?
8. What are the key reasons, in your opinion, that Digital Learning has not been embraced by the rail industry?
9. In your view, what is the relative value of using internal or external experts to design and develop Digital Learning?
10. Would the accreditation of Digital Learning experts for rail specific programs help to ensure quality, consistency and a specialist skill base for design and development issues across the industry?
11. What features and benefits would you look for in a Digital Learning approach for your courses?
12. If your current approach to Digital Learning had a weakness, what would this be?
13. In terms of evaluation, what would you most like to know about your activities on Digital Learning?

Conclusion

14. What other ideas or suggestions do you have to offer in regard to Digital Learning for your organisation in general and across the international rail industry?

Appendix 3
Project poster