

The CER Essay series

Where academic analysis
meets business insight

The future of railway service design: a switch to co-design and empathy with customers

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CER Essays

The CER Essays initiative features a series of essays that show the rail sector as contributing not only to EU transport policy, but touching on different aspects of society at large. Topics covered by the initiative will range from modal shift, climate policy, infrastructure investment, high-speed rail, demography and more. Each essay will feature a different topic and be co-authored by a CER member CEO and a leading academic from the same country and will be used to spark debate among political stakeholders on the role of rail in the EU.



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About the authors

Luce Drouet is a User Experience Researcher and Service Designer at CFL and Ph.D. researcher at the University of Luxembourg in the HCI research group.

Luce's research work focuses on empathy in service design, in the wider context of user-centered maturity in companies. She experiments with empathic design methods to facilitate sharing customers' voices with service employees and to reduce silos in organisations. Luce works also at the Luxembourgish Railway Service (CFL). Her mission is to develop the user-centric approach inside CFL customer projects. She is convinced that to design a user-centered service experience, you must first trigger employees' empathy towards customers and vice versa.

Previously, Luce was a lead UX designer in the French telecom company Orange, for the eXperience Design Laboratory (XD Lab) in Jordan. In this context, she crafted web services for Middle-Eastern and African professionals and implemented design methods in the Agile production process of a developer team in Sofrecom Tunisia. She studied social sciences during her Information and Communication Bachelor's degree at Avignon University. Later, she acquired web and design thinking skills through a Web Project Management master's degree from Paris-Est-Marne-La-Vallée University.



Luce Drouet,
User Experience Researcher at CFL and Ph.D. candidate at HCI research group, University of Luxembourg

Carine Lallemand is an Assistant Professor at the Eindhoven University of Technology (TU/e) and the University of Luxembourg. She is Deputy Editor of the academic journal "Interacting with Computers" (Oxford Academic).

Carine has a background in Psychology, Experience Design and Human-Computer Interaction. Her research interests are mainly focused on the development or adaptation of user experience design and evaluation methods. Carine is the author of a textbook on UX methods ("Méthodes de design UX: 30 méthodes fondamentales pour concevoir des expériences optimales", Eyrolles 2018 2nd edition), currently used in more than 100 curriculums in 6 French-speaking countries.

She is also a passionate advocate for academia-industry relationships. As a former Vice-president of the French-speaking UXPA chapter in Europe, she co-founded in 2012 the premier national conference on UX design in Paris and has been actively involved in the organisation of dozens of UX conferences and workshops. She is regularly invited to speak at practitioners' events and achieves public outreach through interviews and podcasts, thus disseminating scientific research beyond the frontiers of academia.



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Marc Wengler,
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Marc Wengler has been “Directeur Général” (CEO) of the CFL, passenger railway undertaking and infrastructure manager in Luxembourg since March 2014.

He holds a Master's degree in economic sciences from the Université Louis Pasteur in Strasbourg (1992) and obtained the “Diplôme d'aptitude professionnelle - Réviseur d'entreprises”, in 1996, when he worked for Arthur Andersen in Luxembourg. He then became head of finance at Kühne & Nagel Luxembourg before joining the management of Société Nationale de Crédit et d'Investissement.

He began his career in the CFL Group in 2002 as Chief Financial Officer. Four years later, he became Deputy CEO with responsibility for the CFL Group's Freight

and Logistics Division, as well as Finance, IT, Purchasing and Legal.

Marc Wengler is firmly convinced that the quality, either in passenger transport or in freight transport, is the key factor for a modal shift. Since 2014, the CFL Group has, under his leadership as CEO, promoted and implemented the advantages of digitalization in numerous initiatives or innovations to improve quality.

User Experience is one of these and will be broadly introduced in this essay.

Executive Summary

The future of railway service design: a switch to co-design and empathy with customers

Public transport is a key element in the European vision for a more sustainable future. For the shift from individual to public transport to succeed, traveller adoption and retention play a vital role. Beyond pragmatic service qualities, customers nowadays are attracted and supported in their loyalty by personalised experiences. In Luxembourg, CFL leads the way in designing railway services with, and for, passengers through the use of participatory design methods.

In a 2020 report¹, the European Union Agency for Railways concludes that railways need to “evolve from technology-driven to demand-driven”. As congested roads and climate change accelerate the wish to make public transport the number 1 transportation choice, it is essential to shift the priority to designing services that truly attract people, rather than solely transporting them from one location to another.

In this endeavour, the Luxembourgish railway company CFL actively seeks solutions and builds support through a research partnership with the University of Luxembourg.

In recent years, several railway companies in Europe have developed initiatives and proof of concepts to involve passengers actively in the

design of the service experience. Building on this trend and with the support of its partners, CFL explores the use of participatory design methods to support a critical paradigm shift towards customer- and experience-centric processes. Beyond traditional satisfaction metrics, the methods deployed focus on triggering mutual empathy between employees and customers as a way to break down organisational silos impeding the passenger experience, and to encourage diverse teams to work together efficiently and creatively with the customer’s experience as the common denominator. Such methods have become the gold standard in designing products and services for customers that cater for the entire user experience, including emotions, aesthetics, and values.

Railways need to “evolve from technology-driven to demand-driven.”

¹ European Union Agency for railways. 2020. A compelling vision for the target railway system https://www.era.europa.eu/sites/default/files/agency/docs/target_railway_system_en.pdf

Executive Summary

How do innovative user research methods such as co-design workshops, love and breakup declarations, or immersive and interactive showcases of passenger journeys benefit the design of railway services? They trigger conversations, engage and support employees to co-create solutions improving the service experience, and even more essentially: they shift an organisation's view "from inside-out to outside-in."

In this essay, we share insights into CFL's recent service design studies, involving data from approximately 300 employees and 70 passengers whose voices inspire. We illustrate

the opportunities and challenges surrounding the continuous understanding of passenger experiences and provide key take away messages.

As a country, Luxembourg is an ideal testbed to devise solutions, to implement swift changes; with its strong governmental support (e.g., free public transport) and a multicultural population it can serve to extrapolate at a European scale. Industrial and service transformation towards sustainable and responsible development is a national strategic research priority; a customer-centric vision has become a strong driving force in this strategy.

Luxembourg is an ideal testbed to devise solutions, to implement swift changes; with its strong governmental support (e.g., free public transport) and a multicultural population it can serve to extrapolate at a European scale.



**Alberto
Mazzola**

CER Executive Director

Introduction

Mobility is constantly changing, improving, and finding new ways to transport passengers. While factors such as price and time have historically dominated the traveller's decision-making process, a significant evolution is coming. The future of mobility is poised to transcend mere logistics, it will increasingly revolve around enhancing the passenger experience. This shift reflects an evolving understanding that the passenger experience is not merely a journey from point A to point B, but a personal voyage that demands a fresh perspective. Passengers no longer view mobility as a means to an end but as an integral component of the experience they seek, a new era of travel where the journey is a cherished experience in its own right.

European railways are now mainly focused on ensuring new infrastructure by engaging with policy makers on the TEN-T Regulation and Connecting Europe Facility (CEF) funding, on ensuring new rolling stock by talking to the European Investment Bank and manufacturers, ensuring increased capacity by working on new Capacity Regulation with legislators and implementing CER Ticketing Roadmap to ensure seamless international rail ticketing in 2025. Some of our members also go above and beyond by implementing new ways to attract passengers, like the switch to co-design and empathy with customers.

The future of European railways does not solely rely on new infrastructure and increased capacity, admittedly the two most important factors, but also services that are designed for the passenger, by the passenger. As railway operators embark on this journey, they are changing the way they do business and exceeding expectations. That is always hard to do and policy makers should give them the support they need. The collaboration between operators and travellers promises a more vibrant and responsive rail service ecosystem—one that recognizes the uniqueness of each journey and resonates with passengers. Together with new infrastructure, capacity, rolling stock, skilled work force and seamless ticketing it will bring the railway business into the 21st century.

A handwritten signature in blue ink, appearing to read 'Alberto Mazzola', written in a cursive style.



A necessary shift from technology-driven to demand-driven public transport

Public transport is a key element in the European vision for a more sustainable future. The European Commission already set the goal in 2011 for the "majority of medium-haul passenger transport to be carried out by rail in 2050."² For the shift from individual to public transport to succeed, traveller adoption and retention play a vital role; a point often regarded from an engineering point of view alone, under the perspective of pragmatic

metrics (e.g., punctuality analysis, optimization of connections, and transit times, passenger flow analysis) and satisfaction metrics (e.g., satisfaction surveys).

Customers nowadays are attracted by personalised experiences, a standard set by the individual transport industry. Car manufacturers have, for instance, invested in user experience design

1 European Parliament - rail transport fact sheet. 2016. <https://www.europarl.europa.eu/factsheets/en/sheet/130/rail-transport>

to better understand their customers' needs and when designing products are taking into account the pragmatic (comfort, utility) but also the aesthetical and emotional aspects of the experience. Marketing strategies for these products rely on conveying subjective aspects and emotions to potential customers. It facilitates customers' purchase decisions and caters to their sustained emotional attachment.

Railways need to “evolve from technology-driven to demand-driven.”

While a natural spill-over effect has reached public transport organisations to enable them in their transition towards customer-centric service providers, as former public service providers, railway operators are facing challenges in transit towards a user-centred approach. Rail market liberalisation, privatisation of railway companies, climate change awareness, and digitalisation of the service present new opportunities. It pressurises and accelerates the desire to make public transport the number 1 choice and hereby shifts the priority to designing services that truly attract people, rather than technically transporting them from one location to the other. In a recent SWOT analysis, the European Railway Agency for Railways listed among the weaknesses of railways an “inherent reluctance to draw on experience gained from other modes.”³

Customer-driven initiatives in the European railway sector

Improvements in public transportation experiences imply a holistic approach to understanding the passenger experience and looking at passengers' needs and emotions.⁴

User Experience and service design can help the railway sector to listen to their customers differently by adopting a user-centered process. This field has contributed to the strategic success of multiple companies over the last decades, such as in the IT and automotive sectors. Some railway companies have followed suit and invested in dedicated teams working with passengers.

“Service design is a process where designers create sustainable solutions and optimal experiences for both customers in unique contexts and any service providers involved.”⁵

A series of initiatives and proof of concept studies illustrate this transition within the EU:

- In Sweden, SJ implemented participatory design processes to gather customers' insights, such as, for example, their railway app design, including a prototypical “lab app”
- In the Netherlands, NS has set up traveller panels testing their Interior Train Design Vision. They conduct regular research in partnership with academia on passenger experience, for instance, investigating passengers' willingness to use night trains.

3 European Union Agency for railways. 2020. A compelling vision for the target railway system https://www.era.europa.eu/sites/default/files/agency/docs/target_railway_system_en.pdf

4 van Hagen, M. 2017. From Customer Insights to New Services. European Transport Conference. <https://aetransport.org/public/downloads/vR4cq/5362-59ca17d08e776.pdf>

5 Design Service. <https://www.interaction-design.org/literature/topics/service-design>

- Eurostar is developing a unique information portal to meet the needs of travellers with autism spectrum disorder and allow them to become acquainted with the different stages of their travel. In this way, they can feel prepared the day they board the trains.
- In Lithuania, LTG has recently launched a test with their customers to collect feedback on implementing a new service and digital application package.
- In France, SNCF has implemented a series of initiatives to better understand customer experiences, for instance: with the help of virtual reality, customers can explore a virtual railway station for the company to better understand their information needs through simulated experiences;
- In Switzerland, SBB CFF is regularly hiring test customers to report on their daily passenger experience
- In Belgium, SNCB is launching an internal communication program called "Client-Central" to sensibilise their internal teams to passengers' voices.

Outside the EU, there are also promising initiatives, as evidenced e.g., in a detailed report on the UX of the railway in Great Britain or the VIA Rail Canada project that developed a proof of concept for helping blind passengers with the navigation in train stations.

All these approaches have in common that they elevate new qualitative insights into individual passenger experiences as part of a participative approach to designing personalised experiences. Where traditional satisfaction or punctuality metrics justified decisions in the past, additional types of metrics are needed now to comprehend the full scope of customer experiences, including their emotions, aesthetics, or values.

Railway and mobility context in Luxembourg

Public transport in Luxembourg has been free since February 29, 2020. Nevertheless, no other EU country invests more into the railway infrastructure per passenger, with 607EUR in 2021.⁶ The country also actively strives to implement the European mobility strategy: *"Make mobility fair and just for all – for instance, by making the new mobility affordable and accessible in all regions and for all passengers including those with reduced mobility and making the sector more attractive for workers."*⁷

The considerable population growth in recent years (1.7%-2.5% per year), combined with intense cross-border workforce mobility of 150k inbound daily, challenges the country's public transport transformation.⁸ The population size has increased from 372k in 1988 to 635k in 2021.⁹ For 2020-2050, the population growth is estimated to be 47.6%, reaching nearly 1M in 2050, based on projections by the Observatoire Interrégional du marché de l'Emploi in 2021.¹⁰

6 Allianz Pro Schiene. 2022.

<https://www.allianz-pro-schiene.de/presse/pressemitteilungen/deutschland-bei-schieneinvestitionen-weiter-abgehaengt/>

7 European Commission. 2021. Sustainable & smart mobility strategy. https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

8 Luxembourg Statistiques Publics. 2022. <https://statistiques.public.lu/en/actualites/population/population/2022/04/20220411.html>

9 European Commission. Eurydice.

https://eacea.ec.europa.eu/national-policies/eurydice/content/population-demographic-situation-languages-and-religions-46_en

10 Iweps.2021. Evolution démographique 12e Rapport de l'Observatoire Interrégional du marché de l'Emploi pour le 17e Sommet des Exécutifs de la Grande Région. https://www.iweps.be/wp-content/uploads/2021/02/3_IBA_OIE_Demografie_frz_Webversion.pdf

CFL passenger experience in Luxembourg

In Luxembourg, the railway company CFL has entered a one-of-a-kind research partnership with the University¹¹ to push their vision of improving passenger experiences through service design. Together, both partners investigate the benefits of innovative user research methods to leverage an increased empathy with passengers for the CFL service design.

"I think the work is going to be more of an emotional one [...] to have people helping you to feel better on the journey, for example."

(co-design workshop participant quote)

Luce Drouet, UX designer, is leading these initiatives in the context of her Ph.D. research (supervised by Prof. Carine Lallemand) at the Service Quality Department of CFL (research project managed by Sophie Lacour and Tom Nickels).



Innovative user research methods such as co-design workshops or love and breakup declarations are deployed to collect rich qualitative data from both customers and employees, and specific metrics are devised to measure the beneficial effect on empathy of employees. Such methods are participatory in that they enable customers and employees to take a co-creation role in the public service design, an approach largely disregarded so far. Participative methods are key for a successful service design: they generate data allowing for new insights into passenger experience needs, they trigger conversations, and support employees in co-creating solutions as part of the service design. Importantly, as our research proves, they also trigger an increase in employees' empathy as a critical basis for successful service design.

¹¹ We acknowledge Vincent Koenig for initiating this research project and securing funding.

Case studies of the research-industry partnership between CFL and University of Luxembourg

Collecting compelling passenger feedback through love and break-up declarations to the service

Imagine making a love or breakup declaration to your railway company. Think about what makes you love it, what you would never want to change? Or think about why the relationship does not work, all the habits that annoy you?

The love and break-up letter technique¹² stages a fictional relationship between users and a product or service to understand their attachment or pain points. It triggers emotional user expression.

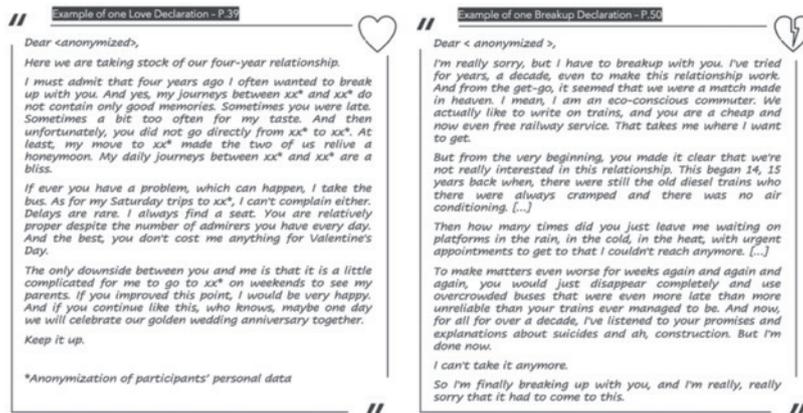
We invited 53 passengers to make declarations of love or break-up with CFL. This feedback differs from the regular customer feedback collected by the company (complaint emails and satisfaction surveys). The user data informs us about the pain points and satisfactions regarding the service. It goes beyond the functional needs and expectations to address people's values and aspirations. Four passengers' psychological needs emerged: control (passengers' feeling to be in control of their train journey and that CFL controls the situation), empathy (CFL empathizes with passengers and passengers empathize with CFL challenges), well-being (all along the service experience) and security (with the meaning of safety).

Thanks to their compelling format, the declarations of passengers can be communicated to employees, to trigger empathy and to unite all stakeholders within the organisation around a customer-centric vision.

Co-designing the future of a railway service

We design services for passengers and collect feedback to continuously improve specific aspects of their experience. What if we include their voices in a different way by co-designing services for passengers, with passengers?

Participatory design methods¹³ are based on the active involvement of users during the conception of a service or product. Besides collecting worthwhile feedback, it is also a forum for fruitful exchanges, mutual understanding and empowerment. Addressing a specific pain point, we invited railway employees and passengers to co-design future passenger information. While designing the service with users, employees received direct user experience inputs and



Two examples of love and breakup declarations

11 Elizabeth Gerber. 2011. Tech break up: a research method for understanding people's attachment to their technology. In Proceedings of the 8th ACM conference on Creativity and cognition (C&C '11). Association for Computing Machinery, New York, NY, USA, 137-146. <https://doi-org.proxy.bnl.lu/10.1145/2069618.2069642>

developed an empathic understanding of users' experiences. Although it is challenging at times for employees to accept criticism, the sessions facilitated how employees considered users' experiences and how they envisioned their role in improving the service quality.

Towards innovative measures of passenger experience: the role of empathy in service design

You are probably familiar with customer satisfaction surveys. Widespread, these tools support the service quality processes. They also have several shortcomings, limiting their potential. Can we develop more meaningful measures to understand passengers' experiences?

Our studies focus on the role of empathy to support the evolution towards customer-centric organisational cultures. Beyond frontline personnel, uniting all employees around these efforts, notwithstanding their position within the company, is a key to success. Empathy can be a useful lever to achieve this goal. The aforementioned methods serve to develop employee's empathic feelings and attitudes towards users. What is needed is a monitoring tool to measure whether and how this is achieved.

We developed a self-reported scale, which allows organisations to measure the impact of design interventions in two ways: (a) establishing an empathy baseline within the organisation, (b) measuring the impact of an intervention on the level of stakeholders' empathy. This measurement tool would facilitate communicating the value of empathy for breaking silos in the organisation and delivering high-quality services and products.



A codesign session at the User Lab of the University of Luxembourg

On CFL side...

"There is a difference between people who take the train every day and people who take a line exceptionally. [...] We know that line 60 is orange, line 70 is purple. People who take the train regularly, they know that."

On passengers side...

"I've been taking the Bettembourg and Belval section for three years now. It's true that if someone asks me the colour or the number of the line, I wouldn't be able to tell them."

Examples of divergent perspectives on passenger experience extracted from the codesign sessions

Other case studies of CFL collaboration with passengers

Beyond the research-industry partnership with the University of Luxembourg, CFL increasingly involves the passengers in their decision-making process. For instance, we consulted the passengers for two primordial customer projects: the future of our train stations and passenger information.



Listening to the passengers' vision of tomorrow train stations

We organized discussion groups with 70 passengers and employees to define CFL's vision of tomorrow stations. Through collages and projection techniques, the participants imagined their ideal train stations. Among other findings we observed tomorrow stations are multi-purposed. For instance, they should be a hub for real-time passenger information. They are also a place to spend time where passengers can shop, take deliveries, relax, and feel secure. This participative process allowed us, and particularly the project managers and architects, to identify passengers' needs, areas for improvement, better practices, and potential levers for actions.

Investigating passenger experience with information

More recently, we investigated passenger experience with information through various activities with 83 passengers. We invited them to document their daily experience with passenger information overall. We wanted to understand how our passengers perceive the content of the information we deliver, but also how we could improve it to fit with their needs. Through these studies, passengers' feedback informed us on the pain and gain point of their experience with our information devices. It allowed our internal teams to better empathize with some passengers' frustrations with the service. This work particularly fed our thoughts to build a passenger information roadmap and improve the quality of information.

14 Drouet L., Bongard-Blanchy K., Koenig V., and Lallemand C. 2022. *Empathy in Design Scale: Development and Initial Insights*. In *Extended Abstracts of the 2022 CHI Conference on Human Factors in Computing Systems (CHI EA '22)*. Association for Computing Machinery, New York, NY, USA, Article 373, 1–7. <https://doi-org.proxy.bnl.lu/10.1145/3491101.3519848>

Conclusion

The present essay provides insights into CFL's service design studies and illustrates both the difficulties and opportunities involved in the continuous understanding of passenger experiences. It also illustrates why it is more important than ever to support railway companies in their transformation endeavour towards effective service design.

The transformation process thus entails addressing challenges such as the following, to some of which the partnership research described above is contributing:

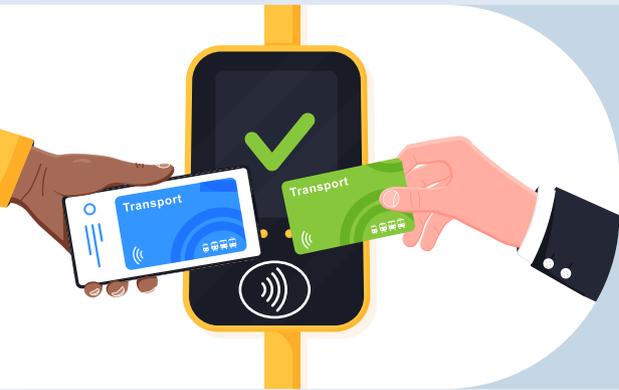
- Accelerating the general UX maturation in public transport organisations across Europe, including the generalisation of design teams at an appropriate organisational level and co-design strategies to develop employees' curiosity and empathy towards passengers.
- Skilling / re-skilling railway service design with user experience designers to drive the design of customer service experiences.

Providing organisations with solid research findings to support them in reconsidering their established decision-making practices, with new types of empirical data on users, often qualitative and self-declared rather than quantitative and measured, gaining in importance. This constitutes a critical paradigm shift framed around questions such as: what customer data is needed, how to analyse it, how to extract meaning from it and act accordingly, and how to make sure all relevant stakeholders can leverage it?

The change will need to be driven by organisations with a clear vision for their transformation, for devising service design decision-making processes based on new types of data, for the re-skilling of their people, and the profiles of personnel they seek to hire. Luxembourg has started this transformation towards effective service design and builds unique solutions based on its partnership with the UL.



Key facts about CFL studies conducted with passengers these last years



Multiple qualitative studies conducted in 2022 with

83
customers

about **passenger information**: passenger experiences with CFL mobile app (30 individual interviews), information messages and contents (17 passengers), overall passenger information (16 passengers documenting their experiences), and future passenger information (20 passengers).



6 093
customers

interviewed in person about their **service satisfaction** in trains, train stations, and buses (2022).



736 customers

interviewed in trains about **passenger information** through a survey to confirm quantitatively our qualitative studies (2022)



Studies in 2020 with **around**

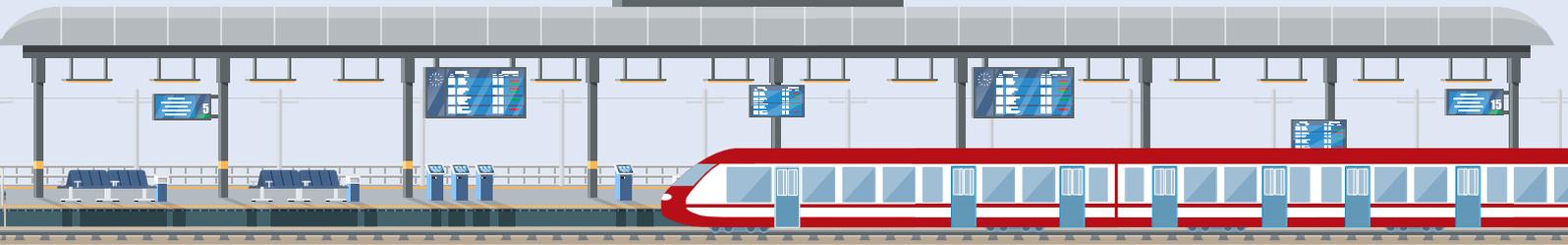
70 customers

and some employees about the train stations of tomorrow (identification of passengers' essential needs, commercial services in stations, environments, and urban revitalization)

Co-thinking of the "Park and Ride" App with customers (2020)

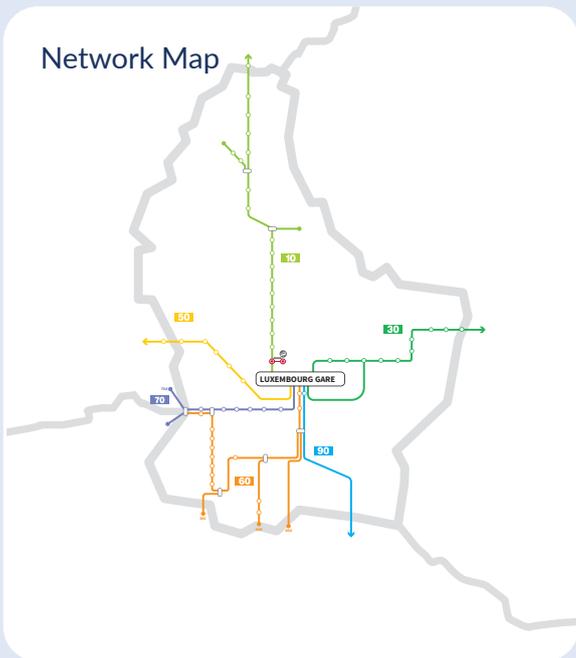


RAILWAY STATION



Key facts

Network Map



Share of the transborder traffic:

42%

of the trains on the network have either as a departure or as terminus a **station abroad**.



Passengers satisfaction (on the basis of the surveys) including the satisfaction with the information to the passengers in case of disruption (topic that has been discussed with a panel of passengers using User experience):

74%

(2022)



61 %

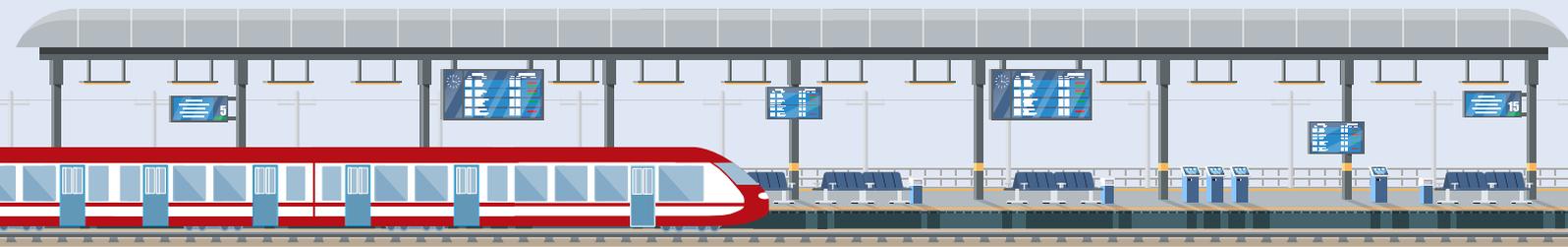
(2018)



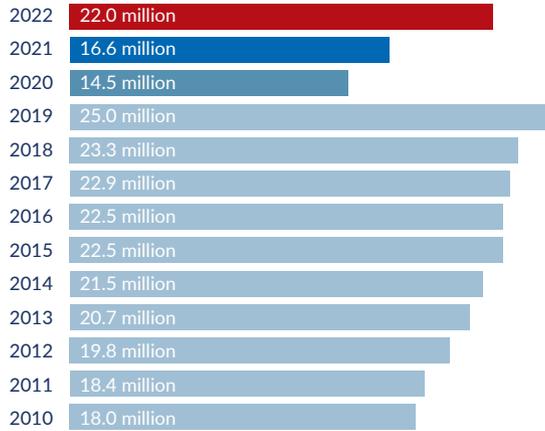
Punctuality:

90,5%

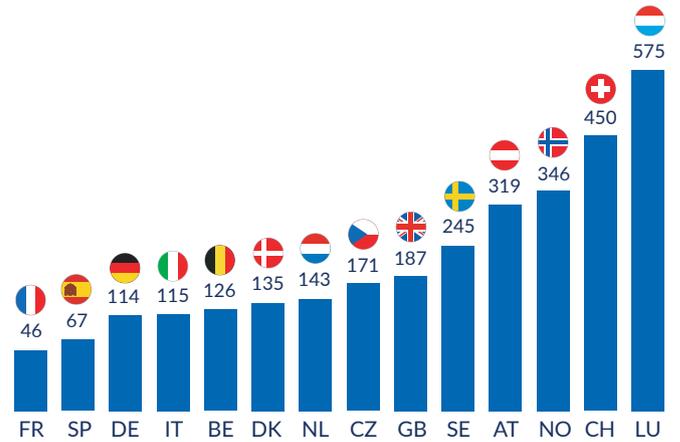
(2023)



Number of passengers (from 2010 to 2022)



Investment of the State in the infrastructure



Source: Allianz pro Schiene



First fully equipped network with ETCS (infrastructure and rolling stock) since 2017



100 %
of green electricity supply

Société Nationale des Chemins de Fer Luxembourgeois (CFL)

Founded in 1946, the "Société Nationale des Chemins de Fer Luxembourgeois" (CFL) is a national and cross-border passenger railway company and infrastructure manager for the Luxembourg rail network in charge of its maintenance and modernization. CFL Group offers various transport services for passengers and freight, covering the entire logistics chain. CFL Group also offers other commercial activities in the fields of carsharing, tourism and real estate. Its shareholders are the Grand Duchy of Luxembourg (94%), Belgium (4%) and France (2%). With more than 4,800 employees, CFL Group is also the largest employer in Luxembourg.

University of Luxembourg

The Human-Computer Interaction research group at the University of Luxembourg, led by Prof. Carine Lallemand, is a dynamic and close-knit team composed of researchers from diverse backgrounds, including HCI, psychology, design, social sciences, and legal studies. Our research encompasses various key areas, including experience design and evaluation methods, usable security and privacy, behavior change for healthier lifestyles, personal informatics, and technologies in the workplace. We're dedicated to exploring the ways in which humans interact with technology to enhance user experiences and address critical challenges in the digital world.

CER

The Community of European Railway and Infrastructure Companies (CER) brings together railway undertakings, their national associations as well as infrastructure managers and vehicle leasing companies. The membership is made up of long-established bodies, new entrants and both private and public enterprises, representing 71% of the rail network length, 76% of the rail freight business and about 92% of rail passenger operations in EU, EFTA and EU accession countries. CER represents the interests of its members towards EU policy makers and transport stakeholders, advocating rail as the backbone of a competitive and sustainable transport system in Europe.



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