UNIVERSITÉ DU
LUXEMBOURG

PhD-FHSE-2023-038
The Faculty of Humanities, Education and Social Sciences

DISSERTATION

Defence held on 16/11/2023 in Esch-sur-Alzette

to obtain the degree of

DOCTEUR DE L'UNIVERSITÉ DU LUXEMBOURG

EN PSYCHOLOGIE

by

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TRIGGERING SERVICE EMPLOYEES' EMPATHY THROUGH DESIGN METHODS

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Triggering Service Employees' Empathy Through Design Methods

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Design layout	Luce Drouet
Illustrations	unDraw - undraw.co (open source licence)
Icons	freepik.com, flaticon.com (collections free for personal and commercial use), iconfinder.com (phosphor icons collection)
Fonts	Nexa Sans Serif Font Family Fontfabric, Avenir (personal use license)
Printed by	Mister Copy, Luxembourg
ISBN	

Drouet, L. (2023). Triggering Service Employees' Empathy through Design Methods. (Doctoral dissertation). University of Luxembourg

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Triggering Service Employees' Empathy Through Design Methods

Doctoral dissertation by Luce Drouet

University of Luxembourg

Chemins de Fer Luxembourgeois - CFL

Funding source	This work is supported by the Luxembourgish Railway - CFL. This is a research project with the objectives to support the understanding of passenger experience, the improvement of the service experience, and the increase company service employees' empathy towards passengers. The funding source has no involvement in the studies designs; in collection, analysis and interpretation of data; in the writing of the reports; and in the decision to submit the articles for publication.
Declaration of competing interest	The first author of this thesis and the other authors of the papers included in this thesis, declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this thesis.

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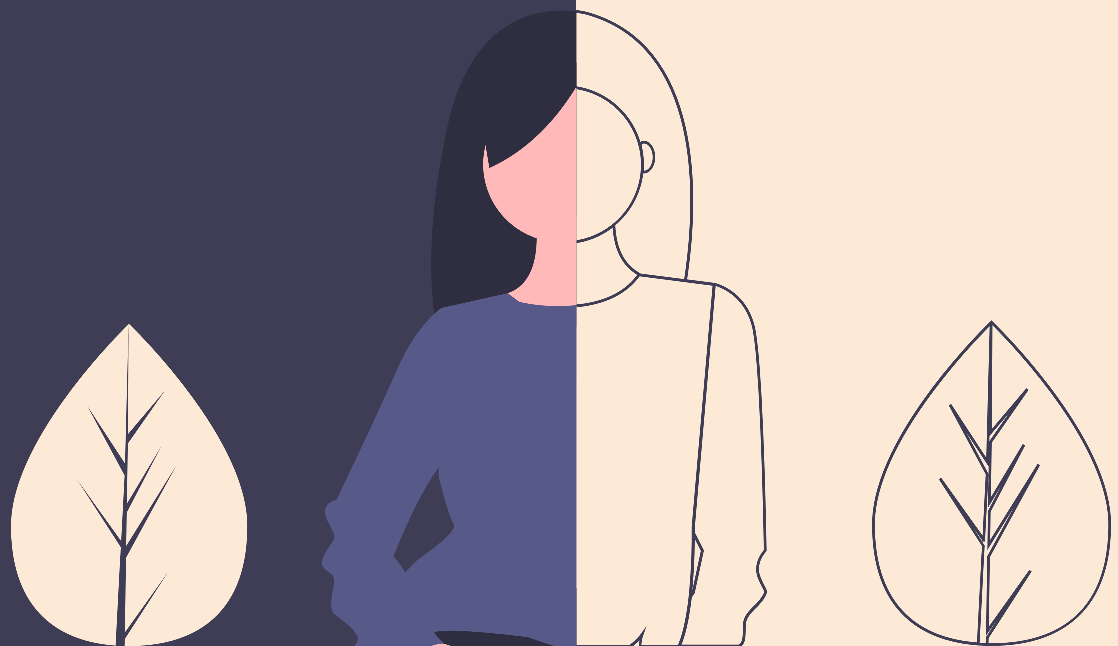


> “Empathy is the art of stepping imaginatively into the shoes of another person, understanding their feelings and perspectives, and using that understanding to guide your actions.”

Krznaric (2014)

Acknowledgments

To begin this manuscript, I would like to express my gratitude to all those who accompanied and supported me throughout my Ph.D.

First and foremost, I sincerely thank my dear supervisor: Prof. Carine Lallemand. Carine, I am immensely grateful for your invaluable guidance in achieving each piece of this thesis, for introducing me to the world of research and its enjoyable aspects, for your patience with my beginner skills in statistics, and for instilling confidence in my research, writing, and analysis skills. While using your book on UX methods as my bible to self-learn user research during my first UX designer positions, I could not have asked for a better mentor to teach me dedication, excellence, and ethical conduct in design and HCI research.

I deeply thank my committee members: Prof. Francesco Viti, Prof. Himanshu Verma, Tom Nickels, and, by extension Prof. Vincent Koenig. They all played crucial roles in my Ph.D. journey. Francesco, thank you for your unwavering support throughout my Ph.D. journey. I always appreciated your wise advice. Himanshu, I am grateful for your guidance in the last part of this Ph.D. journey, opening the doors to the empathic HCI community and allowing me to actively organize the EmpathiCH'23 workshop at the CHI'23 conference. Tom, thank you for helping me build bridges between academia and industry and for consistently recognizing the value of my work with CFL. Vincent, thank you for initiating this project, securing funding, and calling me to become the Ph.D. candidate on that research project.

I thank gratefully CFL for supporting this research project and ensuring I had all the necessary resources at CFL to accomplish this work. I especially thank Sophie Lacour. Sophie, thank you for welcoming me as a full-fledged member of your team at CFL and learning by my side how to collaborate with academic research in the industry. I want to thank my colleagues at CFL, some of whom participated in my research, shared their office space, or simply provided support with smiles and coffee cups: Angie, Bob, David, Gilles, Lisa, Maïté, Myriam, Prunelle, and Solveig. Additionally, I would also like to acknowledge Marc Wengler, CEO of CFL, for his interest in my work and the value he placed upon it. I want also to thank all the CFL employees who participated in my studies. I extend my gratitude to all the CFL passengers who voluntarily took the time to share their feedback on CFL service.

I would also like to deeply thank my dear colleagues from the HCI research team at University of Luxembourg. Thank you for encouraging me, beta-testing my protocols, making me rehearsal for my presentations, correcting my English, reviewing my papers, and a thousand other things. I especially thank Kerstin Bongard-Blanchy, Sophie Doublet, and Vincent Fourrier, who followed me along my Ph.D. journey and peer-reviewed sections or the entire manuscript. Thanks a lot, Margault Sacré, for helping me with statistics and peer-reviewing some of my papers. I am also thankful for all the others who were more than simple colleagues during these last four years. Our HCI research team lived tough moments, I will always remember the great moments we shared around drinks, good foods, music or along parties. You are all unique and wonderful people: Alina, Anastasia, Björn, Chris, Florence, Huiyun, Lorena, Mélodie, Nisan, Reha, Romain, Suvo, Verena and Xiaowei.

I want also to express my gratitude to the amazing and inspiring Professors and researchers I had the privilege to meet at international conferences and during my research stays at TU Delft, among them: Prof. Froukje Sleeswijk Visser for showing great enthusiasm for my project and co-authoring one paper with me. Thank you to the EmpathiCH crew for your engagement in the empathy topic in HCI, among them; Prof. Andrea Mauri, Prof. Thiemo Wambsganss, and Wo Meijer. Thank you Uğur Genç for our discussions about empathy. I also want to thank all the wonderful Ph.D. candidates I met along my journey with whom I had exciting discussions about research and Ph.D. life; among them, Adnan, Alejandra, Ariane, Benedetta, Behzad, Bikey, Carolina, Isabel, Milos, Nadine, Robin, Roy, Samuele, Tessa, Vittoria... I hope I will have the opportunity to meet you again in the future.

I extend my appreciation to all the anonymous reviewers who, though not always making my life easy, contributed to the quality of my work.

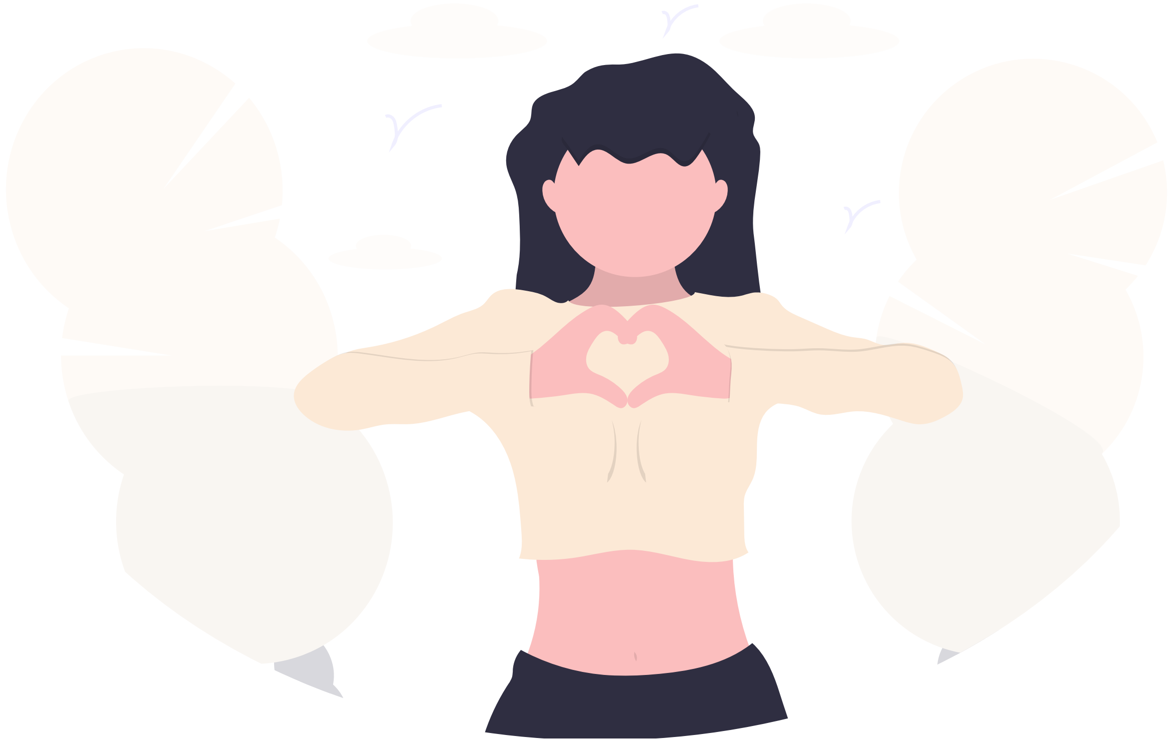
Furthermore, I thank my esteemed external jury members, Prof. Virpi Roto and Prof. Froukje Sleeswijk Visser, for graciously accepting this responsibility. I look forward to our engaging and insightful discussions during the defense.

I am also grateful to all the professionals in UX, CX, and the railway sector whom I had the opportunity to meet along my journey and who served as sources of inspiration. I am thinking, in particular, of the Flupa community and the International Union of Railway (UIC) Customer Experience community.

As my passion for design grew over the years, fueled by the passion of others, I am grateful to all those who showed me the path to becoming a designer. Special mention goes to my dear cousin Alexandre Vannier, the first UX designer I met who provided me with my first freelance UX missions. I thank Jean-Denis Poullain for allowing me to get my first official position as a UX designer at Orange. Thank you to my dear first UX Lead, Régis Gargot, who taught me everything in interface design.

My last thanks go to my family and close friends who encouraged my decision to do a Ph.D. and sometimes even acted as "pre-pre-test" participants as passengers and professionals in service, among them: Dominique, Florian, Quentin, Pierre, Elise, Guillaume, Elke, Margaux, Max, Florent, Estelle, Florie, Ben, Arthur, Clémence, Maryse, Carla, Léa, Virginie, Anne-Cécile, Estelle...

I would like to extend a special thanks to my life partner, Cédric, who joined me on my ongoing Ph.D. adventure and brought me immense happiness. Without his love, unwavering support, and delicious homemade dishes, this intellectual marathon would have been even more challenging.



List of publications

This thesis is a cumulative dissertation based on the following manuscripts, published or under submission in international peer-reviewed venues. Three papers have been submitted, and one has been published in high-ranked international journals. Three papers have been published as conference publications.

We start this dissertation with an introduction presenting the related work, our research approach, and contributions (Chapter 1). Papers A to E, presenting empirical studies, follow this introduction chapter and are part of the chapters: 2. Understanding, 3. Scale development, and 4. Empathic design interventions. Papers F and G are position papers included in the discussion Chapter 5.

Paper A	Drouet, L., Lallemand, C., Koenig, V., and Bongard-Blanchy, K. 2023. Uncovering Factors Influencing Railway Passenger Experiences Through Love and Breakup Declarations. Applied Ergonomics, 111. https://doi.org/10.1016/j.apergo.2023.104030
Paper B	Drouet, L., Bongard-Blanchy, K., and Lallemand, C., 2023. Development of the Empathy in Design Scale (EMPA-D): Measuring Employees' Empathy Towards Users in Service Design. Submitted for journal publication.
Paper C	Lallemand, C., Lauret, J., and Drouet, L., 2022. Physical Journey Maps: Staging Users' Experiences to Increase Stakeholders' Empathy Towards Users. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 Extended Abstracts), April 29–May 05, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3491101.3519630
Paper D	Drouet, L., and Lallemand, C., 2023. Leveraging Passengers' Love and Breakup Declarations to Trigger Service Employees' Empathy in the Context of Railway Transportation. Submitted for journal publication.
Paper E	Drouet, L., and Lallemand, C., 2023. Do Co-creation Workshops Trigger Empathy? Unraveling Empathic Attitudes Between Service Employees and Users During Co-creation Workshops. Submitted for journal publication.

Paper F	Drouet, L., Sleeswijk Visser, F., and Lallemand, C., 2023. Using Empathy-Centric Design in Industry: Reflections from the UX Researcher, the Client, and the Method Expert. In EmpathiCH workshop (EMPATHICH'23), April 23, 2023, Hamburg, Germany. ACM, New York, NY, USA, 9 pages. https://doi.org/10.1145/3588967.3589130
Paper G	Drouet, L., Bongard-Blanchy, K., Lallemand, C., and Koenig, V., 2022. The Measure of Empathy in Design: How Do We Trigger Empathy Among Designers and Beyond?. In EmpathiCH workshop (EMPATHICH'22), April 26, 2022, New Orleans, USA. ACM, New York, NY, USA, 6 pages. https://empathich.com/2022/papers/EmpathiCH2022_paper_2.pdf

We also published the initial work of the EMPA-D scale development.

	Drouet, L., Bongard-Blanchy, K., Koenig, V., and Lallemand, C. 2022. Empathy in Design Scale: Development and Initial Insights. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 Extended Abstracts), April 29–May 05, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3491101.3519848

In parallel to this work, we organized the EmpathiCH workshop on empathy in design and HCI research.

	Drouet, L., Meijer, W., O'Kane, A.A., Singh, A., Wambsganss, T., Mauri, A., Verma, H., The EmpathiCH Workshop: Unraveling Empathy-Centric Design. In Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (CHI EA '23), April 23–28, 2023, Hamburg, Germany. ACM, New York, NY, USA, 9 pages. https://doi.org/10.1145/3544549.3573796

Outreach research activities

To provide the reader with a better understanding of the context in which this research was carried out, we also want to highlight the outreach research activities conducted along this Ph.D. journey. While this side work is not necessarily apparent in the manuscript, it contributed to feeding our thoughts during this research.

This thesis was conducted in partnership with the Luxembourgish railway company - CFL, for whom I provided consulting in UX design, internal presentations to raise awareness of UX value, benchmarking, participation in customer experience in railway sector networking, internal reports of research studies, and presentations of our findings within the company. This list is non-exhaustive.

We presented our research during practitioners conferences:

	"Love or break-up?" - Uncovering passenger experiences with their railway service, 2022, World Passenger Festival Conference, Amsterdam
	"Love or break-up?" - Uncovering passenger experiences with their railway service, 2021, Customer Experience Management Platform Workshop, International Union of Railway - UIC, online
	L'expérience voyageur, 2020, CFL Next Academy, Luxembourg

We published our research in practitioners magazines:

	The future of railway service design: a switch to co-design and empathy with customers, 2023, The CER Essay series - Where academic analysis meets business insight, on-going publication, Community of European Railway and Infrastructure Companies (CER), Brussels
	A la rencontre de la chercheuse Luce Drouet - Collaborer pour concevoir son service, 2021, Forum magazine, Luxembourg
	Le client au centre de notre stratégie - Tous ensemble !, 2020, CFL inside magazine, Luxembourg

Glossary

We define in this glossary the key terms recurrently used in this manuscript. This thesis is interdisciplinary, involving stakeholders and a readership with various backgrounds. Thus, we do not rely on academic definitions but rather define terms with simple words to get every reader aligned with their meaning. The following table share our layman definitions of terms regularly used in this thesis manuscript.

Term	Definition
Empathy	is the means for designers and stakeholders (e.g., service employees) to trigger the willingness to understand users and their experiences. It motivates the action (e.g., improving user experiences) and develops the ability. It is not a tool but a personal engagement. Building empathy requires getting an emotional interest towards users, taking users' perspectives actively (immersion), using their personal experience to connect with the experience of others, and keeping a self-awareness of others' reality.
Design area	
Design	is the broad area of designing things, services, products, and technologies.
User-centered design	refers to the design of things, services, products, and technologies by considering the users' expertise and experience (e.g., feelings, emotions, behaviors, thoughts). It can also be mentioned as a human-centered design in the broad sense of users.
Empathic design	is a design approach, including a set of methods, eliciting empathic understanding of users, and focusing on users' knowledge, feelings, and dreams.
Service design	is a design approach that takes into account stakeholders' experiences within the service organization beyond the users' experiences.
UX design maturity	corresponds to the deployment level of the user-centered design approach within an organization, from knowing that users are essential to deploying a UX strategy to implementing users' expertise in designing and developing things, products, services, and technologies.
Methods	
Design methods	are families of techniques to explore and research user experience, ideate, generate, and evaluate the produced designs.
Empathic design methods	are user research methods aimed at triggering and build designers' and stakeholders' empathy to design services and products for users and improve the user experience.
Stakeholders	
Designers	are people with a design and research background who have been trained to design user-centric services and products; e.g., service designer, UX designer, UI designer, user researcher.
Stakeholders /non-designers	are people who participate in shaping the user experience of services without having a research or design background. Stakeholders go from those who make decisions on service offerings to front-line staff.
UX allies	are all the stakeholders who understand the value of user-centered design and are willing to support a user-centric design approach inside their company.
Silos between teams	are the result of communication lacking between the various teams within a (service) company.
Users	are the people using the service studied from the user-centered design perspective.
Customers	are the people using/paying for the service studied from a marketing and business perspective.
Passengers	are the users of the railway service which is the study field of this thesis.

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Chapter 1.
Introduction

Empathy is one of the main drivers of a user-centered design approach. Designers use empathy as a means for taking the users' perspective ("put themselves into users' shoes") and getting an intuitive understanding of their world, their feelings, emotions, thoughts, and behaviors (Devecchi and Guerrini, 2017; Fulton Suri, 2003; Koskinen et al., 2003), Mattelmäki et al., 2014). Empathy shapes designers' user-oriented mindset. For this purpose, researchers developed an empathic design approach to build designers' empathic understanding of users through empathic user research methods. These methods have empathy characteristics: they are, for instance, visual and tactile, low-tech and cheap, or interpretative (Fulton Suri, 2003; Koskinen et al., 2003).

Beyond designers, in a service context, empathy sparks service employees' awareness of their role in users' experiences. This awareness is the ground for increasing organizations' user experience maturity (Chapman and Plewes, 2014). On the customer side, empathy develops their loyalty and forgiveness towards service companies resulting in better customer satisfaction (Bahadur et al., 2020; Marandi and Harris, 2010; Wieseke et al., 2012). While empathy plays a crucial role in customer-employee relationships in services, the empathic design methods targeted at service employees are still under-researched. Which methods can be used to trigger service employees' empathy? How do empathic design methods influence service employees' empathy towards users?

This thesis aims to understand empathic design methods and their underlying mechanisms to trigger service employees' empathy. This work also researches methods of measuring empathy to assess the employees' empathy building.

We address these two objectives by studying three empathic design methods; the physical journey map, the love and breakup declarations, and the co-creation workshops. Our field of study is the Luxembourgish railway company CFL. We investigate these methods with the employees of the company who are the service stakeholders of the passenger experience. Some of them are in direct daily contact with passengers (e.g., train conductors, ticket officers), while others are in the back office still impacting passenger experience (e.g., train traffic managers, passenger information managers). Usually focused on delivering solutions, we invited some employees to change their perspective and become user-oriented through empathic design methods. We looked to initiate a first step to build service employees' empathy towards users in the long term.

More studies on empathic design methods and empathy measurement tools dedicated to design would deepen the understanding of empathy mechanisms in design. These tools will help the research community to theorize predictive models of empathy for supporting designers in their user-centered approach inside organizations. This thesis is situated at the crossroads of user-centered design, empathic design, and service design (Figure 1).

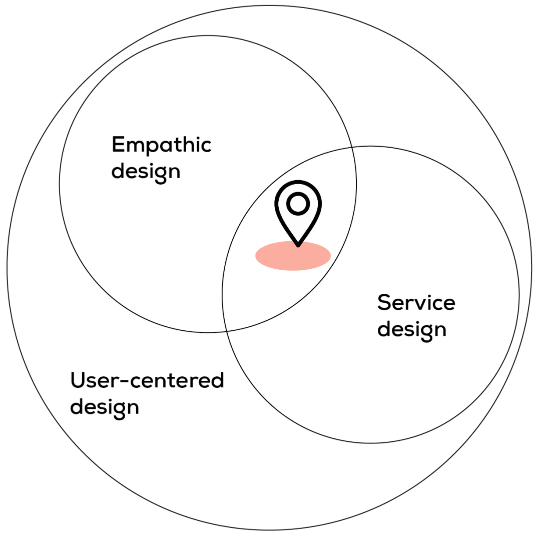

Figure 1. Research areas constituting the scope of the thesis

This thesis is divided into six chapters.

"Chapter 1. Introduction" introduces the main research topics: empathy in design, the particularities of design for services, and the opportunities of empathy in service design. It also presents our research approach.

"Chapter 2. Understand" introduces the related work on the passenger experience in the railway sector in our study field. It also presents the main factors influencing passengers' experience and shares users' inputs and materials we used in our empathic interventions in Chapter 4.

"Chapter 3. Scale development" documents the EMPA-D scale development and validation to measure service employees' empathy towards users.

"Chapter 4. Empathic design interventions" presents three studies investigating three empathic design methods with service employees.

"Chapter 5. Discussion" proposes a generalizable mapping of empathic methods to trigger service employees' empathy. The chapter reflects on our empathic design approach and the quantitative measure of empathy in service design.

"Chapter 6. Conclusion" presents the limitations of this research and introduces future work and opportunities for the design research community.

Considering empathy in design

In this related work chapter, we introduce the construct of empathy in design, and by extension, in service design. We detail the particularities of services and service design. Last, we present opportunities for building empathy in service design. We sometimes refer to the related work sections of papers in this thesis manuscript to avoid repetition.

1. The concept of empathy

Empathy is derived from the Greek word *"empatheia"* meaning *em* = "into" and *pathos* = "feeling." Empathy is used first in German psychology research as *Einfühlung* = "feeling into" (Cuff et al. 2016; Vasques et al., 2022). The Cambridge Dictionary defines empathy as *"the ability to share someone else's feelings or experiences by imagining what it would be like to be in that person's situation."*[1]

Researchers use the concept of empathy to address the following questions: *"How can one know what another person is thinking and feeling? What leads a person to respond with sensitivity and care to the suffering of another?"* (Batson, 2009). Philosophers, psychologists, and neuroscientists explain the concept of empathy through the theories of mind (i.e., the ability to reason about one's own and others' mind, Premack and Woodruff, 1978) and simulation theories (i.e., when one imagines oneself in others' situations, Batson, 2009). Batson (2009) identifies eight concepts of empathy and uses of the term in psychology literature:

- *Cognitive empathy or empathic accuracy*: knowing another person's internal state
- *Facial empathy* or *motor mimicry*, or *imitation*: adopting the posture of others (neural responses)
- *Emotion catching* or *emotional contagion* or *affective empathy* or *sympathy*: feeling as another feels (not knowing all emotions but at least one)

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[1] Two adjectives are used in English, *empathic* and *empathetic*. *Empathic* is the old form of the word, and the *empathetic* form, derived from the sympathetic form, appeared in the 30s. This manuscript uses the original form as commonly done in scientific writing (Ticak, 2022).

- *Projection* or *aesthetic empathy*: projecting self into another's situation
- *Other-perspective-taking* or *psychological empathy* or *empathic attentional* set: imagining how another is thinking and feeling
- *Imagine-self-perspective-taking*: imagining how one would think and feel in the other's place (role-taking)
- *Empathic distress* or *personal distress*: the feeling of distress at witnessing another person's suffering
- *Empathic concern*: feeling for another person suffering (the notion of emotional valence congruent)

Researchers also distinguish the concept of empathy from other related concepts such as sympathy, compassion, or emotional contagion (Ickes and Aronson, 2003).

- *Sympathy*: *"emotional participation; apprehending the other's feelings and participating in them"*
- *Compassion (compathy)*: *"emotional solidarity; sharing the same feelings by dint of sharing the same fate or current circumstance with the other"*
- *Emotional contagion (transpathy)*: *"becoming "infected" or infused with the prevailing emotional state of others"*

1.1. Definition and conceptualization of empathy in design

> *"Empathy's main job is not to help us identify the exact thoughts and feelings of others around us, but to make it possible for subjects to mutually condition one another's attention to and interpretation of the world."*
>
> Stephan (2023)

The design field defines and conceptualizes empathy based on psychology, philosophy and neuroscience theories (see related work in paper B). However, there is currently no consensus on a definition of empathy in design (Chang-Arana et al. 2022; Mauri et al., 2022). In empathic design literature, empathy is referred to as an *"intuitive ability to identify with other people's inner states based upon observation of their outward expressions, their behavior"* (Fulton Suri, 2003). It is a *"defining characteristic of designer-user relationships when the design is concerned with user experience"* (Wright and McCarthy, 2008). Tellez and Gonzalez-Tobon (2019) synthesize the design definitions of empathy as the *"ability to feel and understand other's emotions and circumstances"* and *"a fundamental skill for designers to acquire an in-depth understanding of people (i.e., end-users and other stakeholders) so that products, services, environments, systems, and experiences meet human needs, expectations, and aspirations."* Empathy is a means of changing designers' perspectives to find user-centric and ethical solutions (Barnes and Eriksson, 2015). Empathy in design is actively acquired, for instance through the willingness to be empathic.

The conceptualization of empathy in design and its theorization is still recent and requires further research (Surma-aho and Hölttä-Otto, 2022). Chang-arana et al. (2022) define empathy as an umbrella concept. They list five ways of defining empathy in design; cognitive empathy (thoughts) vs. affective empathy (feelings), circumstances (in life impact empathy), adopted attitude, use of imagination to project into someone else's situation, and matching the mental contents and imagination of designers with that of end-users. Surma-aho and Hölttä-Otto (2022) identified five core concepts and potential operationalizations for empathy in design:

(1) *empathic understanding* – the empathic knowledge about users,

(2) *empathic design research* – methods for adopting users' perspectives,

(3) *empathic design action* – designing valuable solutions for change in society,

(4) *empathic orientation* – a conscious attitude towards others based on the absence of judgment, the respect and value assigned to others' input, as well as inclusiveness and transparency,

(5) *empathic mental processes* enable the motivation and tendency to understand others.

Besides definitions, researchers have investigated the process of empathy in design. Fulton Suri (2003) describes it as the designers' navigation between two extreme conceptions of others' experience: (1) thinking that others are like oneself and will understand what one has designed, and (2) thinking that others are completely different from oneself. Imagination plays a crucial role in this navigation. It is fed by reality and needs to be continuously checked with reality (Fulton Suri, 2003).

Researchers like Hess and Fila (2016a), Kouprie and Sleewijk Visser (2009), and Smeenk et al. (2019) defined frameworks of empathy in design (see related work in paper B). Figure 2 synthesizes these main frameworks.

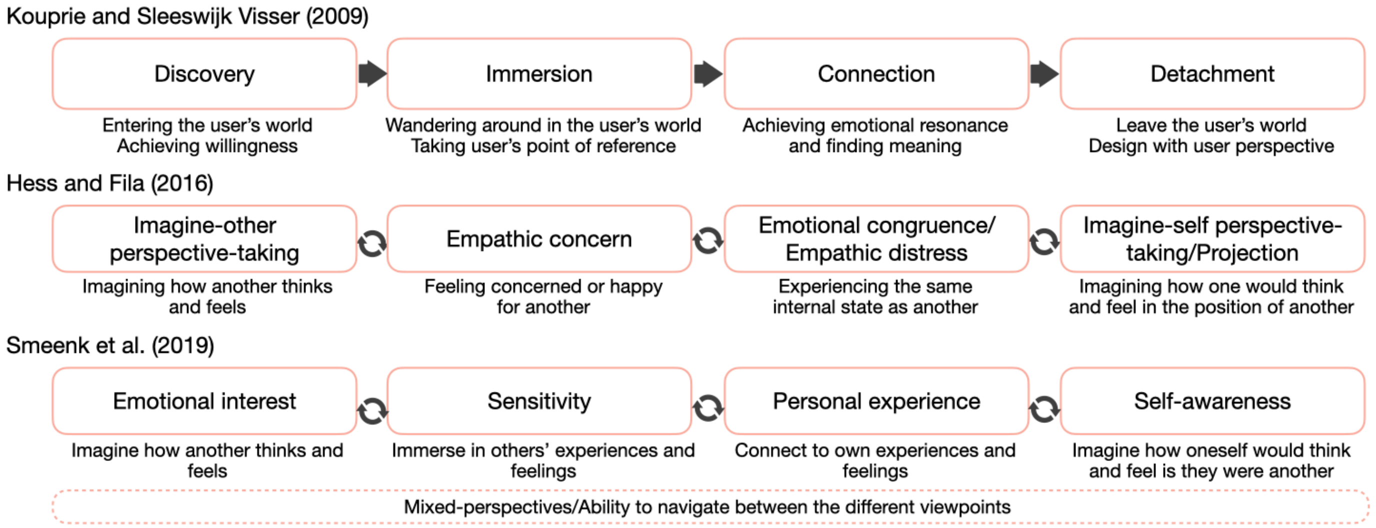

Kouprie and Sleeswijk Visser (2009)
Discovery
Entering the user's world
Achieving willingness
Immersion
Wandering around in the user's world
Taking user's point of reference
Connection
Achieving emotional resonance
and finding meaning
Detachment
Leave the user's world
Design with user perspective
Hess and Fila (2016)
Imagine-other perspective-taking
Imagining how another thinks and feels
Empathic concern
Feeling concerned or happy for another
Emotional congruence/ Empathic distress
Experiencing the same internal state as another
Imagine-self perspective-taking/Projection
Imagining how one would think and feel in the position of another
Smeenk et al. (2019)
Emotional interest
Imagine how another thinks and feels
Sensitivity
Immerse in others' experiences and feelings
Personal experience
Connect to own experiences and feelings
Self-awareness
Imagine how oneself would think and feel is they were another
Mixed-perspectives/Ability to navigate between the different viewpoints

Figure 2. Synthesis of the main frameworks of empathy in design and their overlaps (Drouet et al., 2022, 2023, Paper B)

As illustrated in the previous frameworks, perspective-taking is also essential to empathy. Authors like Smeenk et al. (2016) focus on that aspect of empathy and explain how to navigate between three perspectives: the *first-person perspective* – from the designers' own experience, the *second-person*– with the others/users, the *third-person*– detached from the context and the others/users. All these perspectives can be combined in a design process.

1.2. Empathic design

Empathy is a key element in design for practitioners to understand users and their experience (Surma-aho and Hölttä-Otto, 2022). Representations of design thinking processes often refer to user research as the act of empathizing with users (Interaction-Design, 2022). Empathic Design, which emerged in the late 1990s (Leonard and Rayport, 1997), is based on empathic user research methods (e.g., role-play, probes, journey maps) to foster designers' empathy towards users (Chang-Arana et al., 2022). The empathic design approach includes multiple empirical research methods to develop products and services focusing on empathy towards users (Koskinen et al., 2003).

Empathic design is based on core beliefs. *"People give meanings to things and act on these meanings, and these meanings both arise and are modified in interactions."* (Mattelmäki et al., 2014). One of the first core belief is that empathic research has to be done in a real context, as people's interactions happen in real life. The analysis of empathic research leads to explanations of the meanings, for the design purpose and not only for the explanations themselves. The meanings are understood through making, visualizing, and prototyping (Mattelmäki et al., 2014). Human experience and emotions should be represented through visual, narrative, and tangible creations (Lee, 2014). Unlike traditional market research, Martin Bontoft from IDEO (McGinley and Dong, 2011) explains that empathic research is for inspiration less than for looking after the truth. Often based on qualitative research, empathic research investigates with small samples. *"Whenever the aim is to understand people, designers have to work with a small number of cases. The effort that goes into analyzing each case is considerable. Think about someone who would like to understand your parents, and you get an idea of how vast the task would be. Out of necessity, empathic design relies on purposeful rather than statistical sampling in selecting people for user studies."* (Koskinen et al. 2003).

1.3. Empathic design methods

Empathic design methods allow designers to immerse themselves in the user's experience, and ultimately shift from simple intuitions to suitable concepts (Koskinen et al., 2003). *"We learn about what other people think and feel through empathic interpretation of what they say and do."* (Fulton Suri, 2003). Sanders and Stappers (2012) clarify the meaning of "what people say and do," explaining that "what users say" corresponds to "what people know and tell" and "what users do" equals "seeing and observing what people do." They complete the

Interest in empathy grows when looking at Google trends (Figure 3). Similarly, the trend shows an interesting peak for the term "Empathy design" at the emergence of empathic design, and then the interest grew over time (Figure 4).

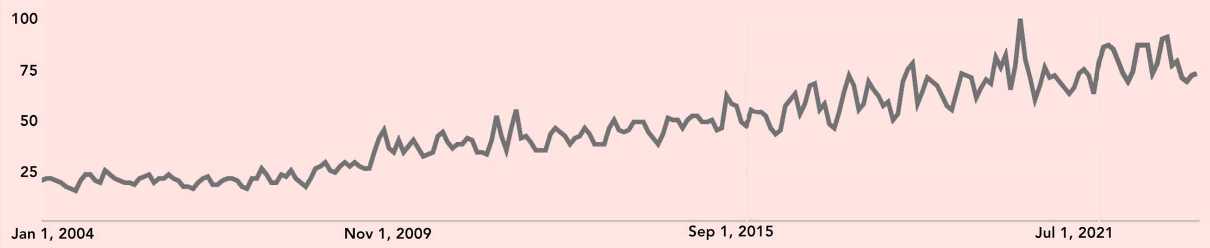


Figure 3. "Empathy" interest over time on Google trends

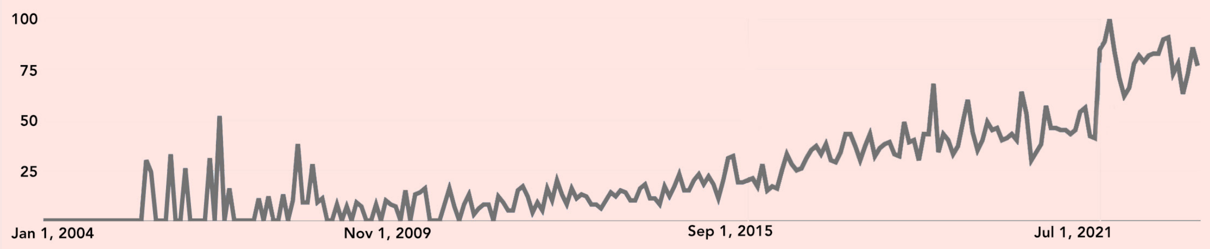


Figure 4. "Empathy design" interest over time on Google trends

model for understanding people with the element "make," meaning the non-verbal, emotions, and dreams (Figure 5., Koskinen et al., 2003; Sanders and Stappers, 2012). Fulton Suri (2003) defines three ways of connecting with people: looking at what people do, asking people to participate, and trying things ourselves. Empathic methods generate inspiring and informative material to feed the image of what is experienced for others (Fulton Suri, 2003). In complement to traditional design methods (i.e., focusing on how people do and use, e.g., observation) and marketing methods (i.e., focusing on how people say and think, e.g., focus groups and questionnaires), empathic methods also explore these aspects however they go beyond and study what people know (their experience is their expertise), feel, and dream (Koskinen et al., 2003); the "make."

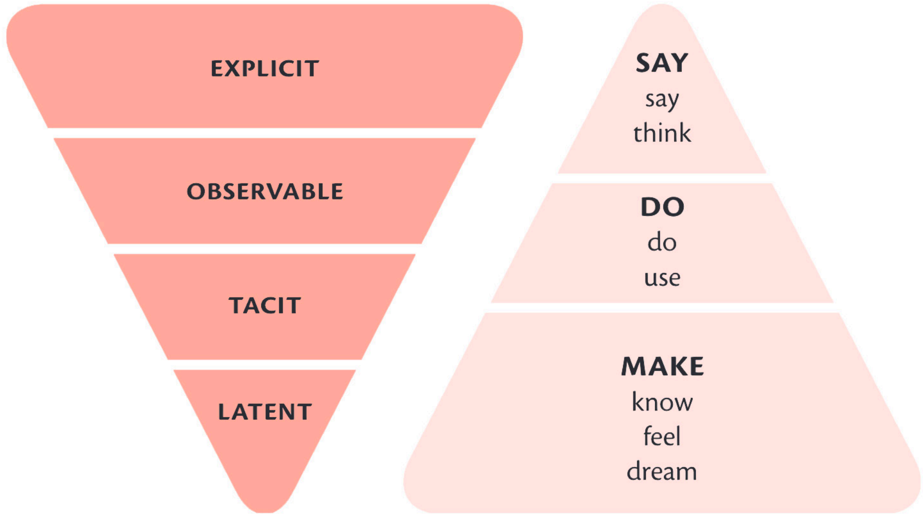


Figure 5. Say-Do-Make model to empathetically understand user experience (Koskinen et al., 2003; Sanders and Stappers, 2012)

These specific methods include empathic qualities that trigger empathy (Koskinen et al., 2003); being visual and tactile, deliberately cheap and low tech, interpretive (understanding how people understand themselves), playful and fun, tested in reality, and targeted at the fuzzy front end (of the design process). Lee (2014) adds that empathic design methods include creative components. Empathic design methods are user-centered (Koskinen et al., 2003), future-oriented (i.e., looking for future solutions), and design-led (Lee, 2014). They are sometimes named "emotional toolkits" when they focus on visuals, narratives, and playful aspects, and "cognitive toolkits" when they focus on mapping the experience (Koskinen et al., 2003). Empathic methods go beyond the moment they are used (Wright and McCarthy, 2008), through the material they generate, and the analysis of this material. But also when the outputs generated through these methods are spread inside the designers' teams. Empathic methods are as well part of the overall empathic process.

Table 1 presents some key methods designers use to empathize with users, mostly based on ethnographic, narrative, and fictional techniques (Pagán, 2022; Wright and McCarthy, 2008). We review also techniques to convey an empathic understanding in the related work of Paper C. These techniques are often mapping techniques borrowed from service design methods (e.g., personas, storytelling, empathy map) and mainly based on narratives, role-play, and simulation techniques (Chang-Arana et al., 2022).

1.4. Empathy building

1.4.1. Methods to teach empathy in design

Empathic methods address many objectives such as researching the user experience or communicating an empathic understanding of users. They can be powerful in understanding others' realities. However, building empathy is a learning process which requires time and is still under-researched in design. The development of dedicated formations to teach empathy to design students is quite recent. These are grounded on existing empathy frameworks and empathic methods in design. We review some of them.

Smeenk et al. (2019) theorized an "Empathic Formation Compass," helping design students to co-design with users. It teaches how to navigate between the perspectives and how to behave as a design professional along an empathic design process. The compass includes some techniques to develop students' self- or other- perspectives, their affective or cognitive empathy, participatory mindset, and their design- or research-leading. Strikkers (2021) proposed an "Empathic Habits" program, including five activities training the design students' skills in listening, self-awareness, involvement of stakeholders, selecting valuable information, imagination and understanding. More recently, Pagán (2022) developed the Eindhoven Empathy Model: *"To empathize with someone else, we need to have some empathic ability and some proximity to the other person's experience."* Building empathy thus requires building empathic ability and proximity with others. Both factors are essential; however, the increase of one can offset the lack of the other. Therefore, teaching empathy must be based on this function: *Empathy = Ability x Proximity*. Beyond developing designers' empathy towards users, the design field also investigated how to build empathy in the context of team collaboration (e.g., the "Empathy Hive" game (Steenbakkers, 2015)).

Table 1. Key empathic design approaches or methods documented in the literature

Method	Definition	References examples
Design ethnography	is the study of people in their natural settings resulting in the description of their social life and culture part of a social system. The approach encompasses various research methods to get an analytic and empathic understanding of people. It is based on "a feel for or sense of the other," the observation and participation in people's life. Design ethnography includes qualitative methods such as observation and cultural probes.	Blythe et al. (2002) Enninga et al. (2013) Hanington and Martin (2012) Lee (2014) Sustar and Mattelmäki (2017) Wright and McCarthy (2008)
Field observations	are the collection of observable data of a population or individuals. The data are behaviors, attitudes, verbal elements, social interactions, or technology interactions. The observation of people's behavior lasts in the context. It nuances the wrong assumptions. There are different ways of observing people in their context: participant observation, non-participant observation, fly-on-the-wall, or shadowing techniques.	Lallemand and Gronier (2018) Pagán (2022)
Interviews	are the verbally inquiring into someone's experience, attitudes, and behaviors in response to the researcher's questions. Interviews explore people's attitudes, opinions, preferences, beliefs, and mental schemes. There are different interview techniques: as structured interviews, semi-structured, group, or individual interviews.	Lallemand and Gronier (2018) Pagán (2022)
Design documentaries	*"Filmmakers who believe that reality can be captured through neutral observation have adopted a self-explanatory name for their genre: fly-on-the-wall documentaries. The intention of such films is to simply observe without intervention, and thus they permit no interviews, reenactments, film lights, narration, dissolves in the editing, etc."* Design documentaries show behaviors and attitudes without intervention with a neutral observation objective.	Raijmakers et al. (2006)
Cultural/Empathy probes	are kits of creative and suggestive activities used to explore people's lives and experiences in their real context. These kits encourage people to interpret, document, and express their ideas and experiences through the activities. They support the dialogue between designers and people. They aim to inspire designers when reading and looking at the material collected. Probes support the empathic understanding of users as if they were telling their stories directly. The activities include e.g., filling postcards, taking pictures, drawing, or writing a love letter.	Gaver et al. (1999) Koskinen et al. (2003) Lallemand and Gronier (2018) Mattelmäki (2006) Mattelmäki and Battarbee (2002) Wright and McCarthy (2008)
Role-plays	designate the use of theater techniques to understand and include people's perspectives in a participative approach. The designer plays the user's role in immersing themselves in the experience and pretending to step in the user's shoes. Acting in a role invites one to explore the emotional states of others. It engages the actor to imagine what it is to be like the others.	Chang-Arana et al. (2022) Medler and Magerko (2010) Newell et al. (2006) Pagán (2022) Wright and McCarthy (2008)
Design games	mediate others' perspectives and support empathy. These are usually cards or boarding games but they can also be digital. Their qualities have the potential to impact society: think, for instance, about games that sensitize people to social changes or bullying. Playing a role helps designers to step out of their cognitive process and to experience those of others. Vaajakallio and Mattelmäki (2014) identified four uses of design games: *for research to observe people's behavior, for building design competence, for empowering users*, and *for engaging multiple stakeholders.*	Mattelmäki et al. (2014) Papoutsi and Drigas (2016) Vaajakallio and Mattelmäki (2014)
Autobiographical design/ First-person methods	are a form of *"design research drawing on extensive, genuine usage by those creating or building the system."* (Neustaedter and Sengers, 2012). This is usually the designers' personal experience when using technologies for which they are the targeted users.	Neustaedter and Sengers (2012) Wright and McCarthy (2008)

Simulators	are artifacts helping to simulate others' contexts and behaviors (e.g., elder interactions, dementia). Simulators engage the designers in people's experiences. The simulators can be physical or virtual spaces reproducing specific realities like those of dementia people, elders, or young people.	Chang-Arana et al. (2022) Kullman (2016) Smeenk et al. (2017)
Experience prototypes	are concrete representations of a system, product, or service. This representation involves different levels of realism, from low to high-fidelity prototypes. The prototypes support exploring future product personal relationships and how people would experience the product.	Koskinen et al. (2003) Lallemand and Gronier (2018) Sleeswjk Visser (2013) Wright and McCarthy (2008)
Storytelling methods	are the use of scenarios to convey and communicate people's experience with a product or service. The stories provide rich descriptions of user experience. Narrative techniques facilitate the imagination of others' experiences. Storytelling methods include design tools such as personas, scenarios, and storyboards.	Battarbee in Koskinen et al. (2003) Lallemand and Gronier (2018) Wright and McCarthy (2008)
Participatory, co-design, and co-creation methods	are methods to collect data through collaborative activities with users and designers to generate collective ideas and solutions. Co-creation usually involves workshop sessions, including generative activities focused on making with visual and tactile material. Co-creation happens in an overall co-design process, including the users at different stages of the design process. These techniques are grounded in a participatory design approach, including political and social implications.	Akoglu and Dankl (2021) Sanders and Stappers (2008, 2012) Smeenk et al. (2016) Sustar and Mattelmäki (2017) Yuan and Dong (2014)

1.4.2. Methods to teach empathy in other research fields

Many fields other than design, such as engineering, health, education, or psychology, have an interest in teaching empathy skills. This body of work is a source of inspiration for the design field. We review some examples with a focus on the engineering and healthcare field, as these have documented attempts and methods for teaching empathy to service stakeholders (e.g., nurses or engineers).

The healthcare field prolifically researches pedagogical methods to develop and assess medical staff empathy. To only mention a few illustrative examples, Pratiwi et al. (2022) reviewed educational interventions to improve the empathy of pharmacy students. The following methods were used: workshops and discussions on empathy performance or focused on specific diseases (e.g., diabetes), aging simulation games, participatory workshop with elders, intergenerational reverse mentoring program, and virtual patient for geriatric software. Tariq et al. (2023) conducted a 5-years longitudinal study to assess the development of empathy throughout medical student formation. Including six targeted empathy activities in the third and fifth years. These were weekly patient-centered learning workshops, including reflective writing, role-play, and activities developing humanities and communication skills. Last example in healthcare, Rodríguez-Ferrer et al. (2022) designed an online escape game to develop nursing students' empathy towards patients.

Closer to design field, the engineering field also addressed empathy training development. For instance, Alzayed et al. (2021) studied empathy changes in engineering students over eight weeks. They did not find an increase in empathy, probably because the students struggled to get in contact with users during the design process. Lunn and Bell-Huff (2022) investigated engineering students' empathy through remote weekly meetings inviting them to self-reflect on their learning pathways. They did not observe significant quantitative changes in empathy; however, their qualitative analysis demonstrated the students' awareness of their power to create value for society. Other researchers developed dedicated education programs to build students' empathy. Walther et al. (2020) built an engineering formation focusing on developing empathic skills through exercises on body language, proximity with others, and the training of affective responding, among other activities. They observed the challenges for the students to engage with users, be aware of their difference of knowledge with users, balance their expectations of such training, and understand the value of empathy. More recently, Sanz et al. (2023) developed the SPC model for empathy development of computer science students.

The model supports the development of:

- Six Skills: *self-awareness, emotion regulation, affective sharing, awareness of others, perspective-taking*, and *mode switching* (between empathic and analytic cognitive mechanisms),
- Six Professional Performance attitudes: *openness to cultural otherness and to the beliefs of others, world views, and practices, respect, civic-mindedness, responsibility, self-efficacy, tolerance of ambiguity,* and
- Three Global Citizenship aspects of value: sustainable development, human dignity, and cooperation.

An iterative cycle of various activities, is taught in class to achieve these goals: sensitization, appropriation, awareness, deployment, evaluation, and feedback.

In these other fields such as healthcare and engineering, the researchers investigating empathy building, measured empathy in longitudinal studies to ensure the effectiveness of the pedagogical interventions.

1.5. The measure of empathy in design

In the same way that design defines empathy based on prior work in psychology and neuroscience, the design field draws on measures of empathy in these two related areas. A simplified overview of empathy measurement tools includes self-report instruments and scales, physiological measures, and verbal or behavioral cues.

The psychology field developed various self-reported scales to measure individuals' empathy (see related work in Paper B). On the neuroscience side, empathy is frequently measured through physiological measures, for instance, facial synchrony – recognition of facial emotions, motion synchrony – motion capture of nonverbal cues, physiological synchrony – e.g., cardiac interbeat interval, or Magnetic Resonance Imaging – brain activation (Surma-aho and Hölttä-Otto, 2022). Qualitative and prosocial measures include verbal or behavioral cues of empathy. Observation of prosocial behavior (e.g., helping someone, taking altruistic decisions) or reactions to others' painful experiences, can inform about empathy (Surma-aho and Hölttä-Otto, 2022). Discourse analysis supported by qualitative data analysis techniques (Weber et al. 2022; Lee et al., 2022) or machine learning (Wambsganss et al., 2022, 2021) can also reveal expressions of empathy, e.g., through the tone of voice, facial expressions, or prosocial language (Rojas et al., 2022).

Although many measures of empathy exist in areas close to the design sciences, these measures do not assess empathy in the design process context. They focus mainly on measuring the individuals' personal ability to empathize in general with others. They assess the predispositions to be empathic and not the willingness to cognitively and affectively understand users of a service or a product to improve their user experience.

The design field relies on these previous fields' assessment tools to measure designers' empathy when designing products or services. Empathy assessment techniques in design mainly rely on qualitative methods rather than quantitative (see related work in Paper B). Surma-aho and Hölttä-Otto (2022) distinguish six techniques for measuring empathy:

- *empathic tendencies* – self-reporting tools assessing how a person would behave in different contexts,
- *beliefs about empathy* – self-reporting tools rating the importance of empathy towards others,
- *emotion recognition* – through visual material depicting people's emotions,
- *understanding mental contents* – assessing in real-time the valence and intensity of others' emotions,
- *shared feelings* – observed via neural-sensors, and
- *prosocial responding* – when a situation of hurting others is simulated.

Chang-Arana et al. (2022) propose an alternative classification based on empathy components in psychology:

- the assessment of *emotional response* through physiological responses,
- the measure of *trait of capacity* through self-reported tools,
- the assessment of *state influences* (context, experiences, culture) through the effect of a specific intervention,
- the *understanding or cognitive empathy* through methods triggering the adoption of another's point of view,
- the *top-down control* through perspective-taking methods asking people to empathize with a specific target, and
- the *source of emotion (is not one's own)* through methods inducing external emotions.

These ways of assessing empathy are more or less adapted to some phases of the empathy frameworks in design. Chang-Arana et al. (2022) link these measuring methods with the steps of empathy design frameworks (Table 2).

Table 2. Empathic aspects to measure, following the empathy framework phases (based on Figure 1 of Chang-Arana et al. (2022))

Empathy framework phases	Empathic aspects
Kouprie and Sleeswijk Visser (2009)'s empathy framework	
Discovery	Emotional response, State influences, Stimulus of emotion
Immersion	Trait capacities, State influences, Understanding
Connection	Emotional response, Trait capacities, Understanding
Detachment	Not one's own
Smeenk et al. (2019)'s empathy model	
Design activity more focused on self or other	Not one's own
Design activity more affective or more cognitive	Emotional response, Trait capacities, Top-down control, Understanding
Design activity has taken with a more participatory or expert mindset	Emotional response, Top-down control
Design activity more design- or research-led	Top-down control, Understanding

2. Designing for services

> *"Service design is the activity of choreographing people, infrastructure, communication, and material components of a service in order to create value for the multiple stakeholders involved. In the very early times, we were focused on designing interfaces, touchpoints, and artifacts that were usable, useful, and desirable for users. Today we see that value should be distributed equally among all stakeholders."*
>
> Mager's interview in Penin (2018)

To understand the design of services, it is necessary to consider design and service research literature. In this section, we first use service research literature, particularly to inform the definition of services and the underlying quality measures. Second, we define service design and review associated measurement instruments.

2.1. Service logic

> *"Service is the application of competencies (knowledge and skills) by one entity for the benefit of another"*
>
> Vargo et al. (2008)

2.1.1. Characteristics of services

The question of the value is central to understanding the services. In contrast with the *value-in-exchange* of product logic, service logic focuses on *value-in-use* (Ng et al., 2009). From people's perspective, services deliver value in use through interactions between user and service company (Vargo et al., 2008) and emotional appraisal (based on product appraisal theories (Desmet, 2003)) as well as in social context (Sleeswijk Visser, 2013). Services in society build and support social relationships and interactions. *"Services are the soft infrastructure of society. [...] The events of our lives are interconnected through a myriad of different services."* (p.34, (Penin, 2018)).

Four characteristics define a service (Penin, 2018). They are:

(1) intangibles: they cannot be sensed, touched, felt, or tasted,

(2) heterogeneous: each service is unique, with human-to-human interactions never the same and dependent on cultural contexts,

(3) inseparable because of the simultaneity of the production and consumption (i.e., user experience of the delivery process), and

(4) perishable: most of the time the services cannot be stored.

The physicalization of service is done through the multiple touchpoints (i.e., they are human-human, human-machine, and sometimes machine-machine interactions), channels (i.e., media facilitating the touchpoints), and servicescapes (i.e., the *"atmospherics and decorative elements"*) that compose it (Penin, 2018).

Services are multidisciplinary. Including complex systems, they require various skills and backgrounds. Multiple disciplines shape the services - technologies, engineering, human interactions, marketing, design, and computer sciences (Penin, 2018; Stickdorn and Schneider, 2012). In consequence, a variety of stakeholders are involved in delivering services. By extension, the customers also play a central role.

The collaboration with customers is a key aspect of service, valued for delivering quality services and products. Customers play various roles in the co-production of a service (Kuusisto and Päällysaho, 2008). They first passively co-product the service through their consumption of it. They also co-perform the tasks and co-create the service value through their users' value. Last, they co-design and improve the service when sharing their experience as users (e.g., during user tests), their opinion about the service, and when participating in discussions with service suppliers (Kuusisto and Päällysaho, 2008). This participation is also beneficial to change the customers' perception of the service when participating in the production (Bendapudi and Leone, 2003).

2.1.2. Traditional service quality measures

Service companies generally use satisfaction surveys to gather customers' opinions (Foglieni et al., 2018; Stickdorn et al., 2018) and improve the service experience. Developed in 1988, SERVQUAL is one of the most famous service quality measurement tool (Parasuraman et al., 1988). This self-administered questionnaire measures five categories: reliability, responsiveness, assurance, empathy, and tangibles. The RATER questionnaire is a simplified version of SERVQUAL (Zeithaml et al., 1990). The scale compares users' expectations with their experience. A more recent and popular measure is the Net Promoter Score (Reichheld, 2003), which measures service value through opinion. Items are based on the customers' willingness to promote the service to others. Besides satisfaction surveys, other service quality measures inform customers' satisfaction and service performance. Opinion mining investigates customers' opinions on social media (Lee et al., 2008). The method is often used to get customers' feedback about the service and investigate their satisfaction. Service organizations also assess the service performance to define the quality of the service delivered. Service performance can be measured through tools like Key Performance Indicators (KPI), or conversion/retention rates. Other measures assess the social impact of services in the logic that quality services positively impact society. This impact is measured through tools such as the Social Return On Investment (SROI), which measures social, environmental, and economic costs and benefits (Nicholls et al., 2012). Similarly, Logic Modeling measures the service system impacts: modeling the relations between the short-term outcomes produced by the service and the long-term community goals (Julian, 1997).

Traditional service quality measures focus on service performance and organizational value. They focus on the *"what"* of services, inform on problems, and point to internal silos organizations (i.e., lack of communication between teams); however, it does not help to understand the *"why"* (Foglieni et al., 2018) nor how to solve problems. One of the reason is that traditional metrics usually measure one specific service aspect (e.g., one specific touchpoint) instead of covering the overall service experience or service sequences (Foglieni et al., 2018).

2.2. Service design logic

> *"A service is an interaction between people, things, and places targeted to produce value. Service design is whatever can be designed to make this interaction more probable, interesting, and effective for all stakeholders."*
>
> Manzini's interview in Penin (2018)

2.2.1. The emergence of service design

Service design emerged in the 2000s as reflected by the first service design conference "Emergence" organized by Carnegie Mellon University's School of Design in 2006 (Sanders and Stappers, 2008). Service design or "design for services" (Kimbell and Seidel, 2008; Wetter-Edman, 2014) has been defined by practitioners and academics alike in many ways. In layman's terms, service design tend to be compared to other umbrella concepts such as design thinking, user-centered design or experience design. Recent literature however agrees that designing for services differs from these concepts: service design is a holistic approach focused on end-user experiences as well as service stakeholders and suppliers experiences involved in shaping services (Roto et al., 2020; Stickdorn et al., 2018). It is concerned with customers, providers, and stakeholders' journey and experience (Roto et al., 2020). *"Service design helps organizations see their services from a customer perspective. It is an approach to designing services that balances the needs of the customer with the needs of the business, aiming to create seamless and quality service experiences."* (Megan Erin Miller in Stickdorn et al., 2018).

Service design is defined as a mindset, process, toolset (e.g., customer journey map), cross-disciplinary language, and a specific management approach to develop innovation (Stickdorn et al., 2018). The service design literature emphasizes the following principles (Penin, 2018; Stickdorn et al., 2018; Stickdorn and Schneider, 2012).

(1) Services are qualified as human-centered (Stickdorn et al., 2018) or people-centered (Penin, 2018). All experiences of people involved in services are considered (i.e., users, customers, and staff).

(2) Service design is collaborative (involving users and stakeholders) (Roto et al., 2018, 2020; Vaajakallio and Mattelmäki 2014): it implies communication between stakeholders from diverse backgrounds, done through service narratives (Penin, 2018). Designers are challenged to understand the relationships between the stakeholders and support their mutual understanding and a mutual language (Lee, 2014; Stickdorn et al., 2018). *"Participatory design practices are central to service design, and one of the core capabilities of service designers"* (Penin, 2018).

(3) The service design process is iterative, going from exploration to implementation through experimental approaches.

(4) Services are sequences of actions. Consequently, designing services implies designing each of these actions and the whole experience of the succession of these actions.

(5) Service design takes place in reality. User research requires investigating the real as well as testing prototypes. Service value lies in physical and digital facts.

(6) The service design approach is holistic.

2.2.2. The design implications of services

Designing services implies various challenges. Service designers need to understand people's tacit behaviors in opposition to formal and codified behaviors (Penin, 2018). They depend on social norms, cultures, emotional and aesthetic aspects. Designing services requires a user-centric approach to observing and documenting users' experience in reality and their use of context.

Service designers need to understand also the medium that allows interactions (e.g., technologies, interfaces). Last, service designers need to understand the plurality of service interactions over time and at which frequency they happen (e.g., weekly or monthly) for designing them depending on consistency.

Service design means designing unpredictable interactions and the unknown (Penin, 2018). While product designers know from the beginning they will design a three-dimensional object, service designers will know what solutions to design only after the research process (Penin, 2018). This unpredictability of interactions makes it challenging to deliver consistent positive experiences (Penin, 2018).

Every stakeholder shapes the services; in some ways, not only designers impact the design of services. The variety of teams and their different backgrounds often result in silos. Communication of the service vision between the teams is challenging. Also, the political structure of service organizations often slows down service transformation and service design culture. Designing public services is even more challenging. The lack of competition makes the performance more difficult (Boyne, 2003). Political and external stakeholders add other constraints to keep designing the services with a user-centric approach (Lee, 2014; Penin, 2018).

2.2.3. The measures of experience in service design

> *"Measurement and evaluation are critical capabilities for designers to strengthen the relationship with senior management or policymakers and to prove the value of design interventions to organizations and stakeholders."*
>
> Penin (2018)

Manschot and Sleeswijk Visser (2011) highlight the importance of assessing the experience value in service design and reflect on how service design could be measured. The experience value refers to people's *"experiences, dialogues, associations, and attitudes that are manifested by emotions, testimonials,* *attitudes, and behaviors."* This assessment can mainly be done through customers' qualitative feedback. Kimbell (2014) explains that services should be assessed based on service outcomes depending on the service context and domain. For instance, in the social care context, one of the outcomes could be increasing participation in activities for people experiencing mental health.

Løvlie et al. (2008) combine traditional and service design approaches to assess services by developing the Return On Investment of service design. First, they iteratively tested prototypes involving users and stakeholders to uncover the *"weaknesses and opportunities and define the design detail."* They also assess organizational success through the Triple Bottom Line; the sum of an activity's economic, environmental, and social effects. Last, they assess the service usability index to define the quality of design in the service sector. The service usability index includes four dimensions: the proposition (people understanding of the service value), the experience (people feeling good about the service), the usability (ease to use the service), and the accessibility (universality).

2.2.4. Service design methods and tools

Various methods and tools support the service design process. Service design methods are often collaborative and participatory, engaging customers and service teams (Megan Erin Miller in Stickdorn et al., 2018). Similar to the empathic design methods (see section 1.3 of this chapter), service design methods include ethnographic methods, observations, individual interviews or focus groups, design probes, co-creation workshops, and prototyping. Whether they are used for service design or empathic design purposes, their stakes are different but not antinomic. When used to design services, their main objective is collecting user feedback to identify pain and gain points for the users' and stakeholders' experiences. When used in an empathic approach, they mainly aim to trigger empathy towards users.

Service design uses also many tools to visualize customer and stakeholder journeys and user experiences, supporting also sometimes empathy towards users (e.g., with the persona tools). Designed by designers, these tools are visual and easily understandable. They aim to break silos between the teams, facilitate cooperation and find consensual solutions. It allows alignment of every team's service vision and service experience. Their visual and narrative qualities convey the users' vision of their service experience (Stickdorn et al., 2018). These tools are often displayed on a research wall (Kolko, 2007; Mattelmäki and Battarbee, 2002; Stickdorn et al., 2018). Table 3 introduces the most known tools in service design.

Table 3. Definitions of the main service design tools (Lallemand and Gronier, 2018; Penin, 2018; Sleeswijk Visser, 2013; Stickdorn et al., 2018)

Service design tool	Definition
The personas	are visual representations of user profiles based on users' motivations for using the service and their opinion about the service. They document users' behavior, frustrations, goals, and tasks linked to users' motivation to use the service. Usually, some demographic information makes the profile more realistic.
The empathy maps	synthesize the users' thoughts and opinions regarding the service. It shares what they hear, think, feel, see, say, and do. For each persona can be draw a dedicated empathy map.
The journey maps	also named customer journey maps or experience maps, are a synthetic and visual representation of end-user service experience on a timeline. It documents each user's interactions with the service (touchpoints) through the different channels offered (digital and human channels). A diagram illustrates the evolution between the positive and negative experiences during these other interactions. Journey maps also present the pain and gain points of the user experience and the opportunities to improve the service. Generally, there are as many journey maps as there are personas.
The service blueprints	share a more holistic view of the journey maps. It synthesizes the customer journey with the logistics and organizational actions of the service company.
The system maps	are also named the stakeholder, the network, or the ecosystem maps. This document synthesizes the different stakeholders/actors of the service; all the people taking part in the service decision (e.g., managers) or delivery (e.g., front-line staff).

3. Opportunities for building empathy towards users in service design

3.1. The value of empathy in service

"Customer experience and service employee experience [are] two sides of the same coin/ two sides of the same service experience"

Vaajakallio et al. (2016)

Without empathy, there is no service (Tripp, 2013). Empathy has always been part of service satisfaction in the service research literature (e.g., SERVQUAL in which customers assess staff's empathy towards them (Parasuraman et al., 1988)). Recent research studied the importance of service frontline staff's empathy (Nguyen et al., 2019), advising service companies to recruit talented frontline staff motivated to understand customers (Saco and Goncalves, 2008). Empathic employees recognize customers' needs more easily than others, improving human interactions and the employee-customer relationship (Bove, 2019). Empathy increases employees' attentiveness towards customers and performance (Ngo et al., 2020; Nguyen et al., 2019; Wieseke et al., 2012). In return, it builds customers' empathy towards the service and its staff (Wieseke et al., 2012). Customers tend to forgive service failures and mistakes (Bove, 2019; Wieseke et al., 2012).

In their framework of empathy in design, Bove (2019) argues that empathy positively impacts service at different levels:

> (1) at the individual or in-group level, motivating helping behavior, facilitating social bonding, and enhancing social support.
>
> (2) at the service organization level, contributing to service quality, customer compliance, and sales performance. The personnel understands better the social signals indicating customers' needs or distress and develops their ability and willingness to take customers' perspectives. Overall it improves service satisfaction and customer loyalty.
>
> (3) at the social level, improving moral decision-making of organizations, reducing prejudice, and discouraging unethical behaviors.

Empathy sparks user-centered innovation (Johnson et al., 2014; Leonard and Rayport, 1997; McDonagh and Thomas, 2010). Chung and Joo (2017) demonstrate that non-designer employees assess designers' product concepts favorably when they empathize with the users.

Empathy is also the core of organizations' culture transformation towards user-centered approaches. Companies moving towards more UX maturity go through the "awareness" second stage of the maturity model which corresponds to making every employee aware of their responsibility towards users and their experiences with the service (Chapman and Plewes, 2014). Thus, every employee in a company needs to empathize with the users of the service (Kalbach, 2017), although at different levels. Consequently, more and more service companies seek to develop empathy inside their organization and towards customers (Bove, 2019; Hess and Fila, 2016b; Nguyen et al., 2019). Empathic methods support this transformation (Pernice et al., 2021). It leads researchers and companies to develop empathy training courses, like Google's building-empathy program – Pokerface (Liu et al., 2018) or Vasques et al. (2022)'s love and breakup letters to build stakeholders' empathy.

3.2. Designers' collaboration with service stakeholders to build empathy within service companies

"In contrast to the myth of the designer as the lone creative genius, service designers should not create alone. While creativity is definitively key to the service design process, it relies heavily on the creativity of others, collaboration, and stewardship."

Penin (2018)

In service design, designers' collaboration with stakeholders is essential. Service staff is the face and voice of service organizations (Penin, 2018). They shape the service and make decisions affecting the end-user service experience. Without stakeholders, the implementation of designed solutions is not possible.

In this context, co-creation is a key element of the service design approach. Service designers must bring people from different backgrounds and understandings to collaborate (Stickdorn et al., 2018). They must do it from the start of projects. The collaboration with stakeholders generates new ideas, solves problems, and co-creates solutions (Penin, 2018). However, expectations regarding this collaboration need to be nuanced. Sanders (2001) reflects on their experience of creative collaboration with non-designer stakeholders, and observed that the stakeholders have only latent creativity because they are not used to expressing their creativity.

Empathy is an essential component of the designers' collaboration with stakeholders leading to shared references and knowledge about users' experiences (Butler and Roberto, 2018). It allows breaking silos between the teams inside the organization (Stickdorn et al., 2018) and to agreed-on solutions for the users (Smeenk et al. 2019).

As a side effect but non-negligible, this collaboration also generates empathy towards the organization and its employees beyond towards users (Sleeswijk Visser, 2013). The collaboration contributes to empowering the stakeholders and improve their work and service experience.

3.3. Successes and challenges of applying empathic design in service design

As seen previously, applying empathic design in the service industry involves developing the approach beyond the design team (Postma et al., 2012), willingly collaborating with stakeholders and engaging them in user research (Sanders and Stappers, 2008). Yet, the success of this approach depends on the organizations' ability to adopt five empathic elements: culture, mindset, methodology, methods, tools and techniques (Sanders and Stappers, 2008). We review some successful applications of the empathic design approach in three service contexts: healthcare sector, private sector, social and systemic context, and their main outputs.

3.3.1. Empathic design in the healthcare sector

The healthcare sector has a longer history attaching importance to the development of medical staff's empathy and the collaboration with end-users. Although Sanders (2009) do not mention empathy as the main goal of their approach, the empathic design literature mentions their work as foundational to empathic approaches. Sanders (2009) documents their collaboration with a hospital's medical staff, patients, and an architecture firm to envision and design the patients' and visitors' experience. The authors conducted visioning workshops with these stakeholders using generative techniques (Sanders and Stappers, 2012) like priorities mapping and picture collages (i.e., comparing medical staff vision with the architecture firm ones and users), experience models (i.e., inviting the nurses to imagine the flow of people in the hospital) and experience timelines (i.e., illustrating the future journey at the hospital). They also conducted participatory prototyping of environments and experiences with staff and patients to model future hospital rooms (with paper material and three-dimensional toolkits). At the end of the process, they user-tested a full-scale room prototype. The architects were involved in the activities and familiarized with the data. Along these various activities Sanders (2009) observed how the medical staff was quick in addressing the problems. Their expertise was useful to ideate on solutions. The activities highlighted the differences between the architects' vision of the patient experience, the medical staff and patients ones. Sanders (2009)'s collaborative approach also allowed medical staff from different teams inside the hospital to meet for the first time.

As another example, Akoglu and Dankl (2021) conducted co-creation workshops with medical staff (doctors and nurses) and patients to think about implementation strategies for a decision tool in cancer care. They developed a framework for designing health and social care with empathy and mutual learning; MOVE - Meet, Switch Over, Voice, Evaluate. They organized co-creation workshops, including these four kinds of activities. The participants first defined together role-play scenarios and actors (medical staff and patients). Then, the participants' role played the others' roles, used their roles and expertise to ideate, prototype solutions, and evaluate them. Akoglu and Dankl (2021) explained, *"design for empathy [...] shall be expanded further to the stakeholders within the design process"* rather than focus only on designers. In their opinion, the co-creation workshops provided *"a space for the egalitarian flow of ideas and a joint development of concepts by all participants."* Their role-play activities built empathy among the stakeholders.

3.3.2. Empathic design in the private sector

In the private sector, Mattelmäki and Battarbee (2002) studied the need of Polar Electro, a company specializing in heart rate monitors, to gain a better understanding of the sporting activities of its non-users. They created empathic probes in collaboration with the employees. These probes included activities such as completing a diary (i.e., collection of routines, thoughts, and feelings) and illustrated cards, and taking photographs. The authors asked 10 non-user participants to complete these probes and interviewed them. Then, the probes and interview material were shared with the company's employees during workshops with the aim to reflect on the material. Mattelmäki and Battarbee demonstrated the users' material was *"a powerful way of bringing the participant's way of life into the corporate meeting room."* The first-person narration played a crucial role in it. The overall process supported employees' empathy towards users, from designing the probes to reading its content.

As another example, Sleeswijk Visser and Kouprie (2008) documented ideation workshops conducted to stimulate Philips Research employees' empathy. They used context mapping techniques previously completed by users and shared them with the employees during the workshops. Some stakeholders' teams had to reflect on users' data and compare their employees' vision with users' perspectives. The authors analyzed which teams empathized the most with users. The teams who reflected on users' experiences referred more often to users and their own experiences. These teams were also more aware of the different experiences of users.

When implementing an empathic design approach inside Philips Research for new product development over few years, Postma et al. (2012) identified three main challenges of doing empathic design in industry:

(1) moving the rational approach to an empathic one,

(2) turning users into partners of the service design, and

(3) engaging stakeholders in user research.

This last point is key in our work. Engaging stakeholders in an empathic approach implies availability constraints. It is difficult to involve everyone at each stage (Postma et al., 2012). The empathic process needs to be flexible to give the possibility to integrate new stakeholders in the process during the project and update them about user research. Postma et al. (2012)'s return of experience emphasizes that stakeholders' involvement depends on their profiles. Project team members are interested in users' anecdotes, while other stakeholders expect user research executive summaries.

3.3.3. Empathic design in social and systemic context

In a broader social and systemic context, Sustar and Mattelmäki (2017) researched immigration services with governmental stakeholders (i.e., decision-makers, policy-makers, and front-end workers) to improve the immigration system. Sustar and Mattelmäki (2017) interviewed immigrants about their service experience and synthesized the data collected under the form of personas. During co-design workshops based on these personas, N = 96 service employees mapped the immigrants' journeys before and after arriving in the country. The authors combined empathic tools like users' profiles (i.e., focusing on *"scaffolding inter-cultural empathy"*), service design tools like journey maps (i.e., focusing on the processes and customer service journeys), and systemic design tools (i.e., *"zooming into the system"*) like gigamaps and rich pictures. The workshops helped the stakeholders to better understand the different viewpoints and acknowledged the relevance and transparency brought by the co-design process.

Beyond these specific study cases, some authors in service design occasionally report project experiences with an empathic design approach to expand the body of knowledge of the field with interesting methods, and insights into challenges, and opportunities. For instance, Enninga et al. (2013) documented projects investigating users' experience in various service contexts (railway, hospital, and museum). They involved some stakeholders in these experiences through creative workshops. These workshops were based on users' insights and data collected during the user research phase (pictures, videos, diaries, probes) which they synthesized under context mapping and personas. They observed how these activities helped the teams to better understand the challenges of their service user experiences.

More recently, Lee et al. (2020) discussed key projects of an empathic design program in Finland. All these projects used ethnographic methods such as probes, co-design, design gaming, role-play, narrative methods, and prototyping methods. Lee et al. (2020) emphasized the necessity for a *multiple intelligibility* of design research (i.e., making the design research accessible to the secondary audiences of stakeholders) and investigate the cultural dimension of this intelligibility with stakeholders from Singapore involved in Finnish projects. For these stakeholders the importance of empathy within projects development was unknown. Lee et al. (2020) observe the dual aim of empathic approach: value user-centered research overall and value empathy in project.

Overall, the empathic design experiences we reviewed illustrate the variety of empathic methods. They all use techniques based on enriching material (e.g., pictures, videos, collages) and creative methods (e.g., role-play, gaming). These approaches depend on the context and have a long-term outlook. They require multiple empathic interventions, for instance, workshops involving the stakeholders at different stages. These studies show that including empathy and collaboration in projects improves stakeholders' understanding of users' problems and the ideation of inclusive solutions. Nevertheless, prior work studying the empathic design approach within the industry remains scares, and the field misses a more meta-review of the knowledge acquired through these studies.

Research approach and contributions

1. Background and motivations

1.1. A personal reflection on the key role of stakeholders' empathy in service design

Before starting this thesis, I worked as a designer practitioner within marketing and development teams. I often reflected on the challenges of getting non-design stakeholders involved in, aware of, and feeling responsible for the user experience. As a designer trained to take others' perspectives, I wondered why putting oneself in the users' shoes seems only "intuitive" for some and how we could encourage other stakeholders to adopt users' points of view. I identified the same challenges, at the level of service, when I started working on this thesis in partnership with the Luxembourgish Railway Company (CFL). Part of this is due to the multiple expertise involved in the user experience of a service. Similar to developers in my former projects, I met service employees convinced of knowing what the users need. I also faced the cliché idea that improving service experience means creating a new app or a website. Yet, interactions with the staff or the service ecosystem are equally important and require that stakeholders, like service employees, become aware that users experience the service and not only use it.

At the beginning of my research project, the main challenge of our industrial partner was to make sense of their strategic vision and motto: "to put the customer in the center of our strategy." In many discussions, empathy emerged as a key to becoming a user-centric service at the level of the entire company: "We should get everyone empathic towards the customer."

1.2. Research path challenges

A first challenge was identifying empathy's scope and role within service teams to shape user-centric services. Historically, empathic design research has been primarily concerned with developing designers' empathy towards users, while our work focuses on other stakeholders' empathy (excluding users). Prior studies on framing empathy in design are mostly based on the extensive literature in psychology. The multitude of empathy definitions makes it difficult to extract an actionable definition adapted to the field and practice of design.

A second challenge was related to the empathic methods that could trigger service employees' empathy (rather than being tailored to design teams only). A prerequisite we defined was that the methods should be accessible to this population, who is not trained to take the users' perspectives or to participate in creative sessions. For the service employees, learning something relevant to their job will likely make them more receptive to users' needs.

Last, to investigate whether and how these methods triggered empathy in service employees, we needed tools to measure the evolution of empathy before and after our interventions. We reviewed various measurement tools in psychology, marketing, and service research. Without appropriate measurement tools for the design context, we developed and validated the Empathy in Design scale (EMPA-D).

1.3. Researcher's roles

In this research project, I endorsed several roles between academia and industry: academic researcher, user researcher, and design strategist.

As an **academic researcher**, I investigated empathic design interventions in industry and their impact on internal service employees' empathy. We developed and validated a self-reported scale: the EMPA-D scale. Being a researcher in the industry is an opportunity to bring science into the applied world. This results in reflecting on the business through a new lens and encourages innovation regarding processes and solutions. On the other side, industry challenges science when researchers conduct empirical studies outside the lab: I faced the well-documented difficulty of controlling parameters and the environment and the unpredictability of the external factors that might bias the experimentations. This hybrid research project also requires translating academic findings into actionable insights for the industry. It sharpened my critical thinking skills and revealed potential industry research biases. I also learned how to curate and share interesting scientific knowledge for the industry.

As a **user researcher**, I studied the customer experience of the railway service. I immersed myself in the company's context. I took note of the existing users' feedback from internal satisfaction surveys, reports of studies with customers, complaints, and suggestions. I conducted observations in train stations and interviewed passengers through the love and breakup declarations method. I organized and facilitated ideation workshops with employees and customers. Overall, I challenged the existing service with users' points of view to help teams think differently about the service. All the methods I used aimed to develop an organizational empathy culture. I investigated ways of implementing an empathic design approach and experienced the underlying opportunities, challenges, and limitations. My studies have been shaped by tensions between theoretical ways of triggering empathy and their feasibility in reality in an applied corporate context.

As a **design strategist**, I accompanied the company on various topics related to customer experience. I participated in democratizing the user-centered design mindset through internal presentations. I supported teams in advocating for the users' perspective on the service, making design decisions according to user insights, and defining project priorities. Although this role cannot be represented in the studies, it has fed my thoughts. The main designer's challenge was translating user insights into the service's concrete design choices (e.g., UI design, UX writing).

Overall, my research has been guided by the motivation of studying methods to trigger service employees' empathy (academic researcher and user researcher) while at the same time providing actionable insights to design the service differently (design strategist).

2. Research objectives and questions

The papers composing this thesis address the common goal of consolidating empathy research in service design to better understand empathy mechanisms and rely on them to deliver user-centered services. **We aimed to investigate whether and how empathic methods would influence or trigger service employees' empathy towards users.** The methods have been chosen to represent different ways of triggering empathy while identifying the advantages, challenges, and limitations of each. We assessed the impact of these methods on empathy with various measures, including the Empathy in Design scale (EMPA-D).

Overall, our research investigates the empathic design approach to promote the understanding of user experiences within a service organization and deliver high-quality experiences of services. The underlying research question is: **How do empathic design methods influence service employees' empathy towards users?**

More specifically, we looked at the following sub-questions:

> How can empathic methods be used to investigate the user experience of a service? (Paper A)
>
> How do empathic methods trigger service employees' empathy towards users? (Papers C, D, E, and F)
>
> What employees' individual factors influence their empathy during empathic interventions? (Paper D)
>
> Which empathic attitudes do service employees and users adopt during empathic design interventions? (Paper E)
>
> Are there changes in employees' self-reported empathy levels before and after participating in empathic design interventions? (Papers D and E)
>
> How to measure service employees' empathy towards users? (Papers B, C, D, E, and G)

3. Research contributions

As an industry-academia partnership, this work contributes to the design and service design field in three main ways: through methodological contributions, empirical contributions, and applied contributions.

This research studies the impact of three design research methods on empathy: the love and breakup declarations (Papers A and D), the physicalization of the journey map (Paper C), and the cocreation workshops based on generative techniques (Paper E). We studied how they trigger service employees' empathy towards users and their relevance for a company, starting with the user-centered design approach.

To assess the empathy level change after our empathic design interventions, we developed a new measurement instrument of empathy dedicated to service design (Papers B and G). This scale aims to support designers in their empathic approach with internal service stakeholders for:

> (1) measuring the empathy level of the teams (as a baseline for starting such an empathic approach),
>
> (2) assessing the success of empathic design methods,
>
> (3) tracking the empathy tendencies evolutions after empathic design interventions,
>
> (4) identifying the employees supportive (also named allies) of promoting users' perspectives and breaking silos inside the teams to deliver user-centered services.

Our studies provide empirical contributions. We collected empirical findings related to the measure of empathy (Paper B) and the use of empathic design methods to trigger service employees' empathy towards users (Papers D and E). We also make empirical contributions to the railway service experience with user insights informing on passenger experience (Paper A).

This research provides insights into the empathic design approach used in the industry context. It informs design researchers and practitioners on the challenges of implementing an empathic design approach in a real corporate context (Paper F).

This work also proposes an initial mapping of how empathic research methods can develop service stakeholders' empathy towards users and which dimension of empathy these methods might trigger. We also share possible uses of a self-reported measure of empathy with service employees (Paper G).

Beyond this thesis manuscript, this research changed the Luxembourgish railway company's paradigm towards its passengers. Through our academic studies and the resulting reports, internal discussions, and consulting missions performed, this work highlighted the need for involving passengers in the service design process. It contributed to making the company aware of the differences between their perception of the user experience and the passengers' perceptions. Consulting the passengers and involving them in workshops with employees, before making decisions about the service, has become a priority for the company.

4. Research framework and methodologies

This interdisciplinary thesis falls within psychology, user-centered design, and service design domains. Our work investigates the role of empathy in the service employees' collaboration with users. Our work is framed by the empathic design approach (Fulton Suri, 2003; Koskinen et al., 2003). More particularly, we based our research on empathy frameworks in design theorized by researchers like Hess and Fila (2016a), Kouprie and Sleeswijk Visser (2009), and Smeenk et al. (2019). Our research covers mainly the first stages of empathy frameworks (i.e., Kouprie and Sleeswijk Visser (2009)'s *discovery* and *immersion* stages). Looking at the user-centered design process, our work focuses on methods in the second stage of the double diamond design process, the "define" phase, when user research is synthesized and transmitted to other stakeholders (Gustafsson, 2019).

We adopted a mixed-method approach, with complementary qualitative and quantitative perspectives to study empathy in design. Table 4 summarizes the methods and measures used for each study.

Table 4. Papers of this manuscript including the methods and measures they investigate

Paper	Title	Study type	Lab. vs. field	Empathic method	Assessment
Paper A	Uncovering Factors Influencing Railway Passenger Experiences through Love and Breakup Declarations	Empirical study	Online interview	Love and breakup declarations	-
Paper B	Development of the Empathy in Design Scale (EMPA-D): Measuring Employees' Empathy Towards Users in Service Design	Scale development	Online survey	-	EMPA-D scale 9-item and 11-item versions
Paper C	Physical Journey Maps: Staging Users' Experiences to Increase Stakeholders' Empathy Towards Users	Exploratory design study	Field study	Journey map	1. Assessment of memorability 2. Assessment of the engagement 3. Generating ideas to improve the service 4. Call-to-action
Paper D	Leveraging Passengers' Love and Breakup Declarations to Trigger Service Employees' Empathy in the Context of Railway Transportation	Empirical study	Field study	Love and breakup declarations	1. EMPA-D scale (9-item version); used before the method 2. Empathy accuracy (recognition of emotions) 3. Emotional resonance 4. Assessment of memorability 5. Assessment of learning, interest, ability to help, and empathy
Paper E	Do Co-creation Workshops Trigger Empathy? Unraveling Empathic Attitudes Between Service Employees and Users During Co-creation Workshops	Empirical study	Laboratory	Co-creation workshops	1. EMPA-D scale (9-item version); used before and after the workshops 2. Interactions analysis
Paper F	Implementing an Empathy-Centric Design Approach in Industry: a Mixed-Person Perspectives Reflection	Position paper	-	-	
Paper G	The Measure of Empathy in Design: How Do we Trigger Empathy Among Designers and Beyond?	Position paper	-	-	

4.1. The empathic user research design methods

The methods we used are adapted from the empathic design methods as scoped and described by researchers like Fulton Suri (2003), Koskinen et al. (2003), and Lee (2014). The three methods we selected include the main characteristics of empathic design methods (Koskinen et al., 2003). Beyond their empathic characteristics, the three methods cover a range from the most processed/synthetic to the most direct: a physical journey map (synthesis of user insights), the love and breakup declarations (raw user data), and co-creation workshops based on generative techniques (direct contact with users). We also selected the methods according to the needs of our industrial partner. Some employees do not use the railway service, and some work mainly from offices and are rarely in direct contact with the users. This means that their understanding of users' experiences can be limited. Thus, we selected methods that bring user insights and experience to these employees and immerse them in the service experience of the users. Our choice of the methods aimed to support a broad exploration of the main research objective rather than an in-depth zoom on one method only. This also aligned with the industrial context regarding the client's expectations and the underlying challenges of applied research. Figure 6 illustrates our choice of methods.

We looked at the main methods traditionally used in service design to democratize user research inside companies. We selected the journey map (Paper C) for its focus on the overall experience of users. We created a **physical journey map** installation to investigate its potential to be more immersive and empathic than its traditional printed version. This method allowed the employees to easily learn about the overall passenger experience and get immersed in this experience in the same place.

With the **love and breakup declarations**, we aimed to trigger empathy through emotional and engaging content (Papers A and D). Usually used to get outside the box and question designers' perceptions of the user experience, we investigated whether this method could bring a new lens of user feedback to the service employees. In addition, using a method appealing to discussing an intimate relationship between users and their service fitted our research context.

After getting in touch indirectly with the users' worlds (through the physical journey map), then listening to the users through a new lens (through the love and breakup declarations), we enabled a dialogue between the employees and the users. The **co-creation workshops** (Paper E) seemed appropriate to start a dialogue in a neutral space-time (unlike the one where the service takes place and the users' experience is at stake). Co-creation is the opportunity to think together about a problem and share the perspective of both sides to build new solutions or improve existing ones.

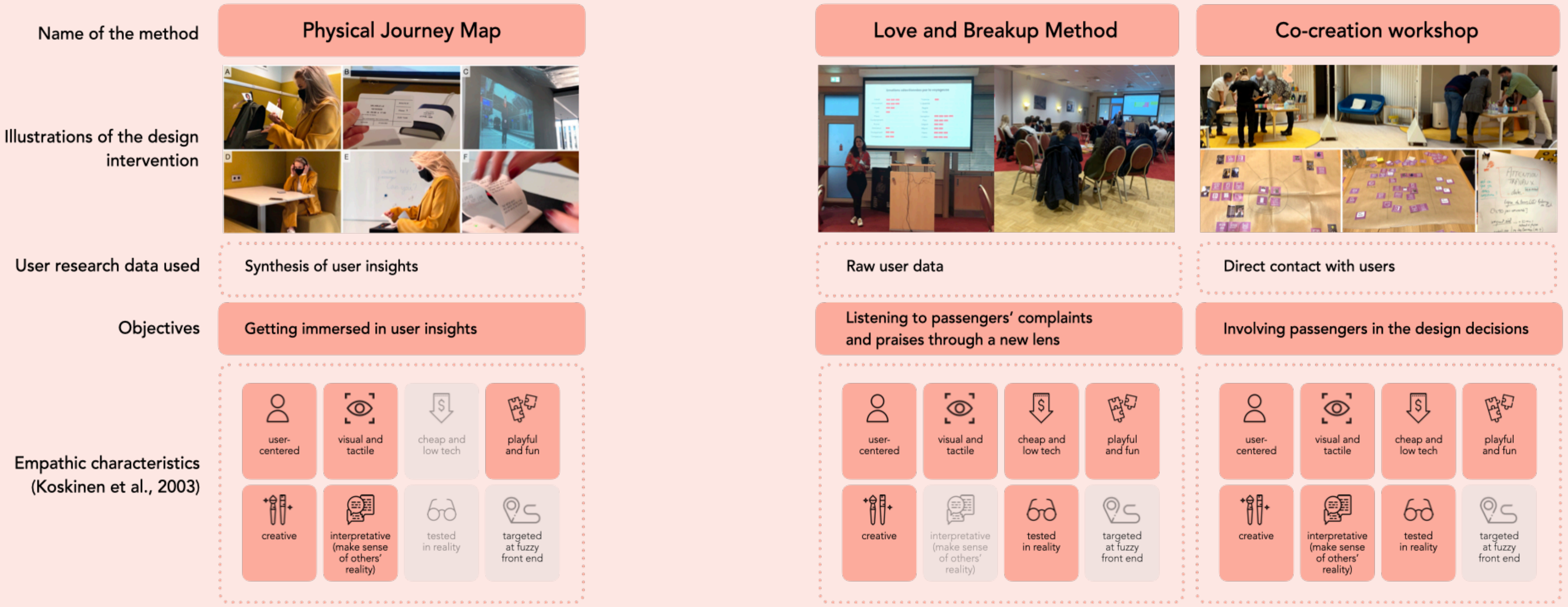

Name of the method
Physical Journey Map
Love and Breakup Method
Co-creation workshop
Illustrations of the design intervention
A
B
C
D
E
F
User research data used
Synthesis of user insights
Raw user data
Direct contact with users
Objectives
Getting immersed in user insights
Listening to passengers' complaints and praises through a new lens
Involving passengers in the design decisions
Empathic characteristics (Koskinen et al., 2003)
user-centered
visual and tactile
cheap and low tech
playful and fun
creative
interpretative (make sense of others' reality)
tested in reality
targeted at fuzzy front end

Figure 6. Synthesis of our empathic user research methods choices

4.2. The measures of empathy

To assess the success of triggering service stakeholders' empathy, we relied on different proxies of empathy inherent to the methods. Each method generates different user insights. Thus, the assessment of empathy is adapted to these user insights. For instance, the love and breakup declarations allow to use of the empathic accuracy technique (i.e., recognizing users' emotions expressed in the declarations).

Last, we developed and validated a new instrument to measure the service employees' empathy quantitatively: the **EMPA-D scale**. We identified the need for this measure during the study of the first design intervention (Paper C). Psychology literature mainly measures people's personality traits, while our work focuses on empathy tendencies in the context of service design. Thus we developed and validated the first 9-item version of EMPA-D used in our following studies (Papers D and E). The scale development was a long process; we used it in different ways and validated a second version of 11 items about the end of this research project (Paper B). In Paper D, we use the scale before the design intervention to assess the baseline of employees' empathy. In Paper E, we measured empathy before and after the design intervention to compare and investigate the empathic methods' effect. In both papers, EMPA-D is not the only assessment of empathy. We think this quantitative measure reveals the trends of service employees' levels of empathy; however, the interpretation of the results goes hand in hand with qualitative assessment.

5. Research outline

This manuscript is a cumulative dissertation structured into six chapters (see Thesis Outline), including seven papers published or submitted to peer-reviewed journals or conferences (Table 4 for the list of publications).

Chapter 1 introduces the notions covered in this work: empathy and service design (based on design, service, and psychology literature). It also explains the thesis project context and our research approach.

In Chapter 2, we collected users' insights into the service as material for our empathic design interventions (Paper A). For this purpose, we investigated the users' experience with the service through an empathic method like the love and breakup declarations.

Chapter 3 presents the empathy measurement tool we developed and validated in service design: the EMPA-D scale (Paper B). This work has been iterative throughout the thesis project. We used only the first version of the scale in the following studies. The second version of the scale has been validated in the last months of the project.

In Chapter 4, we gathered the three empathic design interventions we conducted to trigger service employees' empathy:

(1) The physicalized journey map to immerse service employees in user experience (Paper C).

(2) The love and breakup declarations for the service employees to discover user experience from another prism (Paper D).

(3) The co-creation workshops for the service employees to exchange directly with users (Paper E).

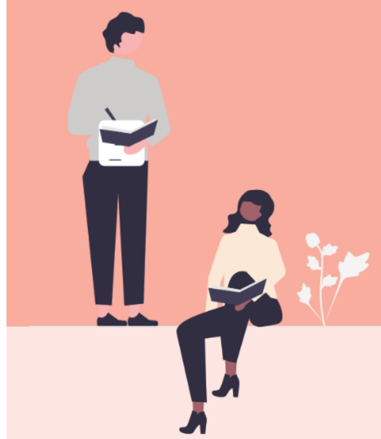
We explored the first empathic design method (1) in parallel with the development and validation of the EMPA-D scale. Along this study, we faced the need to measure empathy quantitatively to observe empathy changes after using our empathic methods.

In Chapter 5, we share the mapping of our three empathic design methods and generalize it to other empathic methods. Each method has different empathic properties and achieves different empathic objectives. The designers can select them according to their goals to support their empathic design approach inside organizations. We also discuss our empathic design approach (Paper F) and the measure of empathy in design (Paper G).

Last, in Chapter 6, we share the limitations of our research and the opportunities for future works.

THESIS OUTLINE

Introduction



Considering empathy in design

Research approach and contribution

Understand

A Uncovering Factors Influencing Railway Passenger Experiences Through Love and Breakup Declarations

Scale Development

B Development of the Empathy in Design Scale (EMPA-D): Measuring Employees' Empathy Towards Users in Service Design

Empathic Design Interventions

C Physical Journey Maps: Staging Users' Experiences to Increase Stakeholders' Empathy Towards Users

D Leveraging Passenger's Love and Breakup Declarations to Trigger Service Employees' Empathy Towards Users

E Do Co-creation Workshops Trigger Empathy? Unraveling Empathic Attitudes Between Service Employees and Users During Co-creation Workshops

Discussion

Towards mapping empathic methods

F Using Empathy-Centric Design in Industry: Reflections from the UX Researcher, the Client, and the Method Expert

G The Measure of Empathy in Design: How Do We Trigger Empathy Among Designers and Beyond?

Conclusion

Limitations

Future work

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Chapter 2.
Understand

In this chapter, we focus on the railway service context. We introduce related work on the passenger experience and review methods used to investigate them in the transportation domain. We thereby illustrate the need for more qualitative research in the railway sector. We investigate passenger experience through an empathic design method, the love and breakup declarations (Paper A). Our findings reveal the main factors influencing passengers' experience. We discuss the opportunities of such empathic design method to convey an understanding of users within a service organization. The love and breakup declarations that we collected in this study constitute the material used in Paper D to trigger service employees' empathy.

This chapter includes the following paper:

Paper A	Drouet, L., Lallemand, C., Koenig, V., and Bongard-Blanchy, K. 2023. Uncovering Factors Influencing Railway Passenger Experiences Through Love and Breakup Declarations. Applied Ergonomics, 111. https://doi.org/10.1016/j.apergo.2023.104030

Uncovering Factors Influencing Railway Passenger Experiences Through Love and Breakup Declarations

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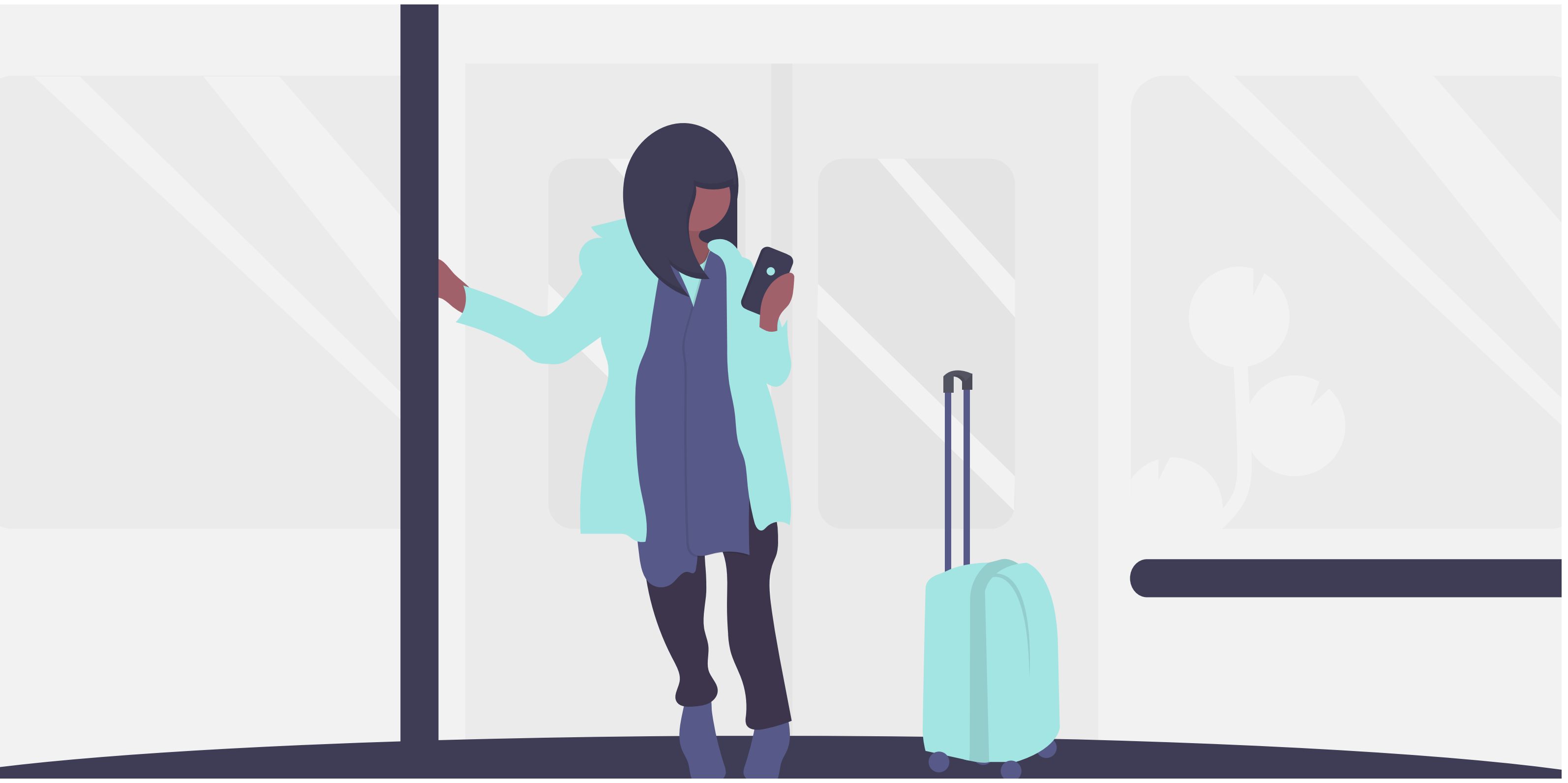
Applied Ergonomics, 111.
https://doi.org/10.1016/j.apergo.2023.104030

Keywords: customer experience, service design, railway transportation



Abstract

While existing approaches for assessing passenger experience are often limited to surveys of customer satisfaction, societal and technological challenges push the railway industry to adopt a user-centric approach to the design of their service. We used the love and breakup method in a study involving N = 53 passengers making a declaration to their railway company to collect qualitative feedback on the passenger experience. The method allowed to gather personal, emotional, and contextual insights into passengers' experiences that can inform the transportation service design process. We describe 21 factors and 8 needs influencing the passenger experience, thereby consolidating and deepening prior work in the railway context. Using the lens of user experience theories, we argue that the service should be assessed against fulfilling these needs, which can act as guiding principles regarding service improvement. The study also presents valuable insights into the love and breakup method to explore service experiences.

Highlights

- We review the methods used to study passengers' experience in transportation.
- We investigate passengers' experiences using the love and breakup method.
- We consolidate prior work by uncovering 21 factors influencing passenger experience.
- We identify 8 key passengers' needs and relate them to user experience theories.
- We discuss the benefits of the love and breakup method in the transportation context.

1. Introduction

Societal, environmental, and technological challenges (e.g., privatization, digitalization) push railway companies to innovate. To face these upheavals, they undertake increasing efforts towards a user-centered approach (International Union of Railways, 2023). However, inquiring users about their experience and designing the service for an optimal passenger experience (which we defined as all aspects that form the user experience of the railway service for private passengers) are novel tasks for this industry (Ross et al., 2020). After decades as a freight service, railway companies' paradigm shifted towards a people-centered service. From the first conference on Design for Passenger Transport in the 1970s, the importance of the customer in service design gained traction. It became indispensable to better understand customer behavior and perceptions (Height and Roy, 1979). While mobility research in Human-Computer Interaction (HCI) continues to be mainly driven by the automotive sector (Glöss et al., 2020), railway companies too have established dedicated teams working with passengers. However, because their research activities occur inside the R&D departments, initiatives through which they publicly share their insights stay rare.

Looking into the available research, public transportation service mainly investigates passenger experience through surveys on service quality and customer satisfaction (dell'Olio et al., 2018). While there is wide agreement on the importance of passenger feedback and emotions (Straker and Wrigley, 2016) in designing transportation services, studies looking into the underlying reasons behind passenger experiences are still scarce (Carreira et al., 2013; Hildén and Väänänen, 2019). They are however indispensable to obtain a better understanding of the different perspectives on mobility (Glöss et al., 2020) and an empathic understanding (Hildén and Väänänen, 2019) of passenger needs.

This paper presents a qualitative study with railway passengers in Luxembourg (N = 53). Aiming to inform the design of user-centered railway services, our study sought to enhance the current understanding of which factors influence the passenger experience and which needs are prominent in this experience. The findings are discussed in the larger frame of theories of psychological needs and user experience, thereby making a contribution to the literature on user experience in the context of rail travel. In addition to these empirical contributions, the paper makes an interesting methodological contribution by extending the service design toolkit in the transportation domain with the love and breakup method. We present this method and discuss the benefits and limitations for its use in the transportation domain.

2. User research in transportation services

2.1. Passenger experience factors

Previous mobility research points to variegated factors influencing passenger experiences (Table 1). Passengers' motivations for using a transportation service differ across socio-economic backgrounds (Foth and Schroeter, 2010). Depending on their use patterns, passengers have been categorized into *must* passengers (e.g., commuters) versus *lust* passengers (e.g., travelers (van Hagen, 2011)), or depending on their travel experience type (e.g., confident, organized, conscious, social (van Hagen et al., 2022), or digital skills (Bradley et al., 2021). Part of the literature on passenger profiles focuses on a specific population (e.g., the elderly, passengers with impairments) and investigates their travel needs (Stein et al., 2017; Vollenwyder et al., 2020).

Passenger needs and expectations depend on various service elements such as safety, staff courtesy/skills, on-time performance, cleanliness (Park et al., 2021), information, onboard activities (e.g., reading, working), social interactions (Hildén et al., 2016, 2017). Contextual task factors, contextual environment factors, personal factors (Ross et al., 2020), and specific travel situations affect passenger expectations and result in a broad spectrum of experiences and emotions (Souche-Le Corvec and Zhao, 2020; van Hagen and Bron, 2013).

The service is not limited to the onboard experience but spreads over several locations and times. The service includes multiple digital, analog, and in-person service touchpoints along the passenger's journey, e.g., interactions with the information channels (Foth and Schroeter, 2010), other passengers (Ross et al., 2020) or the railway staff (Oliveira et al., 2020).

2.2. Research approaches to uncover passenger experiences

Finding suitable methodological approaches to investigate the passenger experience is challenging. Related research has been initiated by professionals with various backgrounds ranging from quality management and marketing to HCI. This section gives an overview of applied quantitative and qualitative research methods (Table 2).

Table 1. An overview of passenger experience factors studied in related literature (public transport and railway literature)

Passenger experience factors	Example of studies (non-exhaustive)
Passenger profiles	Rail passenger profiles (van Hagen et al., 2022; van Hagen and Bron, 2013), bus passenger profiles (Hildén and Väänänen, 2019), passenger profiles related to rail technological innovations (Bradley et al., 2021)
Specific populations	Passengers with impairments (Vollenwyder et al., 2020), elderly mobility (Stein et al., 2017), women's experience (Joshi and Bailey, 2023)
Passenger needs	Satisfaction (Azmi et al., 2018; Barchański, 2023; Cavana et al., 2007; Proussaloglou and Koppelman, 1989), passenger needs and expectations (Blatter and Einsele, 2022; Carreira et al., 2013; Hildén et al., 2016, 2017; Park et al., 2021; van Hagen et al., 2022), contextual and personal factors (Ross et al., 2020)
Passenger experience	Passenger journey and emotions (Souche-Le Corvec and Zhao, 2020; van Hagen and Bron, 2013; van Hagen and de Bruyn, 2015), passenger experience with technological innovations (Bradley et al., 2021), passengers' well-being (Hook et al., 2021), passengers' stress (van Hagen and Vos, 2018), passengers' fall risk due to information search (Larue et al., 2021)
Location-specific	Train stations (e.g., experiencing colors, lights, music, advertising and infotainment) (van Hagen and Heiligers, 2015), transit area (Zhou et al., 2022), first/last-mile (Park et al., 2021), service proximity (Zhai et al., 2021)
Time	Waiting time (van Hagen, 2011), travel duration tolerance (Ermagun et al., 2022), use of journey time (Hildén et al., 2017)
Technology interactions	Information screens and mobile app (Foth and Schroeter, 2010), technological innovation uses (Bradley et al., 2021; Keller and Schlegel, 2019), vending machines (Muhammad et al., 2017), passenger information (Azmi et al., 2018; Beul-Leusmann et al., 2014; Dziekan and Kottenhoff, 2007; Foell et al., 2013; Hildén et al., 2017; Zimmerman et al., 2011; Zorić et al., 2022), audio information (Kostiainen et al., 2011), real-time information (Dziekan and Kottenhoff, 2007)
Human interactions	Cleaning staff in trains (Vos et al., 2019), railway staff in trains (Oliveira et al., 2018, 2020), crowdedness (Kim et al., 2022), social interactions (Camacho et al., 2015)

As acknowledged by prior work, the transportation field primarily builds on factual findings stemming from quantitative research (Carreira et al., 2013). To this end, researchers adapted the popular standardized questionnaire SERVQUAL (Parasuraman et al., 1988) to the railway context and added the item categories *comfort, connection, convenience* (Cavana et al., 2007), and *passenger information* (Azmi et al., 2018). More recently Ittamalla and Srinivas Kumar (2021) developed the holistic passenger experience (HPE) scale to measure the determinants of HPE. Other surveys have been developed and employed to assess the customer satisfaction with national railways services (Barchański, 2023) or specific aspects like train stations (van Hagen and Heiligers, 2015). Some look closely at public transportation service aspects that enhance or hinder passenger satisfaction, like the duration (Ermagun et al., 2022). Specific experimentations are conducted to investigate service design components by comparing configurations for music, colors, and lights in train stations (van Hagen, 2011). Post-user test questionnaires have also been used to gather feedback on interface prototypes (e.g., for a ticket machine (Muhammad et al., 2017)), a smartphone navigation for visually impaired (Vollenwyder et al., 2020). These studies rarely rely on standardized evaluation scales. As an exception, the System Usability Scale has been used for evaluating existing railway information technologies (Beul-Leusmann et al., 2014).

These studies build on self-reported behavior data and are hence prone to limitations such as the peak-end-rule cognitive bias, showing that intense and final moments of an experience are more vivid in memory (Kahneman et al., 1993). To overcome these, physiological measurements (e.g., eye tracking) have been employed as an objective complement to measure railway passenger stress (van Hagen and Vos, 2018). Quantitative metrics based on aggregated data (Foell et al., 2013), and passenger flow data (Zheng et al., 2023) start to find their way into passenger experience assessments beyond self-reports. While this existing quantitative research allowed gathering feedback from large passenger samples, their drawback is the lack of insight regarding underlying reasons for passenger satisfaction ratings. This is why researchers in the domain strongly advocate for additional qualitative research (Carreira et al., 2013; Grosvenor, 2000).

The few qualitative insights - some of which relate to other transportation modes than rail services - stem mostly from interviews (Hildén et al., 2016; van Hagen and Bron, 2013) or focus groups (Camacho et al., 2015; Heufke Kantelaar et al., 2022). Observations have been undertaken to investigate specific issues such as the passengers' risk of falling at train stations while looking for information (Larue et al., 2021). They are also complementing think-aloud techniques during user tests of interface prototypes (Beul-Leusmann et al., 2014; Pang et al., 2019). Content analysis is another qualitative method employed on email customer complaints (Ross et al., 2020) and social media comments (Blatter and Einsele, 2022) to reveal factors affecting the passenger experience. In diary studies (Hildén and Väänänen, 2019; van Hagen and Bron, 2013), cultural probes (Belloni et al., 2009), and story completion (Joshi and Bailey, 2023), passengers self-documented their journeys and associated feelings, behaviors, and attitudes. Beyond the evaluation aspect, co-design methods slowly find their way into transportation service design. They have been used to address accessibility concerns (Vollenwyder et al., 2020) or to ideate potential digital services for buses (Hildén et al., 2017).

2.3. Research objectives

Most prior work in the railway domain focuses on the passenger experience regarding specific issues, and relies primarily on quantitative insights. Obtaining a holistic understanding of passenger experiences, requires a wider use of qualitative research. Using a qualitative approach that invites users to share their individual experiences and that looks at what matters most to them when they are not primed on specific issues, the present study thus aims to:

(1) consolidate and deepen prior empirical evidence of factors influencing railway passenger experience.

(2) identify the most prominent passengers' needs which can be used as guiding principles in the choice of solutions to address the factors of concerns or opportunities.

(3) extend the qualitative research toolkit for transportation service design with the love and breakup method (Gerber, 2011; Hanington and Martin, 2012). To this end, we discuss advantages and limitations of using this method to investigate passenger experiences.

3. Method

To answer the research objectives, we deployed the love and breakup method (Gerber, 2011; Vasques et al., 2022). First employed by design practitioners (Smart Design, 2016), it combines approaches from design probes (Gaver et al., 1999), letters to objects and services (McCarthy et al., 2021), and roleplaying (Gerber, 2011). Such emotion-stimulating techniques are often deliberately provocative, reflective, or amusing to stimulate user reactions (Gaver et al., 1999). They invite people to reflect on experiences with products and services (Sanders and Stappers, 2012) and elicit narratives that are difficult to access via more traditional methods (Gaver et al., 1999). Love letters are a particularly interesting technique as they push people towards expressing what matters most to them. The analogy with a partner relationship resonates with passengers as illustrated by the Twitter account *SNCF, mon Amour* (SNCF, my love, (@sncfMonAmour, 2012)).

Table 2. An overview of research approaches used to uncover passenger experience in previous work (public transport and railway literature)

Research approach	Example of studies (non-exhaustive)
Quantitative approach	For a synthetic view of quantitative methods to understand service quality in transportation service, see (dell'Olio et al., 2018)
General service satisfaction surveys	SERVQUAL standardized scale (Parasuraman et al., 1988), with additional dimensions: comfort, connection, convenience (Cavana et al., 2007) and passenger information (Azmi et al., 2018), holistic passenger experience scale (Ittamalla and Srinivas Kumar, 2021), satisfaction surveys (Barchański, 2023)
Questionnaires on specific topics	Questionnaires on specific topics, e.g., travel duration, use of travel time, technological innovation, satisfaction with commuting (Bradley et al., 2021; Cui et al., 2021; Ermagun et al., 2022; Heufke Kantelaar et al., 2022; Park et al., 2021; Zhai et al., 2021; Zhou et al., 2022)
Experimentations around service design components	Atmosphere in the station (e.g., light, music, colors) (van Hagen, 2011), cleanliness perception (Vos et al., 2019), announcements in train (van Hagen and Sauren, 2015), real-time information (Dziekan and Kottenhoff, 2007)
Post-user tests questionnaires	(Beul-Leusmann et al., 2014; Muhammad et al., 2017; Pang et al., 2019)
Psychophysiological measurements	Physiological sensors measuring passengers' stress (van Hagen and Vos, 2018), Electroencephalogram (EEG), Functional Magnetic Resonance Imagery (fMRI) (Souche-Le Corvec and Zhao, 2020)
Quantitative metrics of passenger behavior (aggregated data)	Behavioral transport data (Foell et al., 2013), passenger flow data (Zheng et al., 2023), Crowd-sourcing data based on commuters GPS trace data using their phones and transit service planned schedule information (Zimmerman et al., 2011)

Qualitative approach	Papers advocating for qualitative approaches in public transportation service research (Carreira et al., 2013; Grosvenor, 2000; Transport Reseach Board and National Research Council, 1999)
Interviews	Interviews (Carreira et al., 2013; Hildén et al., 2016; Stein et al., 2017), in-depth interviews (van Hagen and Bron, 2013), photo-elicitation technique (van Hagen and de Bruyn, 2015)
Focus groups	(Camacho et al., 2015; Heufke Kantelaar et al., 2022)
Observations	Observation on field, e.g., in trains like in (Camacho et al., 2015), observation with eye-tracking (Larue et al., 2021)
User tests including observations and think-aloud	User testing prototypes (Beul-Leusmann et al., 2014; Pang et al., 2019)
Analysis of customer complaints and feedback comments	Comments on Facebook (Blatter and Einsele, 2022), complaints on specific platform dedicated to passengers' feedback (Ross et al., 2020)
Diaries and cultural probes	Diaries (Hildén and Väänänen, 2019), cultural probes (Belloni et al., 2009), online passenger community (van Hagen and Bron, 2013)
Story completions	Online story completion for revealing women's experience (Joshi and Bailey, 2023)
Co-design methods	Co-design of information solutions (Hildén et al., 2017), co-design accessible solutions for people with impairments (Vollenwyder et al., 2020), co-design of solutions for elders (Stein et al., 2017)

3.1. Participants

Our target population were passengers of the railway service in Luxembourg - CFL. We recruited passengers using voluntary sampling through the railway company communication channels (social media, website, Wi-Fi portal), passenger communities, and flyers at train stations. The wording of the call for participants read: "Share your train experience! We are looking for participants to take part in a study. Share your train experiences to help us understand how to improve the Luxembourgish railway service." The method of love and breakup was not mentioned at this stage, to avoid priming participants or inducing a self-selection bias linked to how odd the method can sound. This also safeguarded the spontaneity in their declarations. Interested participants registered via an online form in which they completed (a) demographic information: age, gender, professional status, (b) their railway use frequency and familiarity with the service, and (c) their general satisfaction with the service on a scale from 1 to 10.

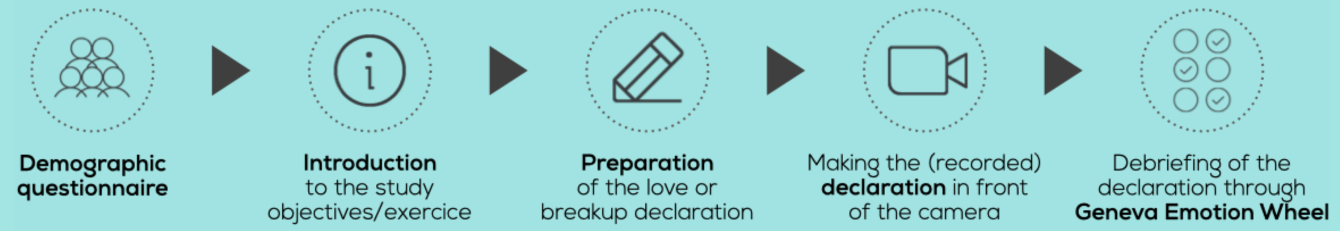
Our sample is composed of N = 53 participants (25 men, 28 women), residents in Luxembourg (n = 42), or cross-border commuters from France, Germany, and Belgium (n = 11). Their age ranged from 19 to 64 (M = 35, SD = 11.28). To account for local specificities, our sample included more than 5 participants for each of the six railway lines of the country. Their professional status included workers (66%), students (30%), and retired or unemployed (6%). 34% commuted during the week and weekend, 58% only during the week, and 8% only on the weekend. Their train travel frequency was every day for 28%, several times per week for 51%, and sometimes for 21%. 91% had already used the railway service for over six months, and 9% for less than six months. Their general satisfaction with the service is M = 7.15 (Min = 4, Max = 10, SD = 1.5).

3.2. Procedure

The individual sessions took place between December 2020 and March 2021. They were conducted remotely due to Covid-19 restrictions. The University's ethics review panel approved the study, and we obtained participants' informed consent. The procedure involved five steps (Figure 1).

Each 45-min session started with a brief introduction of the study objectives: investigating the passenger experience with their local railway service. Participants were then invited to make a love or a breakup declaration to their railway service as if this service was their life partner. They had up to 10 min to prepare the declaration and were free to take notes. The participants made their declaration orally in front of their webcam. The researcher launched the video recording and switched their camera off to avoid being mistaken for the declaration recipient. The participants had no time limitation for the declaration. The recordings ranged from 30 s to 10 min. During a debriefing, participants filled an adapted version of the Geneva Emotion Wheel - GEW (Scherer, 2005) to indicate the emotions they expressed and explain their ratings. Finally, participants were invited to add any comments before they received compensation.

Figure 1. Steps of the study procedure


Demographic questionnaire
Introduction to the study objectives/exercice
Preparation of the love or breakup declaration
Making the (recorded) **declaration** in front of the camera
Debriefing of the declaration through **Geneva Emotion Wheel**

3.3. Material

3.3.1. Love and breakup declarations

The following instructions, adapted from Ahgharian (2016), were displayed to participants. The experimenter orally mentioned to participants that they were entirely free to express whatever they wanted, notwithstanding the type of declaration chosen.

(1) Choose to make a love or a breakup declaration.

(2) Prepare your declaration during the next 10 min. Below are some explanations to guide you.

> *Love declaration to CFL: Talk about what makes you love CFL. What characteristics of CFL would you never want to change?*
>
> *Breakup declaration to CFL: Share with CFL the reasons why the relationship didn't work. Talk about the habits that annoyed you. It's the opportunity to write and make it easier for both of you to move on. Feel free to name services you used to cheat on CFL.*

3.3.2. Geneva Emotion Wheel

The GEW is an emotional measurement instrument used to assess emotional reactions to objects, events, and situations (Scherer, 2005). To fit into the digital study setup, we adapted the wheel into a matrix, with the emotion order randomized. The GEW served the respondents to indicate the emotion they expressed via their declaration. They rated 20 emotions on five degrees of intensity using a 6-point Likert scale starting with a "None" option (no emotion felt) and followed by five numeric labels. In addition, an "Other" (different emotion felt) option was provided.

3.4. Data analysis

We transcribed the declarations (examples in Figure 2) and debriefings and thematically analyzed them. We choose thematic analysis to define the positive and negative aspects of passenger experience per theme, which contributes to consolidating the current literature on passengers' needs in railway services. This also allows the railway service teams to obtain actionable results.

We developed the codebook through an inductive approach in which we defined five main categories, namely service touchpoints, mediating factors (i.e., external factors impacting the service), company appreciation factors, particular use context (Table 3), and passenger needs (Table 4). We organized code training among three peer researchers and double-coded eight participants (15% of the sample, following the guidelines by (O'Connor and Joffe, 2020) using MAXQDA 20.4), leading to a refined coding scheme. Researchers one and two double-coded another set of eight participants, reaching a substantial agreement of 0.76 (Cohen's Kappa, (O'Connor and Joffe, 2020)).

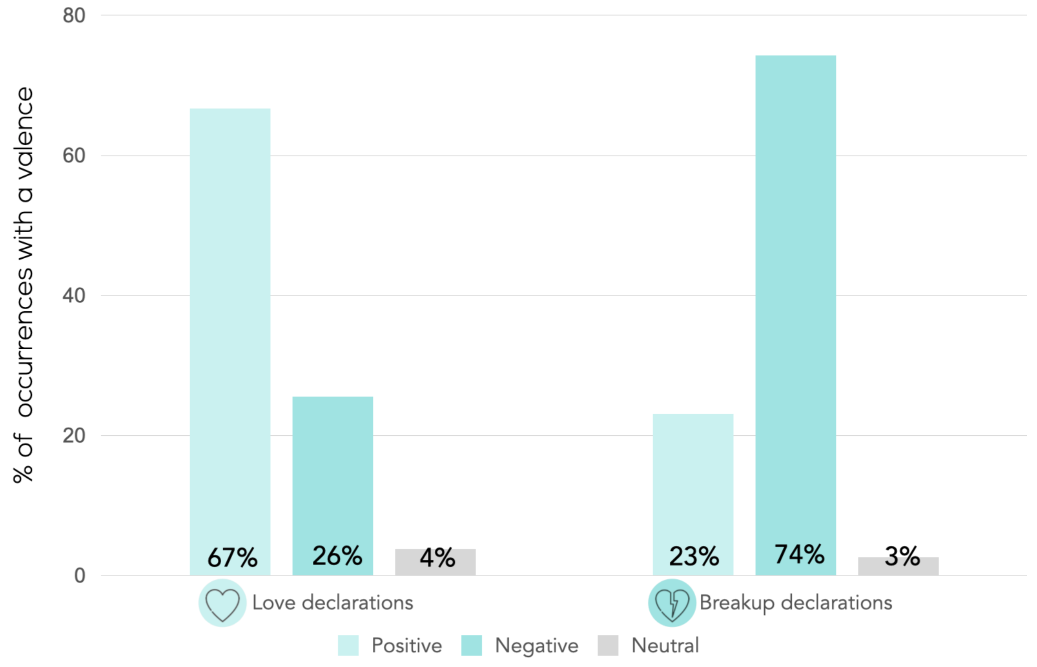
In the results section, we illustrate the findings with participants' verbatims, indicating the type of declaration made using a letter (L for love or B for breakup) prior to the participant's number.

4. Results

4.1. Descriptive results

74% (n = 39) of the participants chose to make a love and 26% (n = 14) a breakup declaration. Regardless of the choice, most expressed positive and negative aspects of their service experience (Figure 3). Based on the content analysis of the declarations, 25 out of 39 love declarations and 10 out of 14 breakup declarations contain positive and negative feedback (n = 10).

Figure 3. Valence distribution of occurrences per type of declarations (N = 53)



N.B. Some occurrences have been coded with positive and negative valence

Figure 2. Examples of love and breakup declarations transcribed

Example of one love declaration – L.39

"

Dear CFL,

Here we are taking stock of our four-year relationship.

I must admit that four years ago I often wanted to break up with you. And yes, my journeys between xx* and xx* do not contain only good memories. Sometimes you were late. Sometimes a bit too often for my taste. And then unfortunately, you did not go directly from xx* to xx*. At least, my move to xx* made the two of us relive a honeymoon. My daily journeys between xx* and xx* are a bliss.

If ever you have a problem, which can happen, I take the bus. As for my Saturday trips to xx*, I can't complain either. Delays are rare. I always find a seat. You are relatively proper despite the number of admirers you have every day. And the best, you don't cost me anything for Valentine's Day.

The only downside between you and me is that it is a little complicated for me to go to xx* on weekends to see my parents. If you improved this point, I would be very happy. And if you continue like this, who knows, maybe one day we will celebrate our golden wedding anniversary together.

Keep it up.

"

*Anonymization of participants' personal data

Example of one breakup declaration – B.50

"

Dear CFL,

I'm really sorry, but I have to breakup with you. I've tried for years, a decade, even to make this relationship work. And from the get-go, it seemed that we were a match made in heaven. I mean, I am an eco-conscious commuter. We actually like to ride on trains, and you are a cheap and now even free railway service. That takes me where I want to get.

But from the very beginning, you made it clear that we're not really interested in this relationship. This began 14, 15 years back when, there were still the old diesel trains who there were always cramped and there was no air conditioning. The worst thing was that whenever somebody used the toilet, the whole train would fill up with the most dreadful smell.

Nobody was interested in fixing this. Until at some point after years new trains arrived. That didn't have all these problems. But then how many times did you just leave me waiting on platforms in the rain, in the cold, in the heat, with urgent appointments to get to that I couldn't reach anymore. [...]

To make matters even worse for weeks again and again and again, you would just disappear completely and use overcrowded buses that were even more late than more unreliable than your trains ever managed to be. And now, for all for over a decade, I've listened to your promises and explanations about suicides and ah, construction. But I'm done now.

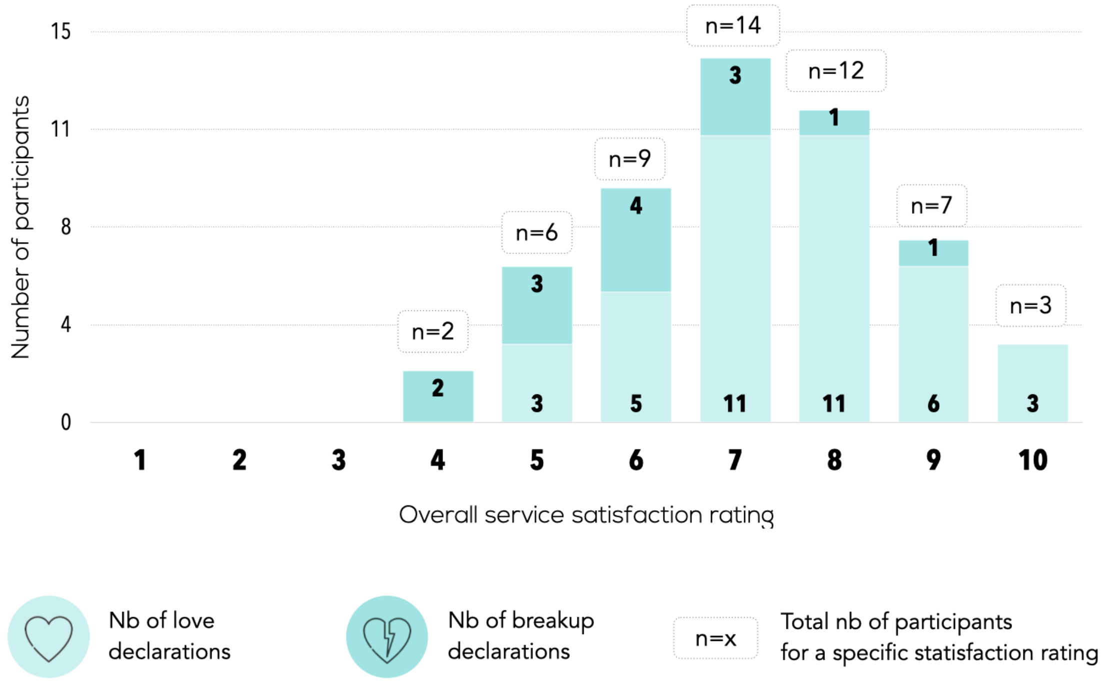
I can't take it anymore.

So, I'm finally breaking up with you, and I'm really, really sorry that it had to come to this.

"

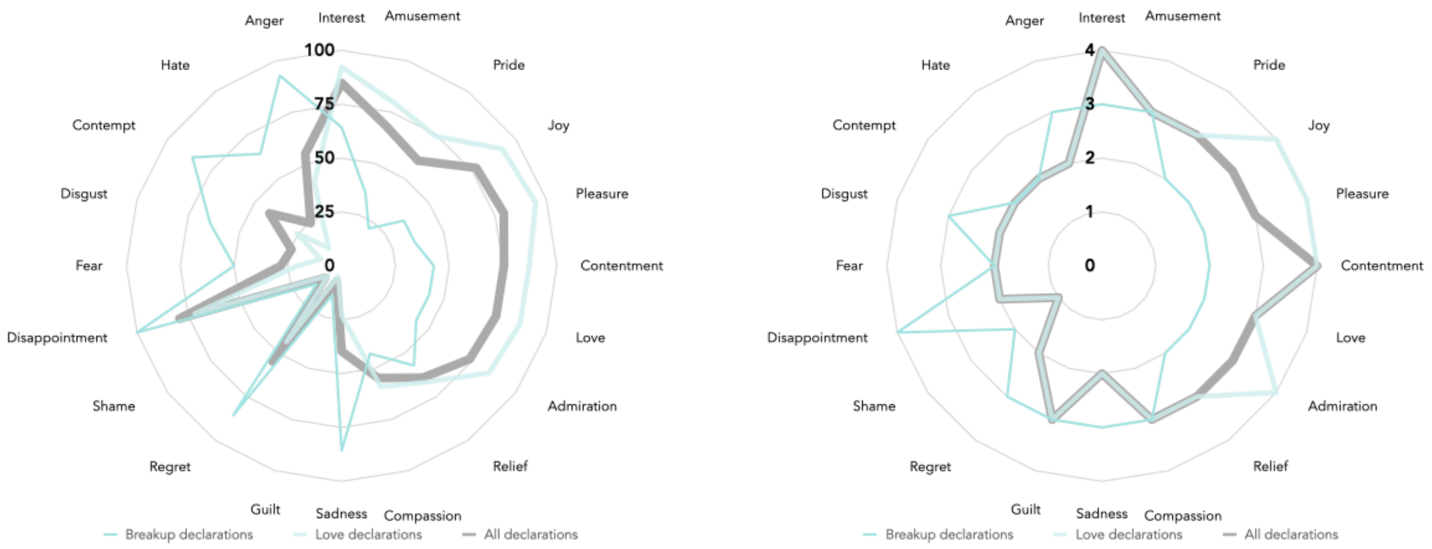
The participants rated their satisfaction with the service prior to the experiment (online demographic survey). Figure 4 presents the link between the choice of declaration (love vs. breakup) and their initial satisfaction rating on a scale from 1 - "Not satisfied at all" to 10 - "Very satisfied." The satisfaction with the service was rated on average as M = 7.15 (Min = 4, Max = 10, SD = 1.5), with a significant difference between the love group (M = 7.54, SD = 1.33) and the breakup group (M = 6.07, SD = 1.44), *t*(51) = 3.46, *p* = 0.001. A few participants who rated the service as satisfactory (i.e., between 7 and 10) did nonetheless make a breakup declaration.

Figure 4. Service satisfaction rating by declaration type: love (n = 39) or breakup (n = 14)



Following their declarations, the participants filled in the adapted Geneva Emotion Wheel indicating the conveyed emotions and their intensity. Overall, the top three selected emotions are interest, pleasure, and disappointment (Figure 5), all selected by more than three-quarters of the participants. The top three selected emotions by the love declarers have a positive valence: pleasure, joy, and interest. The emotions rated as most intense in this group were contentment (M = 3.94, SD = 1.01), interest (M = 3.89, SD = 1.06) and admiration (M = 3.67, SD = 1.05). In the breakup group, the top three selected emotions had a negative valence: disappointment (M = 3.71, SD = 1.38), anger (M = 3.15, SD = 1.21), and sadness (M = 2.75, SD = 1.29). All breakup declarers chose disappointment. This emotion had the highest intensity level in this subgroup (M = 3.71, SD = 1.38). Anger was selected by all but one breakup group participant (M = 3.15, SD = 1.21).

Figure 5. Emotions selected (left figure; percentage of participants who selected the emotion) and their intensity (right figure; means rounded of emotions selected) as rated by the passengers for love, breakup and all declarations (N = 53, (Scherer, 2005))



N.B. « All declarations » and « Love declarations » have similar means from « Pride » to « Relief » emotions

4.2. Factors influencing passenger experience

We identified 21 factors that influence the passenger experience, corresponding to four themes (Table 3).

4.2.1. Service touchpoints

The participants reflected primarily on service touchpoint factors (393 occurrences) such as passenger information, trains, stations, staff, and how those factors directly impact on their experience. Unsurprisingly, the train was at the center of their remarks. Participants mentioned the quality and configuration of trains and their feeling of comfort onboard. "The material, it's very recent and very well maintained." L.18. Passenger information was the second most commented factor. Respondents highlighted the crucial role of information to reach their destination efficiently. "This is not all about the trains, but also information around the train." L.30. They request transparency (e.g., precise delays and disturbance information, including transparency about uncertainty) to feel empowered and confident in their journey decisions. "If we only have some information about a delay, we might be anxious." L.44. Respondents expressed that they can accept delays and cancellations but not that information is withheld. "When it's last-minute issues, it's not always easy. But at least communicating would be good." L.10. Moreover, the behavior of the staff impacts their service perception. Friendly, helpful, multilingual staff triggers empathic, admiring, and grateful comments. Bad experiences with the staff commonly result from rare but remembered unpleasant encounters. "Sometimes you feel like you're being treated like a child in a somewhat condescending way." B.49.

4.2.2. External mediating factors

Mediating factors go beyond the service offer and are difficult to control for the service organization. Yet, they play a crucial role as they are part of the overall mobility experience and often used as a basis for comparison. These factors can be split into two subcategories:

Passengers' personal experience

The majority of our participants commute regularly and hence report familiarity with the service. They comment on specific service improvements, share anecdotes of rail service failures, and express their appreciation: "There are many things that can be improved, but for the size of the country. I think they're trying their best to provide the best service they can." L.46. Participants who commute on lines with recurrent rail service failures share a less optimistic view. "I see the efforts being made, but I don't see the results." L.21. Familiarity plays a role in the service dependence perception. Passengers know that the service does not always meet their expectations and they have to adapt to it. Many take the train by obligation (e.g., no driver's license). Transport choice is mainly guided by efficiency. Taking the train allows them to relax and do personal activities (e.g., reading, working) during the journey. "It's less tiring to take the train than to focus [on the road] in the car." L.44. However, if the journeys are not perceived as efficient, the car is preferred. "I sometimes regret having chosen the train when nothing works." L.26. Passengers' experiences with foreign public transportation services raise expectations: "Ireland is much poorer, but the trains are in better condition; they all have Wi-Fi." B.32. One-third of participants put their experience with the service in perspective with personal characteristics, e.g., personality traits, "It goes with my personality because I like to observe nature." L.04, life philosophy, "My approach to life is more functional." L.46, or passions, "I really like the train; it's a passion." L.24.

External factors

The predominant external factor in our sample was free transportation in Luxembourg (since March 2020). Participants unanimously expressed admiration for the initiative and relief for not having to purchase a ticket or subscription. Free transport has become a new tolerance factor towards the service. “When criticizing, you have to think that first of all; it's free.” B.01. Railway experience is part of a broader mobility context. Participants mentioned opportunities or challenges arising from multi-modality and services used in combination with the train. Recurrent topics relate to the synchronization and availability of those services: “When I arrive at the station, I always have a tram.” L.19, “You even have to take a train beforehand to ensure you have a place in the parking.” L.26. Another external factor addressed by one-third of participants are the other passengers described, e.g., as sometimes “noisy and disturbing.”

4.2.3. Appreciation

The passengers' overall appreciation of the company was positive. “Since we moved in, the service never stopped improving.” L.07. Nevertheless, participants made some remarks about additional stops and weekend timetables. Beyond these general comments, participants pointed at the railway company's difficulties in innovating. “It just takes too long to understand and think further. You need ways to think differently.” L.17. Moreover, corporate communication was criticized: “Your repeated media that the average delays have improved over the last few years… It does not cheer me up because I'm having problems again today.” B.09. However, participants commented on the challenges faced by the company and the staff with empathy, “I know that you're trying.” B.40., “I know you're not perfect, but you have been a vital part of my daily life.” L.45.

4.2.4. Particular use contexts

Our participants reflected on their experience in five particular situations: rail service failures, particular weather conditions, rush hour, Covid-19 situation, and cross-border journeys. Rail service failures were the most mentioned. Participants did not always specify the type of failure, yet all expressed not understanding the reasons for these problems, which leads back to the concerns about passenger information transparency. “We don't know why we stopped.” L.34. Too generic passenger information generates a negative impression of the service management. “You get the impression that the possibilities are put under a hat, and one will come out at random.” L.53. Proper information in critical contexts is crucial and missed: “Too busy dealing with your various problems; perhaps, you are never on the platform when I need information.” B.25.

The weather was the second context factor. Winter weather stood out specifically with issues such as ice on footbridges and waiting in the cold. Participants, furthermore, commented on the discomfort they experience during rush hour. A quarter of them also expressed concerns about Covid-19. They emphasized the importance of hygienic measures and related information such as the train occupation rate. Lastly, participants commented on synchronization issues related to cross-border commutes. “I feel that there is not good communication with CFL although it is a cross-border line.” L.30.

4.3. Identified passengers' needs influencing passenger experience

In addition to the factors identified in section 4.2, passengers' narratives reflect eight needs categorized in psychological needs and pragmatic needs (Table 4).

4.3.1. Psychological needs

Most participants seek control over their experience and wish to feel autonomous instead of dependent on the service. “Not being able to do anything. Powerlessness.” L.52. They expect to be able to choose when to take the train according to their schedule and the travel options offered. More than half of the participants commented on information shortcomings and the service failures. Transparent and consistent information supports passengers' feeling of control; it helps them feel more confident and generates fewer negative emotions: “If you only have the information about the delay, you can be anxious, but when you have the time delay, then you can feel relief.” L.44.

The need for care/empathy reflects the importance of demonstrating attention to passengers. Three-quarters of participants expressed the need to be care for by the service. The lack of listening and understanding impacts their experience negatively and can trigger deception or even blame. “I gave up. The collaborative mode doesn't work. I felt a bit misunderstood, it's just a shame.” L.53. Passengers want to be treated with equity. Not taking care of their well-being inevitably leads to a poor experience: “They know it's at least 2 h late. […] They don't give us a bottle of water.” L.46. Their empathy towards the service and its challenges reaches its limit when the consideration they receive does not meet their expectations. “I don't know what they mean when they say, ‘technical problems’, there is some compassion, but not too much.” L.33.

Several participants commented on the benefits of traveling by train and underlying pleasure. “I gave 4 to pleasure because […], I was remembering and thinking of all the time I spent on the train and using the service in general. I really liked it.” L.46. This notion of pleasure is primarily associated with the personal

Table 3. Identified factors influencing passenger experience

Categories		Factors	Factors description	% of participants	No of occurrences			
					Total	Positive	Neutral	Negative
Service touchpoints (393 occurrences)		Trains	Equipment (models, obsolescence), ambiance (comfort, space, light), functional aspects (number of seats, temperature, Wi-Fi, toilettes, bike/ strollers), cleanliness, safety	91	112	75	4	47
		Passenger information	Messages (content, tone), type of information (timetable, train capacity), temporality (frequency and synchronicity), channels (displays, apps, audio, social media, external)	79	144	49	17	83
		Staff	Staff (in the stations or supporting services): perceptions of kindness, caring, availability, listening, and helping, perception of their job mission	64	82	46	5	38
		Train stations	Ambiance (comfort, color, materials), environment (elevators, stairs), functional aspects (cooling, heating, dedicated spaces like waiting room), cleanliness, renovations, parking	49	55	19	10	39
Mediating (351 occurrences)	Passengers' personal experience	Familiarity with the service	Habits and past experiences with the service: use frequency, comparison between time periods, perception of routines, recurring problems, service history	75	73	33	16	34
		Reasons for using a transport or another	Reasons for traveling by train or not (often compared to cars and buses): time optimization and perception, preference, environmental, financial reasons, tourism	72	85	52	7	28
		Experience with other services	Comparisons with other publictransportations used: advantages and limits	42	43	29	2	18
		Personal characteristics	Personality (degree of patience), passion for trains, contexts (traveling with relatives, home locations), motivation to contribute in the experience quality (keep clean spaces)	34	27	20	5	1
	External factors	Free of charge	The benefits of democratizing public transportations, satisfaction of no longer paying and managing the subscription, the service quality always provided despite free of charge	57	60	51	3	6
		Multi-modality actors	Parking facilities (existence, occupancy), other public transportations (tram, bus) used in combination with trains, bike facilities (spaces for bikes in trains, parking for bikes)	32	44	27	4	20
		Other users	The other users in trains and stations: behaviors, passenger-to-passenger help	25	19	4	1	15

Appreciation (339 occurrences)	Service perception	Appreciation of the company and the service, generic comments about the service, e.g., service improvements, branding, attractiveness of the service in the region	91	143	100	18	43
	Empathy (towards the company)	Expressing empathy towards the company and staff: noting the efforts to improve the service, understanding the service complexity and job difficulties, flexibility of the staff	72	100	55	21	29
	Service offer	Appreciation and wishes regarding the offer: possible destinations and journeys, connections, time-tables, trains frequency, direct lines, international offer, touristic paths	58	64	33	11	21
	Innovation	Innovation ability and differentiation ideas to stay competitive: capability for thinking out of the box, time for taking decisions, investing and improvements and works	21	20	4	5	12
	Communication	Corporate communication through media and press (news about works, punctuality), communication of contents to promote the railway transportation	13	12	1	5	5
Particular use contexts (260 occurrences)	Rail service failures	Management of service failures (delays, cancellations, works) with reasons among others like technical problems and accidents, the alternatives offered	81	164	31	17	126
	Particular weather	Experiences of weather: waiting time during winter, journey in train during summer	38	31	10	3	21
	Times of rush hours	Crowded trains in rush hour: experience with the crowd, trains capacity, trains frequency	36	29	7	0	24
	Covid-19 situation	Management of the Covid-19 situation and sharing concerns regarding the future	23	24	11	2	13
	Cross-border journeys	Specific experience as cross-border passenger: tickets purchase, passenger information between the foreign railway services, cross-border connections	9	12	3	2	7

N.B. The occurrences could be coded positive and negative depending on the occurrence meaning.

activities that participants can have on-board or in stations: “Have the pleasure of meeting friends, with whom I take the train, and with whom I sometimes share a coffee.” L.30.

Security is railway companies’ top priority. Every precaution is taken to avoid accidents. As a result, there was little input from participants on this need. The few participants who mentioned security emphasized their appreciation, “the security criteria are guaranteed.” L.04. For the participants security mainly relates to the feeling of safety. They explained when, how, and why they feel safe, “Your material is so clear and well-lit that it already gives a feeling of safety.” L.05, or unsafe (e.g., deteriorated material, lack of reassuring human presence).

4.3.2. Pragmatic needs

Effectiveness is the reason why most participants choose the train over the car. It is often expressed in terms of reliability: the service should provide reliable rolling stocks, trustworthy information, and competent staff that attends to customer questions, reassures, and handles unexpected situations. Passengers expect a reliable service that ensures punctuality or proposes effective alternatives during rail service failures, “I should look for a new girlfriend, a bit more flexible than you, more reliable.” B.09, “Because my dear service, you are never on strike, you work 24/7, you transport me everywhere I need to go and never leave me.” L.06.

Passengers frequent comments on time echo their need for efficiency regarding which good connections and punctuality are key factors. They count on the reactivity and flexibility of the service. “They are still reactive.” L.10.

The utility need was often mentioned in combination with other needs. 77% of the participants shared expectations of functional needs like Wi-Fi and clean toilets. It also refers to the utility of the service overall. “It has always been useful in my daily life to have this service.” L.38.

A quarter of participants (mostly frequent users, aged between 25 and 54) referred to accessibility, although none of them identified as a person with special needs. They put themselves in other passengers’ shoes or projected themselves when they get older, “There aren’t many lifts at the stations.” L.13. Others share personal experiences of situational accessibility difficulties, e.g., carrying a bike, luggage, or stroller. “Putting the bike up like that on a hook. It’s not easy.” L.33.

Table 4. Identified passenger needs influencing passenger experience

Passenger needs		Description	% of participants	No of occurrences			
				Total	Positive	Neutral	Negative
Psychological needs (811 occurrences)	Control/ Independence	Being autonomous and in control of the journey: having all information to plan the journey and take decision, having alternatives, having power over the situation(vs. feeling powerless), getting answers (vs. not getting information)	85	163	46	23	95
	Care/Empathy (toward users)	Taking care of passengers (staff availability and kindness, guided through information in different languages, not using rail jargon, tone of voice), well-being (human service, not feeling abandoned, having warm and clean spaces to wait or travel),feeling to be part of the service (opinions listened and took into account to improve the service)	79	120	47	10	66
	Physical safety	Feeling of safety (or lack of), comments on security infrastructures	32	41	26	3	18
	Pleasure	Pleasure to take the train (passion for trains, pleasant environment, evoking holidays activities), activities on board (sleeping, daydreaming, reading, listening to music, enjoying landscapes, or getting stimulated to work), socializing or making good memories with friends, colleagues or relatives	66	87	77	7	4

Pragmatic needs (112 occurrences)	Effectiveness	Being able to commute without problems thanks to reliable rolling stocks (no technical issues), reliable information (transparent, coherent across the channels), reliable staff (trustworthy, available, enforcing the rules, competent, organized), reliable service (punctuality, continuity, offering alternatives during failures)	89	151	54	9	90
	Efficiency	Time efficiency (use of time like journey time or waiting time, no delays, punctuality, reactivity, flexibility), efficient journey (efficient service organization, journey, connection and access optimization, service improvements to be more efficient),possibility to make efficient choices depending to the current rail traffic (using the train or the car)	81	137	43	14	83
	Utility	Responding to usability concept and functional needs (allowing something): accessing information through displays, mobile apps, web site, or the staff, having Wi-Fi in trains to work, having toilettes Utility of the service: public utility of the mobility service, practical, transporting everywhere, timetables Utility of renewing train stations or infrastructure for maintaining or improving the service and the offer	77	89	56	15	21
	Accessibility	Accessibility for persons with permanent or situational disabilities, traveling with bikes, luggage, strollers	25	23	7	1	21

N.B. The occurrences could be coded positive and negative depending on the occurrence meaning.

5. Discussion

The study aimed to uncover the prominent factors and needs influencing railway passenger experience, using a qualitative research approach that invites participants to share their service experiences. We discuss how our results consolidate and deepen previous work by highlighting four categories of factors and key passengers' needs. Putting our findings into perspective with the literature on user experience, we provide new insights into the user experience in the context of rail travel. We also discuss the relevance of the original love and breakup method to gather engaging and emotional passenger feedback, and reflect on its use in the transportation domain.

5.1. Factors influencing passenger experience

Most of the findings align with prior work. Service satisfaction and the dimensions of the SERVQUAL questionnaire (Parasuraman et al., 1988) were mentioned by participants in the form of appreciation factors. For instance, the tangibles dimension aligns with our service touchpoints, as well as the *comfort*, *reliability* and *assurance* with the effectiveness (Cavana et al., 2007). Beyond service satisfaction surveys, our results overlap with factors assessed in studies on service design components, e.g., atmosphere (van Hagen, 2011), staff (van Hagen and Sauren, 2015; Vos et al., 2019).

Beyond these overlaps, the present study adds new insights into important topics such as passenger information. Tools for measuring passengers' satisfaction with information (Azmi et al., 2018) highlight the passengers' need to get information at a glance (Hildén et al., 2017) and in real-time (Dziekan and Kottenhoff, 2007). Our results strengthen passengers' request for appropriate information, particularly during service failures. Beyond easier access to information, passengers desire transparent communication. They expect to be informed by the service even when the company does not have definitive answers, e.g., displaying that the duration of a delay is unknown. According to the expressed needs, particular attention should be paid to the messages' content and tone. Enhancing information stands out as a key aspect to address passengers' needs for *control/independence*, *effectiveness*, *efficiency*, *utility*, and *care/empathy*.

Mediating factors influence passengers' regard for the service. Prior experience with other transportation services raises expectations, which, if not satisfied, generate negative experiences and frustration. On the contrary, reasons for using the train that resonate with personal values (e.g., sustainability) generate positive emotions. Our passengers' personal experience and external factors in Table 3 are close to Ross et al. (2020)'s *personal*, *contextual*, and *task factors* impacting passenger experience during rail service failures. Participants referred to personal characteristics to explain their understanding of service challenges or their level of patience (e.g., daydreaming personality). We noticed that familiarity with the service plays a crucial mediating role. Participants taking the train several times per week expressed more controversial, variegated, and detailed opinions about the service. They also mentioned anecdotes regarding the usefulness of aspects of the service and were able to make plausible hypotheses about how the service works. Participants who took the train daily over a long time seemed more tolerant towards the service and followed the improvement over time. Finally, free transport appeared as a singular external factor that positively influences passengers' experience, which aligns with studies on the zero-prices effect (Cools et al., 2016).

5.2. The central role of passengers needs

Currently, transportation research recognizes that passengers have needs and experience positive and negative emotions throughout their journey. These factors are however still under-considered in decision-making about the design of the service. As implications for the railway industry, identifying and addressing the needs and the emotions expressed is key for designing positive passenger experiences. Users' needs *"serve to anchor a wide variety of motivational and functional analyses."* (p.325, (Sheldon et al., 2001)). Some of the needs identified in our study resonate with those from van Hagen et al.'s studies (van Hagen, 2009; van Hagen et al., 2022), which distinguish functional needs, social values, and emotional needs.

Our participants emphasized several pragmatic needs: effectiveness, efficiency, utility, and accessibility. Accessibility has been evoked as a concern for all. The participants mentioned several situational limitations, for example crowded or loud contexts, traveling with heavy luggage or a stroller. These situational impairments, defined as a mismatch between the environment and the interaction that creates a temporary exclusion (Microsoft Design, 2022), are rarely studied as such. Mobility research mainly focuses so far on accessibility for specific populations like the elderly (Stein et al., 2017) or passengers with impairments (Vollenwyder et al., 2020). Looking at disability as "mismatched human interactions" rather than a "personal health condition" could bring inclusion to a new level in the transportation area.

Interestingly, our findings can also be put into perspective with the psychological needs inspired by the Self Determination Theory (Sheldon et al., 2001) and user experience models (Hassenzahl et al., 2010), and pragmatic needs inspired from (Batra and Ahtola, 1991). Eight psychological needs are usually described as the main drivers for a positive user experience (Hassenzahl et al., 2010; Sheldon and Mayes, 2011): *competence/effectiveness, autonomy/independence, security/control, pleasure/stimulation, self-actualizing/meaning, relatedness/belongingness, influence/popularity,* and *physical thriving*. In our analysis, we identified control/independence, care/empathy, pleasure, and physical safety as predominant psychological needs in the railway context. They all overlap, partially or entirely, with the psychological needs. Effectiveness (and by extension efficiency) can be understood as both a pragmatic and a psychological need, defined in this context as the feeling to be capable and effective in your actions (Sheldon et al., 2001). In our sample, this need is closely related to the need for being autonomous and in control of the journey. Companies' infrastructure investments to solve service failures might appear as insufficient if they are not combined with, e.g., adapted passenger information fulfilling passengers' need for control of their journey.

Despite their seemingly important role, other needs such as care/empathy, are still under-researched in the transportation domain. These appear close to the empathy and responsiveness dimensions of the SERVQUAL questionnaire (Parasuraman et al., 1988), which entails the caring individualized attention the firm provides its customers and willingness of employees to help customers. Aligned with research on customer relations in other domains, care and empathy from the service provider motivates passengers to be, in return, more tolerant towards rail service failures and empathic towards the service organization overall (Wieseke et al., 2012). This illustrates the bi-directional nature of empathy, where passengers are both part of- and partners in the service experience (Ngo et al., 2020). Some recent work has explored ways to trigger railway employees' empathy towards customers, by using original ways of sharing customer insights within the company (Lallemand et al., 2022).

The findings have implications for the design of user-centered railway services. The identification of passenger experience factors offer opportunities to ideate solutions to improve the quality of the service. As a myriad of solutions can potentially address a specific concern or opportunity, the passengers' psychological needs should be used as a lens under which the suitability of solutions can be scrutinized. The needs are thus to be used as guiding principles in the choice of solutions.

5.3. Suitability of the love and breakup method for investigating passenger experience factors

In this study, we employed the love and breakup method as a way to investigate passenger experiences. Although not yet used - to the best of our knowledge - in the railway domain, the method has been insightful in different contexts, e.g., users' emotional attachment to technologies (Gerber, 2011), or the identification of pain points and satisfaction with services or products (Vasques et al., 2022). It was used in varying formats: letters (McCarthy et al., 2021), e-mails (Koskinen et al., 2003), or oral declarations (Gerber, 2011). We chose the oral format to encourage spontaneity in the comments shared.

Our study confirmed that the concept of declarations is easily understandable (Gerber, 2011) and playful. It motivated the participants to share constructive feedback. "I liked it. It was a nice approach to get more passionate feedback. It was a lot less dry than I anticipated. It was fun." B.50. It also elicited emotions that triggered memories and made them reflect on their experience more emotionally. Most participants commented that the method helped them to step back from their overall experience and share authentic lived experiences beyond quick factual feedback: "It forced me to reflect on my perception of the service because I usually don't wonder about this." L.06, "It was exciting to ask people to express their feelings. I think it makes everything more personal, and people can organize their ideas better." L.47.

In contrast with transportation research on service satisfaction, the love and breakup method allowed passengers to share their feedback in a non-constrained fashion. By telling their stories, participants depicted a more detailed representation of passenger experiences and a contextual understanding, which are essential to the field (Carreira et al., 2013; Grosvenor, 2000; Ross et al., 2020). The method pointed at factors of which the company was unaware (e.g., control/independence, empathy/care needs). Similar to van Hagen and Bron's in-depth interviews (van Hagen and Bron, 2013), our study unveiled the underlying reasons behind passengers' satisfaction or dissatisfaction.

Relevant for the study of passenger experiences, the love and breakup method might be used for longitudinal purposes (Karapanos et al., 2012) and echoes the popular critical incidents technique (Flanagan, 1954). It has the potential to explore passengers' concerns in a retrospective fashion while being cost-efficient enough to fulfill industry standards (Vermeeren et al., 2010). It carries inspirational value from the nuanced understanding of passengers' perceptions and expressions about the service from perspectives that quantitative methods do not provide.

6. Limitations and future work

Our study involved several limitations. First, the data collected covered only one European country (Luxembourg), with specific characteristics (free transportation, high ratio of cross-border commuters). The research methodology is nevertheless transferable to other locations and can be used in future research.

Our study took place during the Covid-19 pandemic, whose impact likely altered the passenger experience in some ways. Besides the comments directly related to the Covid-19 management, the perception of social factors might have been influenced. There were no restrictions on the rail travel in the country neither during the study period nor the 6 months prior to it. People were solely required to wear a mask. Due to home office agreements, the passenger volume was lower. Similarly, the weather conditions in winter period can results in some factors being more prominent.

Our sampling through the company channels limited us to service users and did not allow reaching people who do not use the service for reasons of dissatisfaction. The sample might therefore over represent passengers with a favorable attitude. Nevertheless, the obtained feedback seems balanced and not overly positive because several passengers saw their participation as an opportunity to get their concerns heard. Using voluntary sampling also possibly introduced a self-selection bias which could exclude people who have reflected less on their travel experiences. As the study was conducted online, our sample also likely excluded less IT-literate passengers.

Making a love or breakup declaration is not natural to everyone. Four participants did not engage with this approach: they did not employ any relationship expressions and solely enumerated the strengths and weaknesses of the railway service. Last, we observed a discrepancy between the overall positive feedback gathered via the love and breakup method compared to the satisfaction rated in the survey. Possibly the forced choice between the love or breakup tended to push people towards more well-meaning feedback, frequently choosing love over breakup. This effect was attenuated by the debriefing stage (negative points were mainly added at this stage), allowing in part to collect nuanced user feedback.

In future work, the value of positive aspects might help increase stakeholders' motivation to listen and believe users' feedback. The love and breakup method shares passengers' input through a new lens as compared to complaints or satisfaction surveys. Typically used for designers' inspiration (Smart Design, 2016) the passenger declarations might catch the attention of the service staff, hence raising their awareness and likely triggering their empathy towards passengers (a key element for an empathy-centric design process (Koskinen et al., 2003) and UX maturity (Chapman and Plewes, 2014)). The use of the method for this purpose remains to be explored in future work. It could be done by sharing the anonymized audio recordings of the declarations with employees, or having a group discussion on the individual declarations. Railway staff strongly impact passengers' perception of their travel experience, as evidenced by prior research (Oliveira et al., 2020; van Hagen and Sauren, 2015; Vos et al., 2019) and our findings. It is thus crucial to guide them on how to understand and improve passenger experience.

7. Conclusion

This paper identifies 21 factors influencing railway passenger experience categorized into four themes: service touchpoints, mediating factors (e.g., external factors), company appreciation factors, and particular use contexts. We uncovered them through the love and breakup method, an unusual user research tool for the transportation domain. The study points out to eight passengers' needs and their influence on passengers' experiences: psychological needs – control/independence, care/empathy, physical safety, pleasure, and pragmatic needs – effectiveness, efficiency, utility, accessibility. These needs were discussed with regards to theories of user experience. The study also gathers valuable insights into the love and breakup method to explore service experiences. Thanks to the originality of the method in this context, this study reveals new perspectives and opportunities in passenger experience studies. The factors and needs identified support a user-centered approach in the transport domain. Finally, this work is a new step towards more dialogue between service customers and stakeholders. Qualitative approaches such as the love and breakup method create a favorable environment to trigger service stakeholders' empathy towards users, which is an essential condition to deliver customer-centric services.

Acknowledgements

We would like to thank Sophie Lacour, Tom Nickels, and the Luxembourgish Railway Company CFL for supporting this project. Special thanks to Sophie Doublet who contributed to the dissemination of our findings in the industry.

Appendices

Appendix A. Emotions selected by the participants in all declarations

Emotions	Nb of participants		Min	Max	Mean	SD
	n	%				
Admiration	39	74	1	5	3.38	1.31
Amusement	36	68	1	5	3.22	1.31
Anger	29	55	1	5	2.34	1.40
Compassion	29	55	1	5	2.79	1.01
Contempt	22	42	1	4	1.95	1.09
Contentment	40	75	1	4	3.57	1.32
Disappointment	42	79	1	5	2.38	1.46
Disgust	13	25	1	4	2.23	1.01
Fear	15	28	1	4	1.93	1.03
Guilt	4	8	1	4	2.75	1.5
Hate	13	25	1	4	1.92	1.04
Interest	45	85	1	5	3.67	1.13
Joy	41	77	1	5	3.44	1.27
Love	40	75	1	5	3.17	1.38
Pleasure	42	79	1	5	3.43	1.27
Pride	32	60	1	5	3.19	1.06
Regret	29	55	1	5	1.9	1.15
Relief	34	64	1	5	2.68	1.25
Sadness	21	40	1	4	2.29	1.23
Shame	5	9	1	2	1.4	0.55

Appendix B. Emotions selected by the participants in love and breakup declarations

Love declarations group

Emotions	Nb of participants		Min	Max	Mean	SD
	n	%				
Pleasure	37	70	1	5	3.59	1.19
Interest	36	68	1	5	3.89	1.06
Joy	36	68	1	5	3.64	1.18
Contentment	34	64	1	5	3.94	1.01
Love	34	64	1	5	3.35	1.28
Admiration	33	62	1	5	3.67	1.05
Amusement	31	58	1	5	3.32	1.28
Pride	29	55	1	5	3.28	1
Disappointment	28	53	1	4	1.71	0.98
Relief	26	49	1	5	2.81	1.27
Compassion	23	43	1	5	2.87	1.06
Regret	17	32	1	3	1.47	0.62
Anger	16	30	1	4	1.69	1.20
Contempt	10	19	1	4	1.7	1.06
Sadness	9	17	1	3	1.67	0.87
Fear	8	15	1	3	1.5	0.76
Disgust	4	8	1	3	1.5	1
Hate	4	8	1	2	1.5	0.58
Shame	3	6	1	2	1.33	0.58
Guilt	2	4	1	4	2.5	2.12

Breakup declarations group

Emotions	Nb of participants		Min	Max	Mean	SD
	n	%				
Disappointment	14	26	1	5	3.71	1.38
Anger	13	25	1	5	3.15	1.21
Sadness	12	23	1	4	2.75	1.29
Regret	12	23	1	5	2.5	1.45
Contempt	12	23	1	4	2.17	1.12
Interest	9	17	2	5	2.78	0.97
Disgust	9	17	1	4	2.56	0.88
Hate	9	17	1	4	2.11	1.17
Relief	8	15	1	4	2.25	1.17
Fear	7	13	1	4	2.43	1.13
Contentment	6	11	1	3	1.5	0.84
Love	6	11	1	5	2.17	1.60
Admiration	6	11	1	5	1.83	1.60
Compassion	6	11	2	4	2.5	0.84
Amusement	5	9	1	4	2.6	1.52
Joy	5	9	1	3	2	1
Pleasure	5	9	1	4	2.2	1.30
Pride	3	6	1	4	2.33	1.53
Guilt	2	4	2	4	3	1.41
Shame	2	4	1	2	1.5	0.71

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Chapter 3.
Scale Development

3

After exploring our field of study, this chapter presents our efforts to develop an empathy measurement tool to investigate service employees' empathy. We developed and validated the EMPA-D scale aiming to measure service employees' empathy towards users (Paper B). The development of EMPA-D has taken place iteratively throughout our research work and was motivated by a lack of suitable tools in the design field. Our first exploratory study investigating the physical journey map method revealed a need to measure empathy in order to assess the effectiveness and impact of our interventions. We then developed and validated an initial version of the scale used in the studies from Paper D and E. Towards the end of this research project, we improved our measurement tool and validated a second version of EMPA-D (Paper B), which was not used in the studies of this thesis.

This chapter includes the following paper:

Paper B	Drouet, L., Bongard-Blanchy, K., and Lallemand, C., 2023. Development of the Empathy in Design Scale (EMPA-D): Measuring Employees' Empathy Towards Users in Service Design. Submitted for journal publication.

Development of the Empathy in Design Scale (EMPA-D): Measuring Employees' Empathy Towards Users in Service Design

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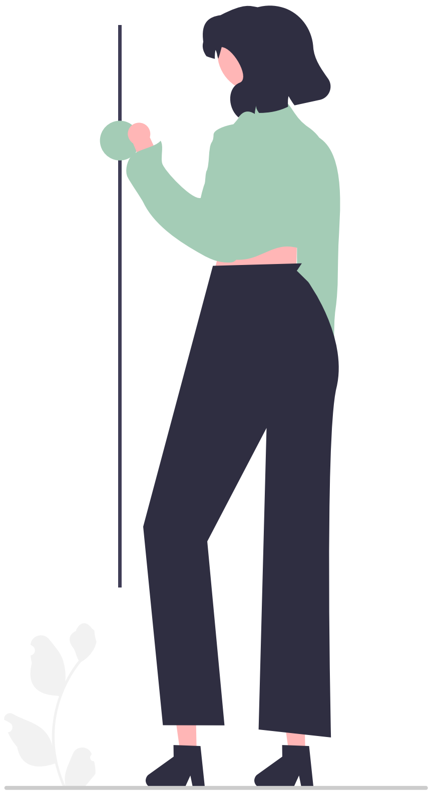
Submitted for journal publication. **See the updated version once published.**

Keywords: empathy, empathic design, scale development, measurement tool, service design



Abstract

To design user-centered services, it is essential to build empathy towards users. It is hence strategic to trigger empathy for users amongst professionals concerned with shaping service user experiences. There is, however, a lack of quantitative tools to measure empathy in design. Through two studies, we report on the development of the Empathy in Design Scale (EMPA-D). The tool aims to measure service employees' empathy towards users. Grounded on theories from psychology and design, we first generated and tested a pool of items through expert inspection and cognitive interviews. In Study 1, we administered 16 items to N = 406 employees. In Study 2, we iterated on additional items and administered the revised scale to N = 305 employees. The EMPA-D 11-item scale includes three dimensions: *Emotional interest/Perspective-taking, Personal experience*, and *Self-awareness*. We report on its psychometric properties, outline how this self-reported empathy measure can support organizations in enhancing their services, and discuss the potential limitations of quantitatively measuring empathy in service teams.

Highlights

- We develop the Empathy in Design Scale (EMPA-D), a self-reported measure of employees' empathy towards users of a service.
- We report on two main validation studies and document the psychometric properties of the scale.
- The scale produces a total empathy score, and scores for three dimensions, namely *Emotional interest/Perspective-taking*, *Personal experience*, and *Self-awareness*.
- This tool contributes to filling the gap in metrics to assess empathy in the service design context.
- In industry, measuring employees' empathy support the selection of appropriate empathic interventions to foster the service user-centeredness.

1. Introduction

Users expect high-quality experiences from products and services. To deliver such experiences, designers require a solid understanding of user expectations, needs, and values. Over the last decades, empathy has gained importance in design (Dong et al., 2018; Koskinen et al., 2003; Sleeswijk Visser and Kouprie 2008) – as evidenced by the emergence of the Empathic Design approach and methods in the 1990s (Koskinen et al., 2003; Leonard and Rayport, 1997). Empathy allows designers to put themselves into the users' shoes (Lietz et al., 2011), feel more engaged with the users, and better understand their perspectives (Devecchi and Guerrini, 2017). Service companies increasingly seek to develop empathy inside their organization and towards customers, as it increases customers' satisfaction, loyalty, and forgiveness towards the service (Bahadur et al., 2020; Bove, 2019; Wieseke et al., 2012). Empathy is a factor of service employee performance (Ngo et al., 2020; Nguyen et al., 2019), which guarantees service quality and fosters innovation (McDonagh, 2010, Bove, 2019).

At the organizational level, empathy is the core of culture transformation towards user-centered approaches. The *awareness* stage of the user experience (UX) maturity model implies making *"every employee aware of their responsibility towards users and their experiences with the service"* (Chapman and Plewes, 2014). In this paper, we focus on employees as service stakeholders: persons involved in creating or providing a service who operate within the bounds of their organization, e.g., front-line employees, maintenance operators, communication officers, IT engineers (Stickdorn et al., 2018). Involved in shaping the service, their empathy towards users plays a crucial role in the experience of users, *"If the people within the organization do not share the attitude or mindset that is needed for doing empathic design, then the effort is likely to strand"* (Postma et al., 2012).

While the importance of building empathy in design is undisputed, little is known about how it can be actively fostered. Being able to measure empathy quantitatively would be a first step to better understanding these mechanisms (Chang-Arana et al., 2022). To the best of our knowledge, no quantitative instruments are currently available to measure empathy within the service or product design context (Surma-aho and Hölttä-Otto, 2022). Besides designers, other service stakeholders have been somewhat overlooked in the design empathy literature so far. Measuring employees' empathy can support the selection of appropriate empathic interventions (Postma et al., 2012; Hess et al., 2017) to deploy within the company. Recent initiatives within the design community have emphasized the need and relevance of empathy measures (Chang-Arana et al., 2022), whether self-reported empathic tendencies (Surma-aho and Hölttä-Otto, 2022) or the assessment of the outcomes resulting from empathic interventions as evidence of increased empathy (Sleeswijk Visser and Kouprie, 2008).

Drawing on frameworks and methods for measuring empathy, particularly in the design context, this paper presents the steps undertaken to build and validate an empathy scale for measuring service employees' empathy. EMPA-D methodologically contributes to the service design field by providing a novel quantitative and standardized self-report measure. The tool is cost-efficient and suitable for research and industry alike. In industry, the scale aims to support organizations by assessing the employees' empathy towards users. In academia, such a measurement tool is relevant to support conceptual discussions as it allows modeling and predicting variables (Chang-Arana et al., 2022), such as the influence of empathy on the success of design interventions.

2. Related work

2.1. Definitions of empathy in design

There is no consensus on the definition of empathy in design, which is often referred to as an "umbrella term" (Chang-Arana et al., 2022). Design research builds its understanding of empathy on philosophy, psychology, and neurosciences, which follow distinct epistemological approaches (Surma-aho and Hölttä-Otto, 2022). Cuff et al. (2016)'s review illustrates the complexity of defining empathy, with no less than 43 definitions of empathy in psychology. To scope the concept, the authors underline the distinctions between:

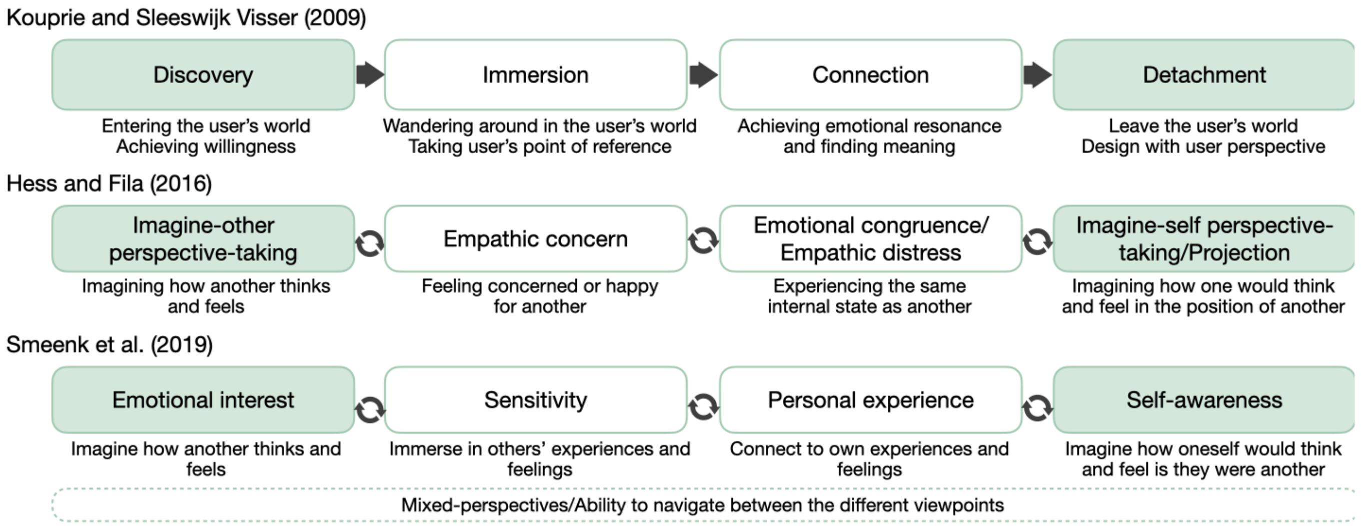
- empathy and other concepts such as sympathy or compassion.
- cognitive – *"the ability to ascribe mental states to others, such as beliefs, intentions, or emotions"* (Maibom, 2017) – and affective empathy involving *"affects on the part of the empathizer."* Both forms of empathy are related and interdependent (Hodges and Biswas-Diener, 2007).
- self/other (Chang-Arana et al., 2022): the empathizer does not experience others' emotions but takes their viewpoint and is aware that others' emotional responses are distinct from their own.
- empathy as a trait of personality – some individuals are more empathic than others, or a state – meaning that being empathic depends on the context (Cuff et al., 2016; Shen 2010), or even a skill (Battaly, 2011; Walther et al., 2017). According to Hodges and Biswas-Diener (2007), empathy is a state of mind that people can control and modify. Likewise, empathy does not trigger a direct behavioral response (e.g., prosocial behavior) but rather the behavioral motivation to act (Cuff et al., 2016). This motivation is key in the design literature (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019b,a).

According to Tellez and Gonzalez-Tobon (2019), empathy is the *"ability to feel and understand other's emotions and circumstances and is a fundamental skill for designers to acquire an in-depth understanding of people (i.e., end-users and other stakeholders) so that products, services, environments, systems, and experiences meet human needs, expectations, and aspirations."* Fulton Suri (2003) describes it as the designers' navigation between two conceptions of others' experience: (1) thinking that others are like oneself and will obviously understand what one has designed, and (2) thinking that others are completely different from oneself.

2.2. Frameworks of empathy in design

Design researchers formalized empathy-in-design frameworks (Chang-Arana et al., 2022), constituting the foundation of the present contribution (Figure 1). Kouprie and Sleeswijk Visser (2009) introduced a four-phase framework for empathic design based on the work of psychologists like Stein et al. (2017) and Rogers (1959). The model illustrates a deliberate act of stepping in and out of others' lives, appealing to cognitive (green in Figure 1) and affective empathy (in white in Figure 1). First, designers approach the users' world through *discovery*. This triggers their curiosity and willingness to understand users' experiences. Then follows the *immersion*, where they internalize the users' point of reference without judging them. During the *connection* phase, they reflect on their own experiences. In the final *detachment* phase, they regain distance to find solutions and ideate.

Figure 1. Synthesis of the main frameworks of empathy in design and their overlaps


Kouprie and Sleeswijk Visser (2009)
Discovery
Immersion
Connection
Detachment
Entering the user's world
Achieving willingness
Wandering around in the user's world
Taking user's point of reference
Achieving emotional resonance
and finding meaning
Leave the user's world
Design with user perspective
Hess and Fila (2016)
Imagine-other perspective-taking
Empathic concern
Emotional congruence/ Empathic distress
Imagine-self perspective-taking/Projection
Imagining how another thinks and feels
Feeling concerned or happy for another
Experiencing the same internal state as another
Imagining how one would think and feel in the position of another
Smeenk et al. (2019)
Emotional interest
Sensitivity
Personal experience
Self-awareness
Imagine how another thinks and feels
Immerse in others' experiences and feelings
Connect to own experiences and feelings
Imagine how oneself would think and feel is they were another
Mixed-perspectives/Ability to navigate between the different viewpoints

Likewise, Hess and Fila (2016b,a) define two axes to scope empathy: affective experiences vs. cognitive processes, self-oriented vs. other-oriented. Their combination results in four dimensions: (a) *imagine-other perspective-taking* when designers imagine how the users think and feel, (b) *empathic concern* when designers feel concerned for the users, (c) *emotional congruence* when designers experience the same emotional state as users, and (d) *imagine-self perspective-taking/projection* when designers imagine how they would think and feel if they were the users. Based on this taxonomy, Smeenk et al. (2019b,a) describe five similar empathy factors: *emotional interest, sensitivity, self-awareness, personal experience,* and *mixed-perspective*. Designers' emotional interest is when they choose to be receptive to users' experiences. The sensitivity develops while the designers are in contact with the users. Self-awareness refers to designers' ability to distinguish their own experiences from the users. When designers are familiar with the use context, they reflect on their personal experience. Finally, the mixed-perspective is the ability to navigate between these viewpoints.

Each of these frameworks contributes to the conceptualization of empathy in design. The sub-dimensions of the construct overlap between frameworks (Figure 1), as in the case of taking the user's point of reference. Hess and Fila (2016a,b)'s *Perspective-taking* dimension corresponds to the *Discovery/Emotional interest* stage of other frameworks, but Kouprie and Sleeswijk Visser (2009) place it in the *Immersion* stage. Overall, these frameworks offer worthwhile foundations to develop tools for measuring empathy in design. What is now needed to consolidate theoretical claims are measurement tools operationalizing these dimensions to support collecting empirical evidence through experimental research (Surma-aho and Hölttä-Otto, 2022).

2.3. Standardized empathy scales in psychology

Various scales measuring empathy have been developed in psychology or related disciplines. Among them, the popular Empathy Quotient (60-item, (Baron-Cohen, 2004)), the Interpersonal Reactivity Index (Davis, 1980), the Toronto Empathy Questionnaire (Spreng et al., 2009), the Empathy Assessment Index (Lietz et al., 2011), or Hogan (1969)'s scale. Many of these scales include an abbreviated version, e.g., Empathy Quotient (Baron-Cohen, 2004), Empathy Assessment Index (Lietz et al., 2011). A single-item Likert scale of empathy SITES has even been proposed by Konrath et al. (2018): "I am an empathetic person (Note: An empathetic person understands others' feelings, and experiences care and concern for them)." Most of the multidimensional scales used in psycho-diagnostic assess empathy competencies or responses, for instance, in the context of behavioral disorders in early childhood (Cuff et al., 2016). Other examples, like the Jefferson Scale of Empathy (Hojat, 2016), measure empathy among healthcare professionals. These tools are generally based on statements assessing several facets of empathy. The ratings are made via Likert scales (Baron-Cohen and Wheelwright, 2004; Davis, 1980), behavior description, or dichotomous Yes/No choices (Stadler et al., 2004). Scenario-based tools asking respondents to infer characters' emotional state are also used (e.g., Petermann and Gust, 2016). Surma-aho and Hölttä-Otto (2022) distinguish two types of self-reporting instruments; those measuring *empathic tendencies* – assessing how a person would behave in different contexts, and those measuring *beliefs about empathy* – rating the importance of empathy towards others.

2.4. Empathy scales in service research

In service research, empathy measures are carried out from the customer's point of view and focus on service quality, like with the SERVQUAL tool (Parasuraman et al., 1988). This standardized questionnaire includes 22 items assessing five dimensions using a 7-point Likert scale. Empathy is defined as *"caring, individualized attention the firm provides its customers."* Five items address customer perception of employees' empathy towards them, e.g., "Employees of XYZ do not give you personal attention" or "Employees of XYZ do not know what your needs are." SERVQUAL has been extensively used for the last decades but has also been criticized for theoretical and operational flaws (Buttle, 1996). Despite its shortcomings, it is one of the first tools, including the employees' attitude when reflecting on empathy towards users. This last decade, service research focused on researching empathy's impact on customer satisfaction, loyalty, and forgiveness towards the service (Bove, 2019). Rare service research measures empathy to explain its impact on service design. Wieseke et al. (2012) measured employees' empathy (i.e., *Perspective-taking*, *Empathic concern*, and *Emotional contagion*) to assess the role of empathy in customer-employee interactions through McBane (1995)'s measurement tool, and Bahadur et al. (2020) assessed the effect of employee empathy on service loyalty with four generic items on employee empathy.

2.5. Empathy assessment techniques in design

A few studies measure designers' empathy during the design process. Given the lack of a validated self-report scale specific to the domain (Surma-aho and Hölttä-Otto, 2022), design researchers resort to alternative approaches. Observing prosocial behavior (e.g., helping someone, or making altruistic decisions) can inform about empathy (Surma-aho and Hölttä-Otto, 2022). Discourse analysis supported by qualitative data analysis techniques (Weber et al., 2022; Lee et al., 2022), or machine learning (Wambsganss et al. 2022, 2021) can reveal facial or vocal expressions of empathy (Salmi et al., 2022), or pro-social language (Rojas et al., 2022). For instance, van Rijn et al. (2011) analyzed the discourse of designers during teamwork, looking for four empathy indicators: empathic expressions (e.g., saying "I think/feel/guess the users think/feel/want…"), own experience (e.g., relating users' needs and experiences to their personal experiences or comparing them to people they know), questioning users' needs and experiences vs. making (false) assumptions, and discussing user facts. Sleeswijk Visser and Kouprie (2008) tested their framework for empathy design in a workshop with design practitioners. To measure the effectiveness of their empathic user research intervention, they combined the Empathy Quotient (Baron-Cohen, 2004) with the observation of specific verbal expressions. They also used ad hoc scales through which designers self-reported their interest, involvement, inspiration, and empathy at regular intervals during the workshop. Finally, they recorded the evolution of the designers' empathy using experience curves. Malge (2017) supported their understanding of designers' empathy using the Balance Emotional Empathy Scale. Finally, Chang-Arana et al. (2020) integrated the empathic accuracy method into the design process. It consists of successive activities: interviews between designers and users are video-recorded. The user watches the recording and annotates key moments by describing their thoughts. Up to 4 weeks later, the designer is shown the video and infers what the user might have thought at each annotated point. The researchers assess the similarity between the inferred and actual thoughts on a 3-point scale. While the empathic accuracy approach can assess designers' empathy to a certain degree, it is complex and time-consuming. Responding to this critique, the Quick Empathic Accuracy involves a shortened experimental protocol with fewer entries (Li et al., 2021). Closely related to design practice is the measure of engineers' empathy with the Empathy and Care Questionnaire (Hess et al., 2017).

The assessment of empathy in design is mainly based on qualitative metrics. Existing studies using quantitative measures of empathy are scarce in the design domain and typically use psychological instruments. However, these instruments are not always suitable for design purposes as they tend to measure empathy as a personality trait rather than a state and thus do not align with empathy in design frameworks. Away from clinical outlooks, a state-based measure of empathy in service design would seek to indicate which empathy dimensions need to be triggered to lead to a shared commitment of employees towards users. Notwithstanding the relevance of qualitative studies, we concur with recent work emphasizing that empathy in design would benefit from quantitative approaches supporting robust hypothesis testing (Chang-Arana et al., 2022). The development of specific empathy in design scales would thus support researchers in testing and refining current theoretical models.

3. Research objectives

While qualitative studies dominate research on empathy in design, a quantitative approach *"allows predicting, controlling, and explaining, [and is] needed to test the causality of empathy in successful design"* (Chang-Arana et al., 2022). Furthermore, existing work focuses on the designers' empathy towards users rather than addressing empathy-building and the effect of empathic design methods in a larger frame involving employees providing and shaping the service. The development of the Empathy in Design Scale (EMPA-D) aims at providing a validated quantitative indicator of service employees' empathy towards users.

As a self-reported measure, EMPA-D addresses the tendency to be empathic and underlying beliefs (Surma-aho and Hölttä-Otto, 2022). The creation of such a tool contributes to filling the gap in metrics to assess empathy in the context of service design, as there is, to the best of our knowledge, no standardized measurement scale of employees' empathic tendency towards users (Chang-Arana et al., 2022; Surma-aho and Hölttä-Otto, 2022; Smeenk, 2019). For industry, the scale aims to support organizations in their growth towards user-centeredness by enabling them to assess their employees' empathy. Quantifying dimensions of empathy will point to shortcomings and guide intervention strategies (i.e., using a specific empathic method). For academia, the scale will provide a standardized quantitative measure of empathy relevant to investigate and modeling several phenomena related to the design process (e.g., the influence of empathy on the success of design interventions).

4. EMPA-D initial development process

4.1. Definition and scope of the construct

Following the best practices on summated rating scale construction (Spector, 1992), we first conducted a literature review to define the dimensions relevant to evaluating empathy in a design context. Building on the frameworks of empathy in design by Hess and Fila (2016b), Kouprie and Sleeswijk Visser (2009), and Smeenk et al. (2019a,b), the empathic tendency includes an initial discovery, an immersion into the user's world, a connection with one's own personal experience and a detachment from the users' viewpoint. For designers, the ability to navigate across these steps, and the underlying cognitive or affective empathy types, is key (mixed-perspective in Smeenk et al., 2019a). From these frameworks, we synthesized and merged similar definitions of empathy. We here forward refer to empathy in design as the ability of designers and service stakeholders to understand users and their experiences, which is reflected by an emotional interest towards users, the sensitivity and ability to actively take the user perspective, build on their own personal experiences to connect with users and keep a self-awareness of others' reality. Empathy in design motivates action and engagement. We envision empathy in design as a multi-dimensional construct with four potential dimensions (Table 1): *Emotional interest/Discovery* (EI), *Sensitivity/Immersion* (S), *Personal experience/Connection* (PE), *Self-awareness/Detachment* (SA).

Table 1. Description of the four dimensions of empathy in design in the construction of the Empathy in Design Scale (based on Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009; Rogers, 1959; Smeenk et al., 2019a)

Dimension	Definition
Emotional interest/ Discovery (EI)	Imagining how users think and feel - curiosity about the users, resulting in a willingness and motivation to explore and discover the users, their situations and experiences.
Sensitivity/ Immersion (S)	Direct contact - taking an active role by wandering around in the user's world, absorbing without judging. Being open-minded and interested in the user's point of reference.
Personal experience/ Connection (PE)	Resonating with the user - connecting with users on an emotional level by recalling explicitly upon one's own memories and experiences in order to reflect and be able to create an understanding.
Self-awareness/ Detachment (SA)	Stepping back in the role of designer or stakeholder - correctly distinguishing between the representations of one's own actions, perceptions, sensations, and emotions and those of users (Smeenk et al., 2019a).

4.2. Creation of a pool of items

Two authors independently generated a pool of items for each of the four dimensions based on a review of self-reported instruments of empathy in psychology, specific design frameworks, and empirical studies. This resulted in six to eight items per dimension (33 in total), with a natural overlap yet subtle variance between certain items. The authors then merged or adjusted items showing the most redundancy, resulting in 29 items. All statements referred to service design but could be adapted to system or product design, as the most frequent wording used in the items revolves around the users' experience.

When designing a measurement scale, the number and type of response categories were carefully considered, as they may influence the psychometric data quality. Inspired by Kashdan et al. (2020) and following standards in our field, a 7-point Likert scale to indicate "the degree to which these statements accurately describe you or not" was chosen and successfully pilot tested for comprehension and sensitivity. It offers a high granularity inviting respondents to make less polarized choices (Simms et al., 2019), and allows participants to adopt a neutral position. Despite debates on the ambiguity of using the middle option on odd-numbered response scales (Kulas and Stachowski, 2013), it seems worthwhile to leave the opportunity to indicate neutrality in our context. All statements were positively formulated to avoid additional cognitive load and potential errors linked to the use of double negatives (Swain et al., 2008; Weijters and Baumgartner, 2012), potentially impacting the internal consistency and factor structure of a scale (Zeng et al., 2020). We closely monitored the responses during pre-testing to detect potential acquiescence or response biases. We included attention checks in the administration of the scale to prevent carelessness or non-contingent responses.

4.3. Initial expert evaluation

We conducted an expert review of the pool of items, following Cabrera-Nguyen (2010)'s scale development guidelines. The goal was to validate whether the items measure empathy and relate to the dimension to which they are attributed. We submitted the pool of 29 items to three experts with cognitive psychology and interaction design backgrounds and knowledgeable in empathy, service design, and standardized scale development. We checked the scale's face validity by asking them to review each item separately and categorize it in the predefined dimensions. They could comment both on their understanding of the item and language issues. This resulted in a reformulation of items and a decrease from 29 to 17. Some items did not obtain consensus in terms of face validity or clarity, others were redundant in the dimension measured. In the following stages, we kept redundant items to identify the most suitable ones.

4.4. Initial version and pretest

We pilot-tested the initial version to ensure item understandability and detect potential response bias. As the models and frameworks in design used in the creation of the item pools are mostly applied to designers, we can wonder whether the same dimensions can relate to the empathic tendencies of service employees delivering and partially shaping the service. We pretested the 17-item version of EMPA-D with N = 8 digital service employees (five men, three women aged 23 to 45, fluent English speakers). We used cognitive interviewing (Castillo-Díaz and Padilla, 2013) to investigate how participants interpreted and responded to each item. Beyond ensuring the items understandability, this technique constitutes a source of construct validity evidence (Castillo-Díaz and Padilla, 2013; DeVellis, 2003). Each participant rated the understandability for each item on a 5-point Likert scale (1 - "Not understandable at all," 5 - "Totally understandable") while explaining their responses. We analyzed their item ratings, explanations, and understandability ratings.

We noted some comprehension issues of key terms or errors or ambiguity in the item wordings. While five out of 17 items reached very high understandability scores of 4 or 5 (EI1, EI3, EI4, SA2, SA4), the variance was rather high for the remaining 12 items. The average understandability score was nevertheless high for seven other items with a mean score above 4 (EI2, S1, S2, S4, SA3, PE2, PE4). The items with the lowest understandability score were S5 (M = 3.25, SD = 1.67), PE1 (M = 3.25, SD = 1.75), and SA1 (M = 3, SD = 1.51). Regarding S5, participants raised concerns that not all service employees can easily "go to the field" while customer-facing staff is already there. As the term was considered jargon, we removed this item. Item SA1 originally read - "I imagine how I would think and feel if I were a regular user rather than an employee" Here, "regular" is aimed at distinguishing users from the respondent when the employees, too, are potential service users. This was not well understood and therefore removed. The absence of context and mention of frequency in item PE1 - "I often consider and reflect on my own experiences and feelings" led to confusion. The reformulated item omits "often" and clarifies the context. Item S2 - "I pay attention, without judging, to how users experience the service" was understood (M = 4.25, SD = 0.89) yet had a complex construction and was simplified.

We contextualized and refined the instructions to refer more explicitly to the participant's professional context. In addition, the answer scale option "Neutral" (used in Kashdan et al. (2018)'s Social Curiosity Scale) was perceived as disruptive and reformulated into another common Likert anchor label, "Moderately describes me." Finally, we looked at the distribution of pretest answers on the scale to explore the scale sensitivity (i.e., the capacity to discriminate between individuals with different levels of empathy). Several items showed a skewed tendency with high agreement scores, especially in the self-awareness dimension. It was thus a point of attention in future steps to ensure that common biases such as acquiescence or social desirability (Krumpal, 2013) would not affect the psychometric properties of the tool. This stage resulted in a 16-item experimental version.

5. Study 1: Administration of the experimental version

5.1. Participants

We administered the EMPA-D to N = 406 valid respondents (212 men, 193 women, 1 undisclosed). Eight respondents were excluded from the sample due to failing the attention checks. Participants' age ranged from 19 to 76 (M = 37.4, SD = 11.07). We used the crowd-sourcing platform Prolific.co. The participants were native English speakers and full-time employees. Building on the Prolific sampling options for professions in the service sector, we administered the scale to service employees from various industries, e.g., public administration, hospitality/tourism, transportation and logistics, information technology, marketing/retail (n = 226), and employees in customer-facing positions (n = 180). All respondents indicated to what extent (from 1 to 7) they work in direct contact with users (M = 5.7, SD = 1.09). The time spent in their current organization ranged from less than one to 47 years (M = 7.3, SD = 8). Over half of the participants (58%) held a university degree. Our University ethics panel approved the study. The participants gave informed consent and received fair compensation. The study was labeled "Working in a service company" to not prime respondents on empathy.

5.2. Material and procedure

Following the demographic questions, we administered the experimental version of EMPA-D composed of 16 items presented in a randomized order. Each item is a first-person statement rated on a 7-point Likert scale, from 1 - "Does not describe me at all" to 7 - "Completely describes me" (Appendix A).

5.3. Data analysis

We carried out the statistical analysis with SPSS version 27. There was no missing data. Univariate statistics were run to examine the means and standard deviations of each item as well as to check for possible outliers or entry errors. No outliers or entry errors were found. For the sake of brevity and following APA norms, detailed statistics presented in tables are not repeated in the text. Scale acronyms and item codes will be used for the result description.

5.4. Results

5.4.1. Factor analysis and reliability

We ran an Exploratory Factor Analysis (EFA, principal axis factoring) on the 16 items composing the experimental version of the scale with a direct Oblimin rotation (which allows the resultant factors to be correlated). The suitability of EFA was assessed prior to analysis. Our sample size of N = 406 for this analysis provided a ratio of 25 cases per item, thus largely fulfilling the recommended person-to-item ratio of 5:1 or 200 recommended cases (Howard, 2016). The overall Kaiser-Meyer-Olkin (KMO) measure was .95, which is "marvelous" according to Maibom (2017)'s classification. Bartlett's Test of Sphericity was statistically significant $\chi 2(120) = 3559.288$, $p = 000$, indicating that the data was likely factorizable. Inspection of the correlation matrix showed that all variables had at least one correlation coefficient greater than .30. The communalities (proportion of the item's variance explained by the extracted factors) were all above .30, confirming that each item shared some common variance with other items.

The EFA provided two factors based on components with Eigenvalues greater than 1. A visual exploration of the scree plot combined with a parallel analysis (O'Connor, 2000), however, suggested a three factors retention choice, explaining 63% of the variance. Contrary to our assumptions, the data did not reflect four dimensions. We carefully examined each item and applied a combination of criteria for factor loading cutoff (as suggested by Howard (2016)). We considered satisfactory variables that loaded onto their primary factor above .40 and loaded onto alternative factors below .30. We also considered differences between the primary and alternative factor loadings. The final selection was composed of 9 items loading on the 3 components *Emotional interest* (EI), *Personal experience* (PE), and *Self-awareness* (SA). We found a meritorious KMO (Maibom, 2017) of .88 and a statistically significant Bartlett's Test of Sphericity, $\chi 2(36) = 1653.949$, $p = 000$. Component loadings and communalities of the rotated solution are presented in Table 2. This three-factor solution explains 72% of the variance in the data. The factor pattern loadings ranged from .44 to .86.

Estimates of internal consistency for the EMPA-D Total and each of the factors were measured by the McDonald's Coefficient Omega (Table 3). Omegas of .89, .76, and .72 were obtained for the EMPA-D Total, EI, PE, and SA. These initial estimates of reliability suggest that the EMPA-D and its three factors have good or acceptable levels of internal consistency in the current sample.

Table 2. Extracted components and factor loadings based on principal axis factoring with Oblimin rotation (N = 406)

Initial item code	Factors 1	 2	 3	Item-total correlation	Communalities	Mean	SD
Emotional interest (EI)							
EI1	.86			.82	.81	5.33	1.53
EI3	.80			.77	.68	5.33	1.49
EI4	.85			.78	.73	5.16	1.5
Personal experience (PE)							
PE2		.65		.62	.59	4.60	1.45
PE3		.87		.63	.67	4.98	1.53
PE4		.44		.52	.37	4.54	1.6
Self-awareness (SA)							
SA2			.66	.49	.39	5.73	1.28
SA3			.52	.52	.45	5.45	1.25
SA4			.74	.58	.59	5.55	1.3
EigenValue	4.52	1.10	.85				
% variance explained	50.24	12.25	9.46				

Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization. Component loadings <.40 are suppressed. Major loadings for each item are bolded.

Table 3. Descriptive Statistics and Omega Reliabilities of the three subscales (EI, PE, SA) and EMPA-D total scores

Scale	Nb items	Min	Max	M	SD	ω
EMPA-D *Emotional interest*	3	1	7	5.27	1.37	.89
EMPA-D *Personal experience*	3	1	7	4.71	1.25	.76
EMPA-D *Self-awareness*	3	1.33	7	5.58	1.02	.72
EMPA-D Total	9	1.44	7	5.18	1.02	.87

5.4.2. Factor intercorrelations

Relationships were examined between all components within the EMPA-D. The intercorrelations among the three factors presented in Table 4 suggest that the factors are interrelated to a moderate to high level.

Table 4. Intercorrelations between subscales and total scores of EMPA-D

Scale	1	2	3	4
1. EMPA-D *Emotional interest*	-	.61**	.56**	.89**
2. EMPA-D *Personal experience*		-	.46**	.84**
3. EMPA-D *Self-awareness*			-	.77**
4. EMPA-D Total				-

**. Correlation is significant at the 0.01 level (2-tailed),
*. Correlation is significant at the 0.05 level (2-tailed), p <.01

5.4.3. Relation with sociodemographic variable

We examined the relations between demographic variables and the EMPA-D scores. There was no significant correlation between EMPA-D and seniority in the company, r = -.07, *p* = .15, or EMPA-D and age, r = -.087, *p* = .079. Aligned with prior literature (Baron-Cohen and Wheelwright, 2004; Jolliffe and Farrington, 2006), an independent samples t-test revealed gender differences in the empathy scores, with women (M = 5.30, SD = .98) scoring higher than men (M = 5.09, SD = 1.04), *t*(403) = -2.07, *p* = < .039, *η*2 = -.21. We conducted one-way between subject ANOVAs to compare the respondents' profiles on the level of empathy. The empathy scores are higher in customer-facing profiles (M = 5.31, SD = .96) than in general service staff (M = 5.24, SD = 1.03), *F*(2, 403) = 7.74, *p* = < .001, *η*2 = .04 (inter-group differences tested by post hoc analysis significant at *p* = < .001 level).

5.4.4. Discussion

Study 1's findings show that our scale covered three dimensions out of the four initially identified in the design research literature, namely (from strongest to weakest in the amount of variance the factors contribute to): the *Emotional interest* (3 items), the *Personal experience* (3 items) and the *Self-awareness* (3 items, see EMPA-D 9-item version in Appendix B). The EI dimension appears more prominent in the percentage of variance explained. The *Sensitivity/Immersion* in the users' world described in design frameworks (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019a,b) is not covered by the resulting items. Qualitative analysis showed that items in this dimension were rather jargonous (e.g., "sensitive," "point of reference," "immerse," "go to the field") or referred to specificities of the job missions (S4, S5) that were not always under the control of respondents. In addition, statistical analyses showed that two items from S subscale possibly loaded on EI. Described in design literature as the second stage of the empathic process (Kouprie and Sleeswijk

Visser, 2009; Smeenk et al., 2019a), we cannot conclude whether the items as formulated in the S dimension were less adequate for measuring employees' empathy (who have fewer opportunities to immerse themselves in the field) than designers' empathy or whether the item construction was flawed. Initially, the items were formulated to measure the immersion in the users' world, but the literature also simply defines this dimension as the act of taking the users' perspective (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009). The ability to take others' perspectives beyond the initial emotional interest stage is a key factor of empathy (Chang-Arana et al., 2022; Hess and Fila, 2016b; Smeenk et al., 2016). We thus iterate a new set of items on this dimension in Study 2.

6. Study 2: New iteration of the scale and validity testing

The *Sensitivity/Immersion* dimension from design empathy frameworks (Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019a) was not successfully measured after Study 1. The items were too jargonous or non-applicable, with two loading possibly on the *Emotional interest* dimension. The items were originally formulated to measure the immersion in the users' world, but the literature more globally defines this dimension as the act of taking the users' perspective (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009). As the perspective-taking component plays an essential role (Chang-Arana et al., 2022; Surma-aho et al., 2019) and often relates to the *Emotional interest* dimension, we created a new pool of items and conducted a second scale validation study. This study also includes measures of convergent and discriminant validity.

6.1. Creation and pretest of items on perspective-taking

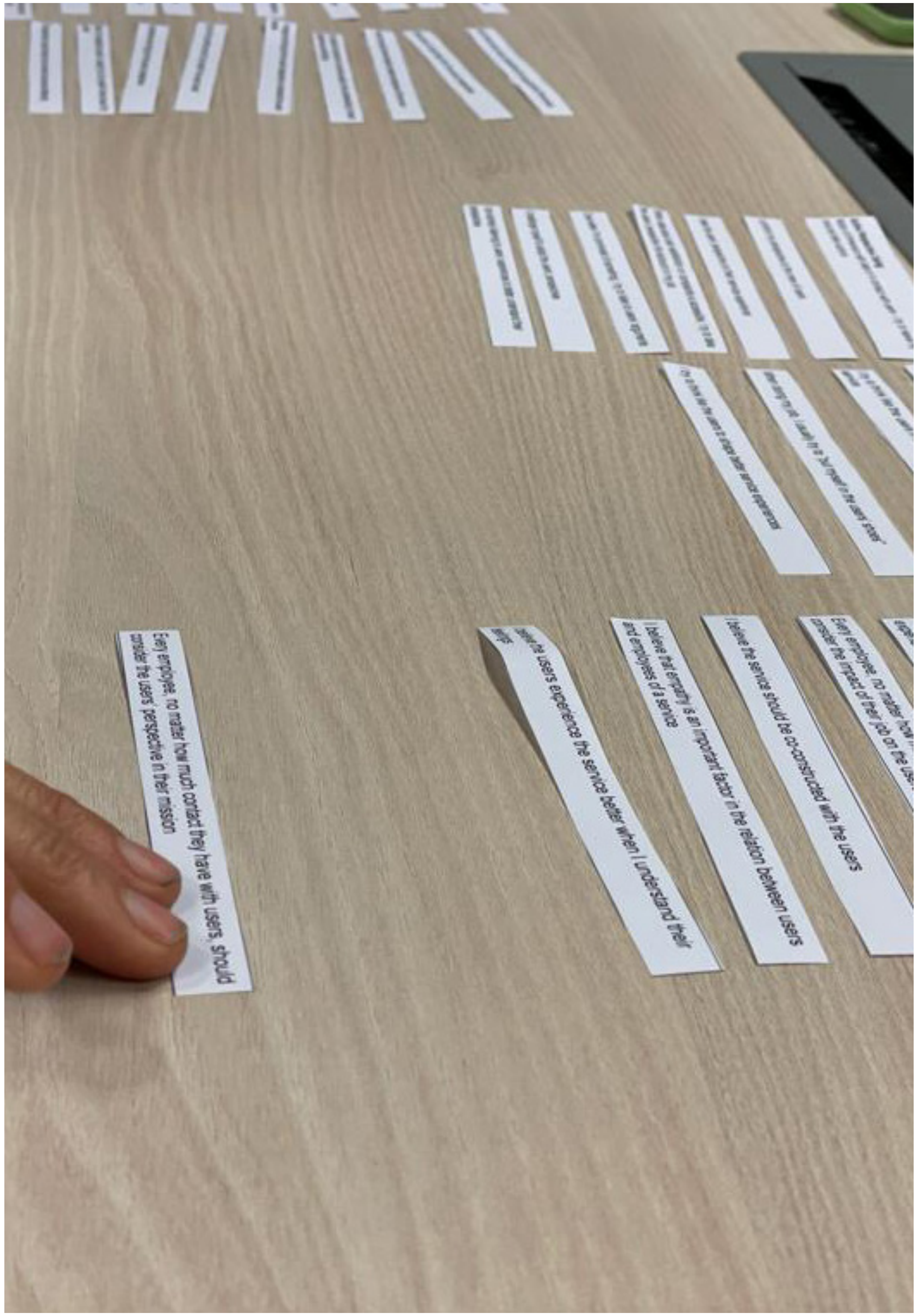
We reviewed empathy scales, including a *Perspective-taking* dimension in psychology (among others; IRI (Davis, 1980), Jefferson scale (Hojat et al., 2001), Empathy Assessment Index (Lietz et al., 2011)), as well as frameworks and scales in service and design literature (Smeenk et al., 2016; Surma-aho et al., 2019; Wieseke et al., 2012). Two authors individually wrote new items (28 in total). Discussing, improving, and removing some of them led to a purposively large pool of 24 items about perspective-taking, including both what Surma-aho et al. (2019) define as evidence-based perspective-taking (*"understanding based on primary research and user interaction"*) and anticipatory perspective-taking (*"comprises more interpretative processes, such as attempts to foresee how users would react to new products"*). Two expert reviewers from Study 1 assessed the face validity of the 24 items. They also evaluated the understanding of items by commenting on them orally. After this expert evaluation, 15 items related to *Perspective-taking* remained. We pre-tested these initial 15 items with N = 8 participants (2 men, 5 women, 1 undisclosed, aged from 28 to 46 (M = 32), fluent English speakers) through online cognitive interviews. We recruited participants working in various service domains. Same as for Study 1, the participants assessed each item's understandability on a 5-point scale. The 15 items all reached high understandability scores above M = 4. The items (PT1, PT4, PT5, PT6, PT7) with the lowest scores and most discussed by the participants, were examined closely. The word "usually" was removed from all items, as it tended to bias the respondents by mitigating the commitment of the statement. We made minor adjustments to most items based on the respondents' comments, resulting in 15 revised items (Appendix C).

6.2. Administration

We administered the 15 new items of *Perspective-taking* along with EMPA-D 9 items retained in Study 1. In addition to this dimension revision, Study 2 aimed at furthering the examination of the psychometric properties of the EMPA-D (construct, convergent, and discriminant validity). Potential links with additional concepts such as relationships with users, user-centered practices, or motivation to take action for the users (Lallemand et al., 2022), were also explored.

6.2.1. Participants

Study 2 involved N = 305 respondents (155 men, 149 women, 1 undisclosed). 13 respondents were excluded due to failing the attention check items. The age ranged from 19 to 68 (M = 39.83, SD = 12.11). 69% of the respondents held a university degree. As in Study 1, we recruited full-time service employees through the crowdsourcing platform Prolific.co. The time spent in their current organization ranged from less than a year to 39 years (M = 8.69, SD = 7.74). Participants gave informed consent and received fair compensation. All respondents indicated on a scale from 1 to 7 to what extent they work in direct contact with users (Min = 1, Max = 7, M = 5.83, SD = 1.70). Participants also rated their relationship with users (on a 7-point Likert scale: 1- "Strongly disagree", 7- "Strongly agree") and the user-centered practices of their company (Table 5).


Every employee, no matter how much contact they have with users, should consider the users' perspective in their mission
... the users experience the service better when I understand their ...
I believe that empathy is an important factor in the relation between users and employees of a service
I believe the service should be co-constructed with the users
Every employee, no matter how
consider the impact of their job on the use

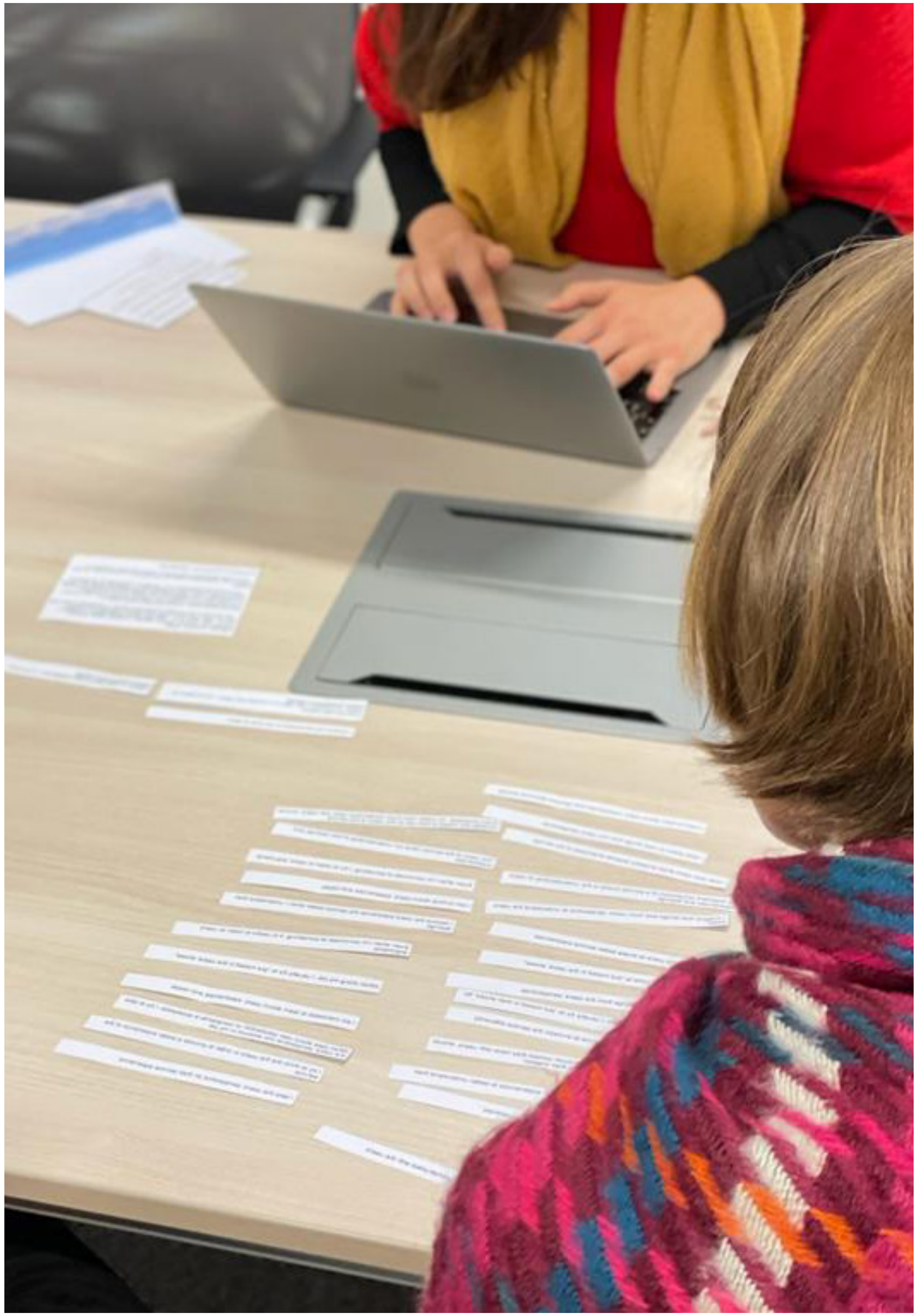


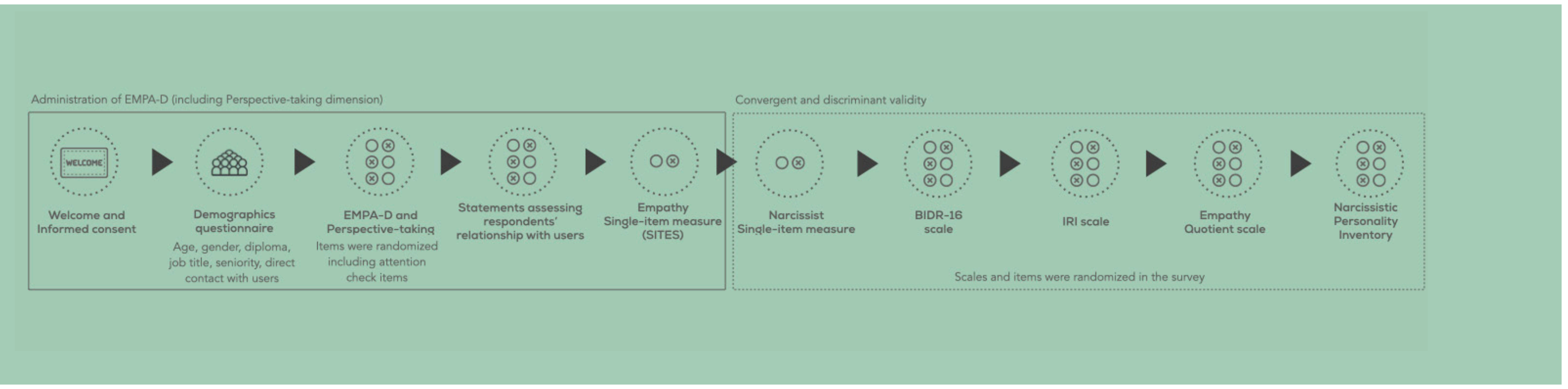
Table 5. Descriptive statistics of the statements assessing respondents' relationship with users

Statement	Min	Max	M	SD
I have good knowledge of how users experience the service	2	7	5.74	0.95
I am able to help improve the experience of service users	1	7	5.68	1.22
My job contributes to or affects the experience of the users	1	7	6.03	1.07
I am, myself, a user of the product or the service provided by my company	1	7	4.21	2.14
I am often attending trainings related to user	1	7	4.68	1.72
My company shares with me (some form of) data about the users	1	7	5.53	1.43
I am willing to co-construct the service with the users	1	7	5.23	1.29
I am ready to change my work routines and procedures to improve users' experiences	1	7	5.27	1.32
I feel responsible for the experience of the users with the service	1	7	5.53	1.29

6.2.2. Material, procedure, and data analysis

The procedure is presented in Figure 2. Respondents were asked to fill in the scale including the new *Perspective-taking* items. Regarding convergent validity, we administered a single-item measure of empathy - SITES (Konrath et al., 2018), the three subscales of the Interpersonal Reactivity Index; *Perspective-taking, Empathy concern,* and *Fantasy scale* (Davis, 1980), and the Empathy Quotient (Baron-Cohen and Wheelwright, 2004). We predicted a significant low to moderate correlation between EMPA-D and these instruments. For the discriminant validity, the literature establishes that narcissism is associated with reduced empathy (Hepper et al., 2014; Burgmer et al., 2021). We administered the narcissist single-item - SINS (Konrath et al., 2014), and the Narcissistic Personal Inventory - NPI-13 (Gentile et al., 2013). We also administered the Balanced Inventory of Desirable Responding - BIDR-16 (Hart et al., 2015). We predicted negative correlations between EMPA-D and these instruments.

Figure 2. A synthetic view of the scale administration procedure in Study 2


Administration of EMPA-D (including Perspective-taking dimension)
Convergent and discriminant validity
WELCOME
Welcome and Informed consent
Demographics questionnaire
Age, gender, diploma, job title, seniority, direct contact with users
EMPA-D and Perspective-taking
Items were randomized including attention check items
Statements assessing respondents' relationship with users
Empathy Single-item measure (SITES)
Narcissist Single-item measure
BIDR-16 scale
IRI scale
Empathy Quotient scale
Narcissistic Personality Inventory
Scales and items were randomized in the survey

Single Item Trait Empathy Scale - SITES (Konrath et al., 2018)

We administered the single-item SITES to support the construct validity of EMPA-D. On a 7-point Likert scale (1 - "Not very true of me," 7 - "Very true of me"), the participants rated the following statement: "I am an empathetic person (Note: An empathetic person understands others' feelings, and experiences care and concern for them)."

Interpersonal Reactivity Index - IRI (Davis, 1980)

We used all the dimensions of IRI (Cronbach's α = .85); *Perspective-taking* (PT - tendency to adopt the psychological point of view of others), *Empathic concern* (EC - feelings of sympathy and concern for others), *Personal distress* (PD - "self-oriented" feelings of personal anxiety and unease in tense interpersonal settings), *Fantasy scale* (FS - tendencies to transpose themselves imaginatively into the feelings and actions of fictitious characters). Each subscale entails seven statements to which respondents express their degree of agreement on a 5-point Likert scale ranging from 1 - "Does not describe me well" to 5 - "Does describe me well." After a reliability analysis, items of each subscale were averaged to create a PT score α = .81, EC α = .82, PD α = .85, and FS α = .80 following the scoring principles described in (Davis, 1980).

Empathy Quotient - EQ (Baron-Cohen and Wheelwright, 2004)

This self-administered questionnaire measures empathy in adults. Respondents shared their agreement, on a 4-point Likert scale from 1 - "Strongly agree" to 4 - "Strongly disagree," with 40 statements featuring different situations. After a reliability analysis (Cronbach's α = .90), we computed an empathy quotient (Baron-Cohen and Wheelwright, 2004).

Single Item Narcissism Scale - SINS (Konrath et al., 2014)

SINS invites participants to rate, on a 7-point Likert scale (1 - "Not very true of me," 7 - "Very true of me"), the following statement: "I am a narcissist (Note: The word 'narcissist' means egotistical, self-focused, and vain)."

Narcissistic Personal Inventory - NPI-13 (Gentile et al., 2013)

This widely used scale of trait narcissism includes three subscales: *Leadership/Authority* (LA, Cronbach's α = .65), *Grandiose/Exhibitionism* (GE, Cronbach's α = .64), *Entitlement/Exploitativeness* (EE, Cronbach's α = .51). Despite its relatively low level of internal consistency documented in prior work (Ackerman et al., 2011), the sub-dimension of narcissistic entitlement (NPI EE) is particularly relevant as a divergent measure for empathy. We used the short 13-item version of NPI to limit participants' fatigue. For each item, respondents chose which of two statements they most agreed with. After a reliability analysis (Cronbach's α = .77), we computed a global narcissism score.

Balanced Inventory of Desirable Responding - BIDR-16 (Hart et al., 2015; Paulhus, 1991)

The BIDR-16 was used as a measure to control for response bias and for its theoretical links to the concept of empathy. It includes two subscales: *Self-deceptive enhancement* (Cronbach's α = .78) – i.e., honest but overly positive responding, and *Impression management* (Cronbach's α = .78) – i.e., bias towards pleasing others. Our participants filled out the BIDR-16 items, on a 7-point Likert scale from 1 - "Strongly disagree" to 7 - "Strongly agree." After a reliability analysis (Cronbach's α = .83), items were averaged into a socially desirable responding score.

6.3. Data analysis

The data analysis was carried out in the same way as Study 1 (see 5.3). There was no missing data. Univariate statistics were run to examine the means and standard deviations of each item as well as to check for possible outliers or entry errors. No outliers or entry errors were found.

6.4. Results

6.4.1. Factor analysis and reliability

We ran an Exploratory Factor Analysis (EFA, principal axis factoring) on the 24 items included in Study 2 with a direct Oblimin rotation (which allows the resultant factors to be correlated). Our sample size (N = 305) largely fulfills the recommendation of a minimum sample size of 200 or a 5-to-1 participant-to-variable ratio (Howard, 2016). We found a marvelous KMO (Maibom, 2017) of .97 and a statistically significant (p = .000) Bartlett's Test of Sphericity, $\chi 2(276)$ = 5321.294, p = < .001. All variables had at least one correlation coefficient greater than .30 in the correlation matrix. The communalities (proportion of item's variance explained by the extracted factors) were all above .30, confirming that each item shared some common variance with other items.

The EFA initially provided three possible factors (based on components with Eigenvalues greater than 1), explaining 64% of the variance in the data. A visual exploration of the scree plot combined with a parallel analysis (O'Connor, 2000) confirmed this factor retention choice. Contrary to our assumptions, the data did not reflect a potential distinction between *Emotional interest* (EI) and *Perspective-taking* (PT).

We carefully examined each item and applied a combination of criteria for factor loading cutoff (as suggested by Howard (2016)). We considered satisfactory variables that loaded onto their primary factor above 0.40 and loaded onto alternative factors below 0.30. We also considered differences between the primary and alternative factor loadings. Additional arguments for deleting these items resulted from pretest comments (see section 6.1). The final three-factor solution (explaining 74% of the variance in the data) is composed of 11 items loading on the three components *Emotional interest and perspective-taking*, *Personal experience*, and *Self-awareness*. We found a marvelous KMO (Maibom, 2017) of .91 and a statistically significant Bartlett's Test of Sphericity, $\chi 2(55)$ = 2036.890, p = 000. Out of the new items introduced, three were retained (PT3, PT5, PT9) and completed the EI dimension to become EIPT. Table 6 presents the component loadings and communities of the rotated solution. The factor pattern loadings ranged from .43 to .98. Reliability analysis for EMPA-D three subscales is reported in Table 7 (using McDonald's Coefficient Omega, except for PE which has fewer than 3 items) and suggests good levels of internal consistency in the current sample.

Table 6. Extracted components and factor loadings
based on principal axis factoring with Oblimin rotation (N = 305)

Initial item code	Factors 1	2	3	Item-total correlation	Communalities	Mean	SD
Emotional interest and perspective-taking (EIPT)							
EI1	.98			.87	.84	5.56	1.31
EI3	.84			.79	.69	5.58	1.33
EI4	.88			.82	74	5.48	1.41
PT3	.82			.80	.69	5.76	1.38
PT5	.68			.78	.66	5.41	1.34
PT9	.66			.76	.64	5.64	1.35
Personal experience (PE)							
PE2		.78		.61	.62	4.76	1.42
PE3		.78		.61	.59	5.05	1.47
Self-awareness (SA)							
SA2			.78	.54	.53	5.90	1.13
SA3			.43	.50	.42	5.72	1.15
SA4			.67	.58	.55	5.75	1.10
EigenValue	5.87	1.25	2				
% variance explained	53.33	11.39	9.07				

Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization. Component loadings <.40 are suppressed.
Major loadings for each item are bolded.

Table 7. Descriptive Statistics and Omega Reliabilities of the three subscales (EIPT, PE, SA) and total scores of EMPA-D

Scale	Nb items	Min	Max	M	SD	ω
EMPA-D EIPT	6	1.33	7	5.59	1.17	.93
EMPA-D PE	2	1	7	4.90	1.29	.76
EMPA-D SA	3	2.33	7	5.79	.90	.72
EMPA-D Total	11	2.78	7	5.43	.91	.91

Cronbach's alpha was computed for PE because the McDonald's Omega cannot be estimated with less than 3 items

6.4.2. Factors intercorrelations

Relationships were examined between all components within the EMPA-D. The intercorrelations among the three factors presented in Table 8 suggest that the factors are interrelated at a moderate to high level.

6.4.3. Convergent and discriminant validity

We assessed the construct validity by investigating the reliability of subscales, scales, and related constructs, and the relationships between them (Table 9).

We found significant positive associations between EMPA-D Total and SITES r = .42, *p* = < .001, *CI*(.33, .51) and between EMPA-D Total and Empathy Quotient r = .34, *p* = < .001, *CI*(.24,.44), supporting the convergent validity of EMPA-D scale as a distinct measure of empathy. As predicted, associations are also positive between IRI and EMPA-D Total r = .33, *p* = < .001, and for the three EMPA-D subscales, with a higher correlation between IRI PT and EMPA-D EIPT r = .41, *p* = < .001, 17.1% of variance explained.

We predicted significant negative correlations between EMPA-D Total and the measure of narcissism SINS and NPI-13 (at the EE subscale level). There is a small negative correlation between SINS and EMPA-D Total r = -.15, *p* = .01, *CI*(-.26,-.04), and its dimensions EIPT and SA r = -.13, *p* = .02 for both. There is no significant correlation with PE. Similarly, we see a small negative correlation between NPI-13 EE and EMPA-D Total, EIPT (r = -.17, *p* = .002, 3% of variance explained) or PE (r = -.12, *p* = .04, 1.4% of variance explained).

We found a negligible significant association between social desirability BIDR-16 and EMPA-D Total r = .17, *p* = 0.003, *CI*(.06, .28), and BIDR-16 IM r = .22, *p* = <.001, 4.8% of variance explained. The same holds for associations between BIDR-16 Total and EMPA-D EIPT r = .13, *p* = .03, 1.6% of variance explained, and EMPA-D PE r = .13, *p* = .02, 1.8% of variance explained. This suggests that

Table 8. Intercorrelations between subscales and total scores of EMPA-D (with EIPT, PE, and SA dimensions) and validity instruments

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	.55**	.53**	.86**	.41**	-.13*	.34**	.41**	.15**	-.07	.30**	.30**	.04	-.17**	-.04	-.07	.00	.20**	.13*
2		-	.36**	.83**	.32**	-.11	.26**	.33**	.11	-.07	.22**	.23**	.04	-.12*	-.08	-.06	.06	.16**	.13*
3			-	.73**	.29**	-.13*	.32**	.37**	.20**	-.12*	.28**	.33**	.01	-.11	.01	-.03	.09	.17**	.16**
4				-	.42**	-.15*	.37**	.46**	.18**	-.10	.33**	.34**	.04	-.16**	-.05	-.07	.06	.22**	.17**
5					-	-.41**	.58**	.46**	.32**	-.04	.49**	.56**	-.10	-.34**	-.04	-.19**	.07	.28**	.21**
6						-	-.32**	-.27**	-.17**	.04	-.26**	-.33**	.24**	.37**	.31**	.39**	-.02	-.29**	-.19**
7							-	.52**	.45**	.06	.76**	.64**	-.22**	-.38**	-.15**	-.31*	-.08	.30**	.14*
8								-	.28**	-.13*	.60**	.49**	-.25**	-.38**	-.09	-.29**	.09	.44**	.32**
9									-	.20**	.76**	.33**	-.09	-.10	-.02	-.09	-.22**	-.09	-.18**
10										-	.47**	-.15**	-.25**	.01	-.06	-.14*	-.54**	-.25**	-.46**
11											-	.49**	-.30**	-.31**	-.12*	-.31**	-.31**	.12*	-.10
12												-	-.07	-.29**	-.09	-.18**	.25**	.37**	.37**
13													-	.46**	-47**	.83**	.28**	-.17**	.05
14														-	.32**	.72**	-.06	-.39**	-.28**
15															-	.79**	.23**	-18**	.02
16																-	.21**	-.30**	-.07
17																	-	.42**	.83**
18																		-	.86**
19																			-

**.Correlation is significant at the 0.01 level (2-tailed), *.Correlation is significant at the 0.05 level (2-tailed)
1. EMPA-D EIPT, 2. EMPA-D PE, 3. EMPA-D SA, 4. EMPA-D Total, 5. SITES, 6. SINS, 7. IRI EC, 8. IRI PT, 9. IRI FS, 10. IRI PD, 11. IRI Total, 12. EQ-40, 13. NPI-13 LA, 14. NPI-13 EE, 15. NPI-13 LA, 16. NPI-13 Total, 17. BIDR-16 SDE, 18. BIDR-16 IM, 19. BIDR-16 Total.

EMPA-D measures empathy rather than people's wishes to be perceived as empathic (Jolliffe and Farrington, 2006). There were no significant associations between BIDR-16 Self-deceptive enhancement and EMPA-D Total r = .06, *p* =.32, 0.3% of variance explained, and its subscales. These analyses provide evidence for the discriminant validity of EMPA-D.

Table 9. Descriptive Statistics and Alpha Reliabilities of the subscales and total scores of validity instruments

Scale	Nb items	Min	Max	M	SD	*α*
SITES	1	1	7	5.70	1.23	
SINS	1	1	7	1.78	1.21	
IRI *Empathic concern*	7	.71	4	2.78	.71	.82
IRI *Perspective-taking*	7	.86	4	2.61	.64	.81
IRI *Fantasy scale*	7	.29	4	2.38	.79	.80
IRI *Personal distress*	7	.00	4	1.62	.78	.85
IRI Total	28	.61	3.71	2.35	.47	.85
EQ-40	40	10	71	41.69	12.96	.90
NPI-13 *Leadership/Authority*	4	.00	4	.86	1.14	.65
NPI-13 *Grandiose exhibitionism*	5	.00	5	.87	1.21	.64
NPI-13 *Entitlement/Exploitativeness*	5	.00	4	.66	.94	.51
NPI-13 Total	13	.00	12	2.39	2.57	.77
BIDR-16 *Self-deceptive enhancement*	8	1.38	7.50	4.36	1.18	.78
BIDR-16 *Impression management*	8	1	8	4.79	1.31	.78
BIDR-16 Total	16	2	7.69	4.58	1.05	.83

6.4.4. Relation with sociodemographic variables

We examined the relations between demographic variables and the EMPA-D scores. As in Study 1, there was no significant correlation between EMPA-D and seniority, r = -.06, *p* = .27. There is however a significant correlation between EMPA-D and the extent to which respondents work in direct contact with the users of the service (r = .31, *p* = <.001). As a reminder, participants rated their relationship with users and the user-centered practices of their company (see Table 5). It is interesting to investigate the relationship between these variables and the empathy dimensions (Table 10). Aligned with our assumptions, the fact for an employee is a user of the service is positively correlated to the PE dimension (r = .20, *p* = <.001) but not to EIPT (.11, *p* = .053) or SA (r = -.043, *p* = .456). As a user, the experience of other users resonates with one's own (Bove, 2019). Being a user of the service is however not a good predictor of overall empathy towards users, with only 1.7% of the variance explained when conducting a linear regression, *F*(1, 303) = 5.196, *p* = 0.23, *η*2 = 0.17.

A challenge related to empathy in design is also to make everyone in the organization realize the impact of their job on the service experience (Postma et al., 2012) even if they are not customer-facing. A linear regression was run to predict EMPA-D from the perceived ability to help improve the experience of the service. This variable statistically significantly predicted EMPA-D Total, *F*(1, 303) = 95.783, *p* = <.001, *η*2 = .240, explaining 24% of the variance in empathy level. Similarly, a multiple regression was run to predict EMPA-D total from user-centered communication or training actions performed by a company (items "my company shares with me (some form of) data about the users" and "I am often attending trainings related to the users"). These variables statistically significantly predicted EMPA-D total, *F*(2, 302) = 38.011, *p* = <.001, *η*2 = .201, explaining 20% of the variance in empathy level. All two variables added statistically significantly to the prediction, *p* = < .001.

Aligned with prior work, we then researched whether empathy towards users would impact the employees' willingness to take action and contribute to the improvement of the service experience. A linear regression was run to predict the readiness for action (item "I am ready to change my work routines and procedures to improve users' experiences") from EMPA-D total. The empathy level statistically significantly predicted readiness for action, *F*(1, 303) = 103.622, *p* = <.001, *η*2 = .255, with 25% of the variance explained. It is beyond the scope of the present work to examine this relationship further, yet is it useful to note that other mediating factors could be explored in future work and that EMPA-D can be a useful tool in this endeavor.

Table 10. Intercorrelations between sociodemographic variables and subscales of EMPA-D (with EIPT, PE, and SA dimensions)

Items / EMPA-D dimensions	EIPT	PE	SA	EMPA-D Total
I have good knowledge of how users experience the service	.45**	.35**	.34**	.50**
I am able to help improve the experience of service users	.50**	.35**	.21**	.43**
My job contributes to or affects the experience of the users	.46**	.30**	.40**	.47**
I am, myself, a user of the product or the service provided by my company	.11 (*p* = .053)	.20**	.-043 (*p* = .46)	.13 (*p* = .023)
I am often attending trainings related to the users	.41**	.34**	.17**	.39**
My company shares with me (some form of) data about the users	.36**	.17*	.29**	.33**
I am willing to co-construct the service with the users	.59**	.38**	.25**	.51**
I am ready to change my work routines and procedures to improve users' experiences	.53**	.35**	.33**	.51**
I feel responsible for the experience of the users with the service	.61**	.39**	.35**	.56**

**.Correlation is significant at the 0.01 level (2-tailed). *.Correlation is significant at the 0.05 level (2-tailed).

6.4.5. Discussion

In Study 2, we adapted the *Sensitivity/Immersion* dimension to employees through new items oriented on perspective-taking. Rather than a complete pivot away from the SI dimension, these items reflect the active immersion in the perspective of users, in the way designers immerse themselves in the users' world (Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019a). Surma-aho et al. (2019) refer to evidence-based perspective-taking based on primary research and user interaction. The findings from Study 2 thus result from an improved contextualization of employees' roles and how they relate to the frameworks initially focused on designers.

The analyses conducted in Study 2 show that EMPA-D covers three dimensions of empathy in design: *Emotional interest and perspective-taking, Personal experience*, and *Self-awareness* (see Table 11 and Appendix D). The *Emotional interest and perspective-taking* items load on a unique dimension as theorized by Hess and Fila (2016b) (and previously observed in Study 1 with overlaps between EI and S items). In practice, the emotional interest drives the action of perspective-taking; the concepts are thus related and inseparable. The scale eventually includes more items for this first dimension, which reflects a larger breadth of content of this dimension as compared to the other two.

Table 11. Definitions of the three dimensions measured by EMPA-D

Dimension	Definition
Emotional interest and perspective-taking (EIPT)	Measures the employees' willingness to learn from users, including their interest and curiosity towards users. It also measures their active engagement in evidence-based perspective-taking.
Personal experience (PE)	Measures the employees' ability to use their personal experience with the service (or the one of their acquaintances) to understand users' experience.
Self-awareness (SA)	Measures the employees' ability to distinguish between their experience and the users' experience (self/other distinction).

Analyses of factor loadings led us to eliminate PE4 from the final solution (part of the PE dimension in Study 1). PE4 loaded more strongly with the EIPT dimension. Its formulation – "I compare users' experiences with the ones of people I know" – was likely problematic as the item implicitly assumes that the respondent personally knows someone using the service.

Regarding convergent validity, we found significant positive associations between EMPA-D Total and SITES, and with Empathy Quotient. Significant correlations between EMPA-D EIPT and both IRI PT and IRI FS illustrate the adequate measure of perspective-taking by our dedicated EMPA-D EIPT subscale. Regarding discriminant validity, our results align with prior literature (Hepper et al., 2014; Burgmer et al., 2021); EMPA-D is negatively correlated with narcissism, and more specifically with NPI-13 *Entitlement/Exploitativeness*. We found evidence in the relation between EMPA-D and BIDR-16 that EMPA-D items are not overly subject to social desirability (Jolliffe and Farrington, 2006).

7. General discussion

In this paper, we presented the development and initial validation of the Empathy in Design Scale (EMPA-D) through two studies (N = 406 and N = 305). Drawing on the vast literature and measurement scales in psychology, we propose a specific self-report tool adapted to research and practice in service design. The dimensions and items of EMPA-D are grounded in design frameworks initially created to investigate designers' empathy towards users (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019a,b), which we extended in the context of service design to internal stakeholders (e.g., employees) who are instrumental to the users' service experience (Stickdorn et al., 2018). In this section, we discuss the possible scenarios of the use of the EMPA-D scale, nuance the relevance of the quantitative approach of empathy in design, acknowledge the limitations of the present studies and present opportunities for future work.

7.1. What are possible use scenarios for the EMPA-D scale?

EMPA-D is thought for any service context – private or public, in all sectors – addressing a variety of professionals involved in shaping the service experience. EMPA-D's theoretical foundations and generic formulation make it likely suitable in the product design domain too, yet it has not been validated in this context. How can the scale be worthwhile to service design? The scale is an opportunity to increase the credibility of an empathic approach in the industry, which values Key Performance Indicators and Return On Investment to guide decision-making (Bias and Mayhew, 2005; Stickdorn et al., 2018). The company can address questions such as: on which empathic dimension do specific groups of employees score the highest or lowest? Is there a high emotional interest for the users? Is this interest shared across the organization or rather limited to customer-facing employees? What are the antecedents and outcomes of empathy in design (Surma-aho et al. 2019)? The data allows organizations to identify staff members that are highly empathic towards customers and who might be suitable to take on a more active role in the design process. Informed by this data, the organization can furthermore deploy targeted empathic design interventions (Drouet et al. 2023). Methods such as co-design are, for instance, known to support perspective-taking (Akoglu and Dankl 2021; Smeenk et al. 2016). Our findings also emphasize the importance of diffusing a culture of shared responsibility for the service experience: employees recognizing their ability to improve the service experience appears as an antecedent to developing empathy (and especially emotional interest). EMPA-D can then also be used to efficiently assess the effectiveness of the intervention (Drouet et al. 2022) by measuring the empathy levels of the service employees before (baseline measure), during, or after the empathic design intervention.

7.2. A nuanced approach to empathy in service design

Many factors come into play when addressing empathy in design and the overall organizational strategy and resources should be considered when using an empathy measurement tool. At the stakeholder level, the need to be empathic towards users varies with the job mission. Some dimensions of empathy might be useful to all service employees (e.g., *Emotional interest*), while others can be specific to customer-facing personnel (e.g., appealing to *Personal experience*). Empathy can also be limited by cultural and demographic factors (Chang-Arana et al., 2022). The EMPA-D scores thus need to be interpreted according to the service context and population surveyed and put into perspective with qualitative data.

Potential ethical risks related to measuring empathy in companies must also be considered (Drouet et al., 2022). First, an empathy measurement tool could be diverted from its primary use and be used to assess employees' performance. If the goal is the selection and deployment of empathic interventions, we suggest deriving analyses at the team level and safeguarding the anonymity of individuals. This also calls for interventions at the organizational level, considering empathy as a skill to be developed rather than a personality concern as it is common in the healthcare (e.g., Pratiwi et al., 2022) or engineering domains (Walther et al., 2020; Alzayed et al., 2021; Surma-aho et al., 2018; Hess et al., 2017). This view on empathy as a skill is aligned with our analyses in Study 2, which show that 20% of the variance in reported employees' empathy level can be explained by user-centered actions performed by a company. Empathy training initiatives like Google's program Pokerface (Liu et al., 2018) or Vasques et al. (2022)'s love and breakup letters can be a source of inspiration. A second risk is that empathy could be perceived by companies as the holy grail of user experience, rather than improving the service through a holistic user-centered approach. Empathy scores might turn into an end in itself with a marketing objective. Some authors criticize the adverse side of empathy when designing in a capitalistic logic (Holt, 2011) while others point out that empathy in design became more an ideology than a helpful principle (Heylighen and Dong, 2019). This can result in the empathy trap phenomenon (Mattelmäki et al., 2014) where designers forget their own concerns.

Finally, in industry, our tool aims at taking stock of empathy as a parameter of the company's user-centredness and supporting employees (at large, not only customer-facing) in building empathy towards users of a service or product. It might thus seem desirable for an employee to showcase empathic tendencies and "cheat the test" (Hemmerdinger et al., 2007) by presenting themselves in a positive light. Measures like the BIDR-16 (Hart et al., 2015) or the Lie scale of the Eysenck Personality Scale (Eysenck and Eysenck, 1991) can be used to make self-report instruments robust to social desirability. Other best practices include anonymization (and reassuring communication) in the administration of the scale and a clear vision shared by the management that the measure is meant for self-growth rather than the assessment of personnel.

7.3. Limitations

This study involves several limitations. Regarding the development of the scale, the initial items in Study 1 constituted a good representation of the conceptual facets of empathy in design as documented in the literature. Nevertheless, the item pool might appear small because we chose to rather pilot test and refine it during cognitive interviews. The first pool would also have benefited from less active formulations regarding the *Sensitivity/Immersion* dimension. This insight led to the development of new items on the *Perspective-taking* dimension in

Study 2. In our scale development process, some items were removed due to the lack of applicability to the roles of some service employees (as compared to e.g., designers, customer-facing personnel, or simply depending on their job missions). While removing items for this purpose is common practice in scale development, one can challenge whether these items did not reflect the manifestation of empathy in service employees, or whether this manifestation is expressed in a variety of ways insofar that it may be challenging to capture in a concise and generic instrument.

Another limitation related to our sample of paid crowd workers. If studies on these samples do not discredit their quality (Behrend et al., 2011; Peer et al., 2022), their motivation and the authenticity of their answers might be influenced by this status. We included attention check items, as a common strategy to cope with issues of inattentiveness and satisficing.

Although self-report instruments are efficient in collecting data, this approach is prone to biases (Lietz et al., 2011). Two of them are of particular attention: the acquiescence bias and the social desirability bias. A mix of positively and negatively-worded items can reduce the acquiescence bias. We did not adopt this strategy, in an effort to maximize understandability: rating negative phrasing requires more attention from the respondents (Swain et al., 2008; Weijters and Baumgartner, 2012). Social desirability is another concern when the results of the test might be perceived as a measure of performance (which is mitigated here by the sample of crowdworkers).

7.4. Future work

At the construct level, researchers (Chang-Arana et al., 2022; Surma-aho and Hölttä-Otto, 2022) advocate that quantifying empathy in design would only be possible once consensus has been reached within the community on its scope and definition. These processes are cumulative and slow and require scientific consolidation efforts. The EMPA-D is a first step, paving the way to further initiatives and validation studies. Empirical use of the scale in situ through various design interventions will contribute new insights into the usefulness and applicability of the tool and allow it to improve iteratively. Studies on the predictive validity of EMPA-D should be conducted next to investigate whether the scale helps to better predict the service experience or other service-related outcomes. We invite other researchers to pursue work of quantifying empathy in design, e.g., by using EMPA-D in other contexts or in complement of other measures. Some scales in the healthcare domain exist in two parallel versions (Davis, 1980; Hojat et al., 2001): one for employees and one for users to rate their perception of the employees' empathy towards them. As empathy occurs in interaction and it "takes two to tango" (Ngo et al., 2020), it is equally relevant to investigate the role of users' empathy towards employees on the resulting service experience (Ngo et al., 2020; Wieseke et al., 2012).

8. Conclusion

In this paper, we report on the development and first validation of the Empathy in Design Scale (EMPA-D), a short 11-item measure of empathy in service design. The scale produces a total empathy score, and scores for three dimensions, namely *Emotional interest and perspective-taking*, *Personal experience*, and *Self-awareness*. The creation of this tool contributes to filling the gap in metrics to assess empathy in the service design context, by operationalizing the dimensions of empathy as described in design research frameworks (Hess and Fila, 2016b; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019a,b). It can support the collection of empirical evidence through experimental research designs (Surma-aho and Hölttä-Otto, 2022), which will allow for refining or consolidating theoretical claims. In industry, the scale intends to support organizations to assess employees' empathy towards users and consequently deploy empathic methods to foster user-centredness.

Acknowledgments

We would like to thank the HCI research team at the University of Luxembourg, and particularly Sophie Doublet and Verena Distler, who contributed to the scale validity analyses. We also sincerely thank Vincent Koenig, who contributed to the funding acquisition and the supervision of this project, and Francesco Viti for his role in the supervisory committee. We also thank Sophie Lacour, Tom Nickels, and the Luxembourgish Railway Company CFL for supporting this project.

Appendices

Appendix A. 16-item experimental version of EMPA-D (not validated)

Item code	Item
Emotional interest (EI)	
EI1	I am interested to learn about users' experiences and needs
EI2	I imagine how users think, feel or behave in different situations
EI3	I am curious about users' experiences and needs
EI4	I want to learn about users' experiences and opinions about the service
Sensitivity/Immersion (S)	
S1	I am sensitive to the experiences of users
S2	I observe without judging how users experience the service
S3	When thinking about the service, I take the users' point of reference
S4	I immerse myself in the user's world
Personal experience (PE)	
PE1	When thinking about the service, I consider and reflect on my own experiences and feelings
PE2	The experiences and feelings of users resonate with my own
PE3	I understand the users' experiences because I know how it feels
PE4	I compare users' experiences with the ones of people I know
Self-awareness (SA)	
SA1	I imagine how I would feel and think if I were a user rather than an employee
SA2	I am aware that my experiences as an employee are different from the ones of users
SA3	I realize that there are similarities and differences between my experiences and the ones of users
SA4	I understand why users perceive things differently than I do as an employee

Appendix B. 9-item EMPA-D version in Study 1

Item code	Item
Emotional interest (EI)	
EI1	I am interested to learn about users' experiences and needs
EI3	I am curious about users' experiences and needs
EI4	I want to learn about users' experiences and opinions about the service
Personal experience (PE)	
PE2	The experiences and feelings of users resonate with my own
PE3	I understand the users' experiences because I know how it feels
PE4	I compare users' experiences with the ones of people I know
Self-awareness (SA)	
SA2	I am aware that my experiences as an employee are different from the ones of users
SA3	I realize that there are similarities and differences between my experiences and the ones of users
SA4	I understand why users perceive things differently than I do as an employee

Appendix C. Experimental version of perspective-taking dimension administered (not validated)

Item code	Item
PT1	I imagine how things look from the users' perspective
PT2	I am consulting data about users whenever it is accessible to me
PT3	As an employee, I try to find out what the users' needs are
PT4	When I'm frustrated by users, I try to "put myself in their shoes"
PT5	I take action to view things from the users' perspective
PT6	I challenge my perspective with the one of the users
PT7	I try to get out of my comfort zone to "put myself in the users' shoes"
PT8	Even when I'm convinced of something, I try to listen to users' arguments
PT9	I am actively listening to users' experiences to better understand their perspectives
PT10	I pay attention to users' complaints and testimonials about their service experience
PT11	I do my job with the users in mind
PT12	I try to think like the users
PT13	When doing my job, I try to "put myself in the users' shoes"
PT14	When users criticize the service, I try to "put myself in their shoes"
PT15	I imagine what it is like to be in the users' shoes

Appendix D. Final version of the 11-item Empathy in Design Scale (EMPA-D)

Instructions: The table below includes statements related to your professional context. By 'users' we mean people/customers who use your organization's products or services. Please use the 7-point scale* to indicate the degree to which these statements accurately describe you or not. Respond spontaneously: there are no right or wrong answers, only your perspective matters.

Item code	Item	Initial item code
Emotional interest/Perspective-taking (EIPT)		
EIPT-1	I am interested to learn about users' experiences and needs	EI1
EIPT-2	I am curious about users' experiences and needs	EI3
EIPT-3	I want to learn about users' experiences and opinions about the service	EI4
EIPT-4	As an employee, I try to find out what the users' needs are	PT3
EIPT-5	I take action to view things from the users' perspective	PT5
EIPT-6	I am actively listening to users' experiences to better understand their perspectives	PT9
Personal experience (PE)		
PE-1	The experiences and feelings of users resonate with my own	PE2
PE-2	I understand the users' experiences because I know how it feels	PE3
Self-awareness (SA)		
SA-1	I am aware that my experiences as an employee are different from the ones of users	SA2
SA-2	I realize that there are similarities and differences between my experiences and the ones of users	SA3
SA-3	I understand why users perceive things differently than I do as an employee	SA4

*The 7-point of the scale are: 1/ Does not describe me at all 2/ Barely describes me 3/ Somewhat describes me 4/ Moderately describes me 5/ Generally describes me 6/ Mostly describes me 7/ Completely describes me

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Chapter 4.

Empathic Design Interventions

In Chapter 2, we collected user inputs to understand our service user experience context. In Chapter 3, we developed an empathy measurement tool to assess service employees' empathy, for the design community but also for our own interventions. In this chapter, we seek to share our learnings about passenger experience with employees and trigger service employees' empathy through three empathic design methods: the physical journey map, the love and breakup declarations, and the co-creation workshops. Each study included in this chapter (Papers C, D, and E) investigates one method. All these methods include the main characteristics of empathic design methods and cover a range from the most processed/synthetic user data to the most direct: a physical journey map (synthesis of user insights), the love and breakup declarations (raw user data), and co-creation workshops (direct contact with users). Employees' empathy was measured differently in these empirical studies (see Chapter 1, section "Research approach and contributions") as they were conducted in parallel with the development of the EMPA-D scale.

Paper C	Lallemand, C., Lauret, J., and Drouet, L., 2022. Physical Journey Maps: Staging Users' Experiences to Increase Stakeholders' Empathy Towards Users. In CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '22 Extended Abstracts), April 29–May 05, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3491101.3519630
Paper D	Drouet, L., and Lallemand, C., 2023. Leveraging Passengers' Love and Breakup Declarations to Trigger Service Employees' Empathy in the Context of Railway Transportation. Submitted for journal publication.
Paper E	Drouet, L., and Lallemand, C., 2023. Do Co-creation Workshops Trigger Empathy? Unraveling Empathic Attitudes Between Service Employees and Users During Co-creation Workshops. Submitted for journal publication.

Physical Journey Maps: Staging Users’ Experiences to Increase Stakeholders’ Empathy towards Users

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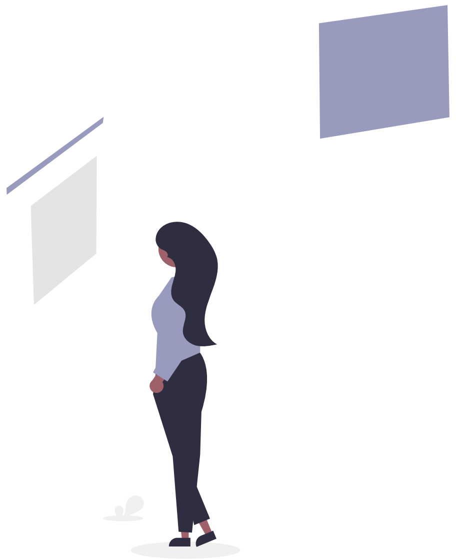
CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI ’22 Extended Abstracts), April 29–May 05, 2022, New Orleans, LA, USA. ACM, New York, NY, USA, 7 pages https://doi.org/10.1145/3491101.3519630

Keywords: experience mapping, customer journey mapping, data physicalization, user research method, empathy

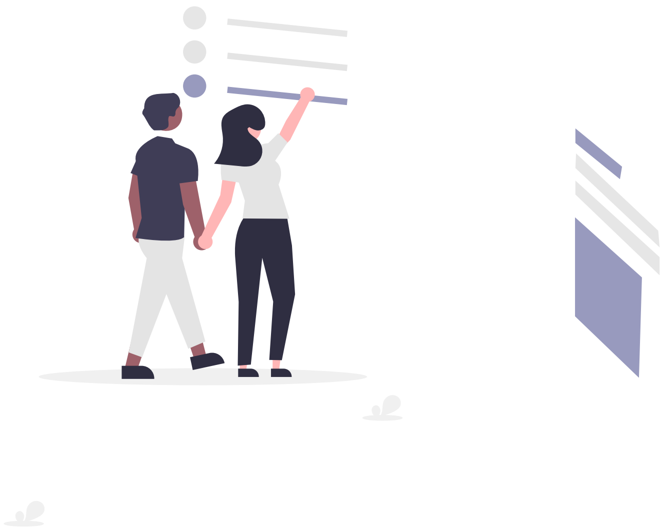


Abstract

Customer journey mapping is a widespread service design tool that synthesizes and communicates user research insights to stakeholders. In its common form, a journey map is a synthetic (typically non-interactive) visualization of the key steps of the users’ experience with a service or product. By decomposing the elements of a journey map and staging them under the form of a physical and interactive installation, we intend to leverage the power of journey mapping to break silos and prompt employees within an organization to discover end-users’ journeys in a compelling and empathic way. This aims to support the user-centered maturity of the organization by developing employees’ curiosity and empathy towards users. We illustrate this approach through a case study on railway passengers’ experiences. We explore the value of richer transfers of user research insights through physical journey maps and discuss design processes and mediums enabling journey maps to come to life.

Highlights

- We ideated with 10 designers on the opportunities to physicalize a journey map, a tool traditionally used in service design to synthesize users’ experiences.
- We prototyped the physicalization of a train passenger journey map based on passengers’ data of a railway company.
- We tested the prototype with five employees of another railway company to immerse them in passenger experiences.
- We discuss the potential of such a method to trigger service employees’ empathy towards users.



1. Introduction

A journey map visualizes the experience of a person (often the customer of a service) over time (Stickdorn et al., 2018). It unveils all the key steps of the experience and can take many forms, varying in their scale or scope depending on the purpose of the map in the design process. In its traditional form, a journey map is a synthetic visualization, on screen or on paper, focusing on a main actor (often represented by a persona). Amongst other uses, it allows communicating user research insights to stakeholders in a synthetic yet compelling way. It encourages people across the organization to consider the user's experiences, feelings, and needs. It forms a "boundary object" that allows diverse teams to work together efficiently and creatively with the customer's experience as the common denominator (Kaplan, 2016a; Stickdorn et al., 2018).

As few academic publications investigate journey maps as a design tool, the numerous benefits attributed to mapping experiences are mainly documented by practitioners. Surveying 48 user experience professionals in 2016, Kaplan (2016a) emphasizes key benefits of journey mapping. By synthesizing user research, maps uncover hidden truths and new insights. When co-created, they facilitate collaboration between groups. More importantly, over a third of respondents reported that journey mapping helps align stakeholders around a common vision and shared goals, thus growing cross-department consensus. Journey maps support building empathy within an organization (AdaptivePath, 2013; Kaplan, 2016a; Kaplan, 2016b, Stickdorn et al., 2018). They shift an organization's view "from inside-out to outside-in," give teams a common big picture and help break silos (Kalbach, 2017; Kaplan, 2016a). As pointed out by Kalbach (2017), such a process should not be limited to frontline personnel only but rather every employee in a company must empathize with the end-users of their product or services. Journey mapping supports the involvement of everyone by creating a personal connection (Kaplan, 2016a): it helps people within the organization to see the impact of their daily work on the customer experience.

In academia, the process of creating journey maps and the resulting impact are described for specific application areas (e.g., in healthcare (Reay et al., 2017)). Journey maps have also been documented as an inspiration tool to spot design research opportunities (Menheere et al., 2020). There is a limited amount of published work looking at journey mapping from a methodological perspective, and this body of knowledge is spread between several disciplines. Relevant studies including proposals to enrich customer journey maps as a design tool adopted a main focus on the source of data to be represented in the journey map (Alvarez et al., 2020; Ismirle, 2018; Rosenbaum et al., 2017). Rosenbaum et al. (2017) linked marketing research to the mapping process to leverage the power of journey maps as a strategic innovation tool. Alvarez et al. (2020) developed a data-driven customer journey map that bridges insights from explicit (e.g., self-reported) and implicit user data (bio-physiological reactions). Ismirle (2018) suggests to use journey maps to consider individual user stories and overcome the issues of aggregating user research data into an "average user."

Closer to the concept we develop in the present contribution, a few research teams attempted to enhance designers' empathy for users by presenting user research data in richer formats. McGinley and Dong (2011) studied how communicating rich user data in many forms could enhance designers' empathy with end-users. They staged user research using a 10-min documentary film based on video clips compiled during the research phase, an interactive dashboard of insights, and experiential artifacts aims at letting the design team experience the sensations involved in a bar setting (e.g., broken glass). The authors emphasize a *"need to move away from the dry representations that exist in conventional anthropometric resources, and to bring human information to life through presenting user insights as fuller stories, conveying liveliness through visual material, and giving scope for the design audience to complete the interpretations, allowing a level of co-ownership. Presenting more than just data when trying to understand the lives of real people, a variety of strategies and techniques need to be deployed in order to get closer to a true understanding."* (p.193, (Mcginley and Dong, 2011)). Finally, Neubauer et al. (2017) introduced technology-enabled empathy mapping. During a workshop, they used Virtual Reality (VR) as a tool to support designers in developing a better sense of empathy for the users and the context. Their scenario, designing for the International Space Station, was an unprecedented challenge designers have not experienced. Their preliminary results indicate that new technology, such as VR, can be leveraged to develop empathy within the early stages of the design process.

Our contribution is twofold. We introduce the concept of physical journey maps and illustrate this approach through a first industrial case study. We reflect on our design process and discuss relevant considerations when translating a traditional visualization of the experience into an interactive physical installation, thereby paving the way for future work.

2. Design process

Our research and design process started by defining the goals and expected benefits of a physical journey map. What is the purpose of physicalizing a rather successful and so widespread service design tool? What benefits do we expect? We then conducted an expert ideation session to explore the design space and creative potential of this idea. Based on a generic storyboard of what such an installation could look like, we finally applied the concept of the physical journey map to an industrial use case in collaboration with a national railway company. We report insights from a preliminary user study.

2.1. Goals and expected benefits of a physical journey map

We define physical journey maps as physical installations staging user research data and insights through various mediums and sensory modalities to represent the journeys of the users of a service or a product. The goal we envision for physical journey maps is to bring customers' stories to life in a compelling and empathic way in order to break down organizational silos and unite employees around a common vision. It aims to be an onboarding tool into service design, raising employees' interest in the user experience at every level of the organization. If successful, it should trigger conversations, engage and support employees to co-create solutions to improve the service experience. Factors of success include: (a) the installation gives employees a deeper understanding of the end-users and their experiences, (b) it triggers social curiosity for users and basic forms of empathy, and at a higher level, (c) it inspires people to take ownership and action to improve the service experience. By staging the customer journey as an interactive experience, we deploy a traditionally visual service design tool in physical space and time. The physical journal map supports a multi-sensorial embodied experience, which aims to be memorable and to resonate with employees at every level of the organization.

2.2. Expert ideation session

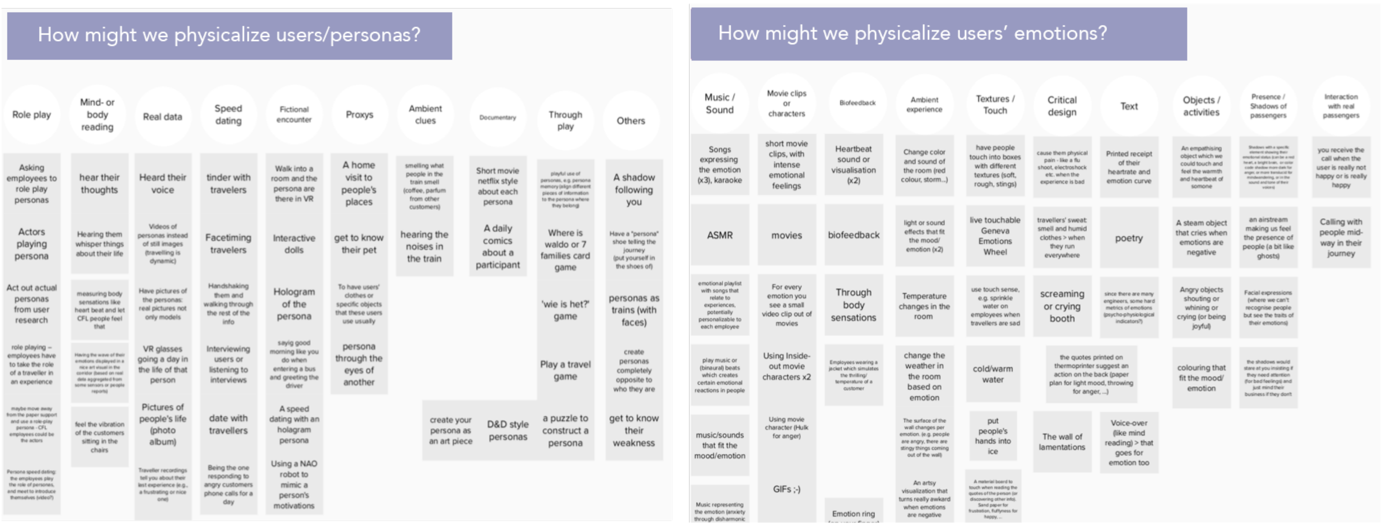
We conducted a brainstorming session with designers in order to generate ideas on how to translate the elements of a journey map into physical representations. Ten designers (4 men, 6 women) participated in the ideation session, all having several years of experience in the field of design (Min = 5 years, Max = 16 years). All participants were trained and knowledgeable in user research, and specifically customer journey mapping.

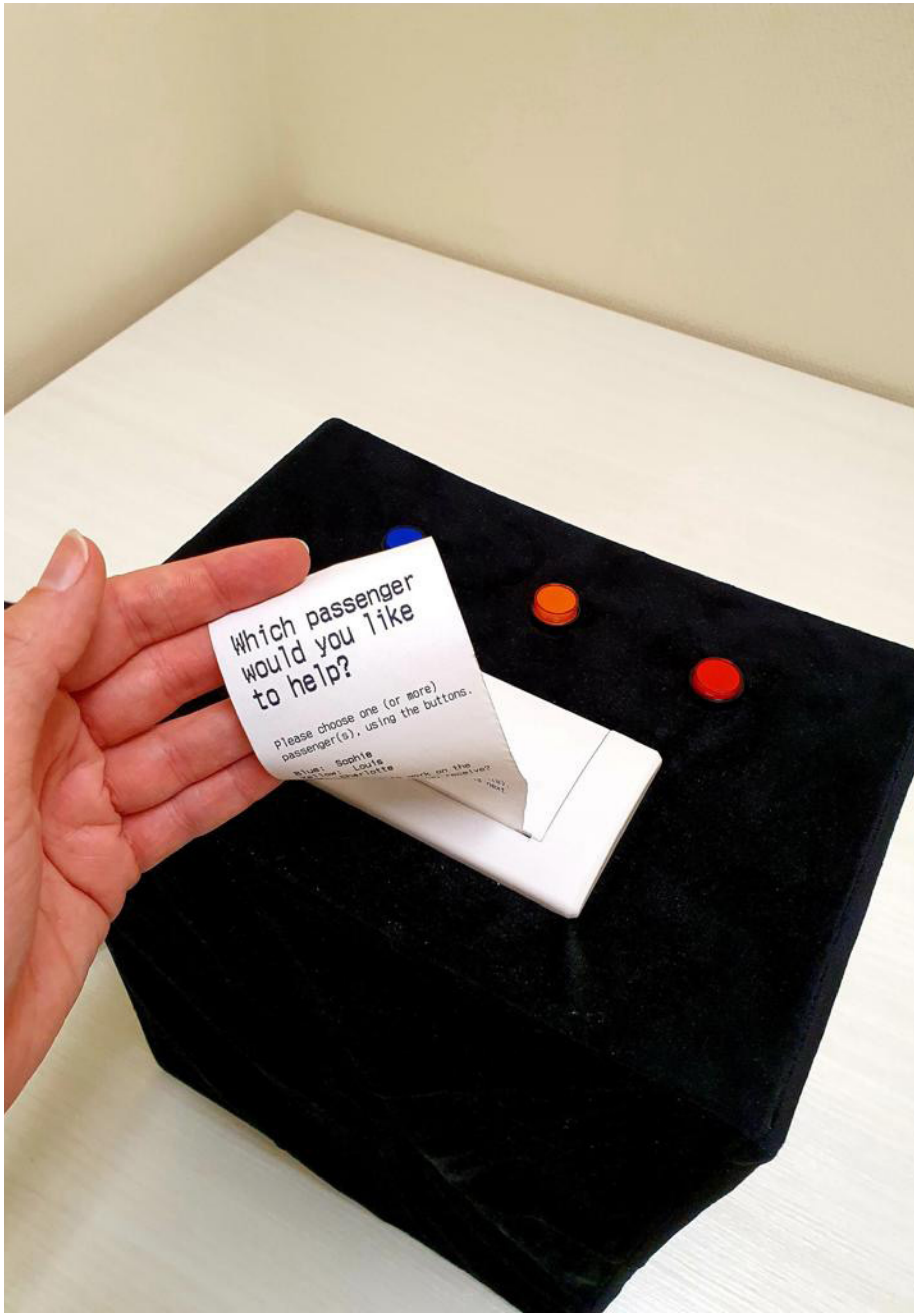
We considered elements of a journey map separately and asked the designers to answer How Might We questions, such as "How might we physicalize users' emotions?" or "How might we physicalize pain points?." This prompt was repeated eight times, corresponding to the eight main elements of a journey map (Lallemand and Gronier, 2018), namely: (1) the user/persona, (2) the timeline/stages of the experience, (3) the users' actions, (4) the users' thoughts, (5) the users' emotional experience, (6) users' needs, (7) the insights or pain points discovered, and (8) the design opportunities or ideas for improvement along with the internal ownership. For generalizable purposes, the ideation was done on a generic basis without relying on a specific case study or example. To encourage out-of-the-box thinking, participants were asked not to think about technical feasibility at this stage. The session was conducted online on an interactive whiteboard, first individually followed by a discussion phase.

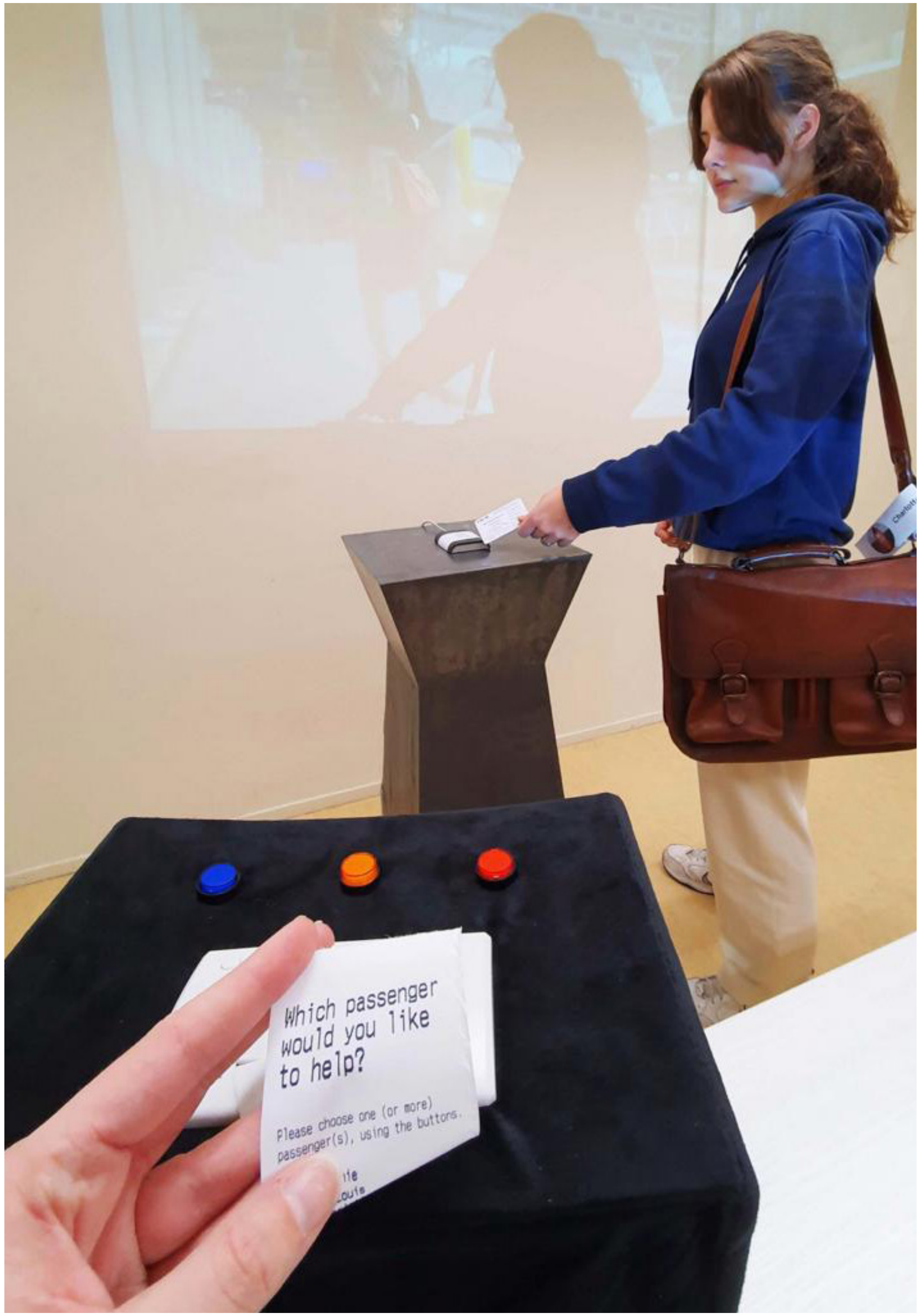
Around 50 ideas were collected for each element, some being more or less original, feasible, or provocative. Not all ideas used technology to convey the message, and participants evoked the necessity of combining tech and low-tech elements to create a compelling experience. Results were analyzed using affinity diagramming (Figure 1). Due to space constraints, we only mention here some idea categories evoked by the participants. Examples of ideas to physicalize personas were role-play or speed dating, shadows, using VR experience to live a day in the life of a persona, or discovering them via proxy artifacts (e.g., virtual visit of their home, inventory of their handbag). The journey timeline was often thought of as a progression through the physical space in the installation but ideas around time displays, nature metaphors, or browsing interactions were also mentioned often. Participants proposed to physicalize emotions using ambient experience, artsy visualizations, biofeedback, movie clips or animated characters, textures, or an emotion booth.

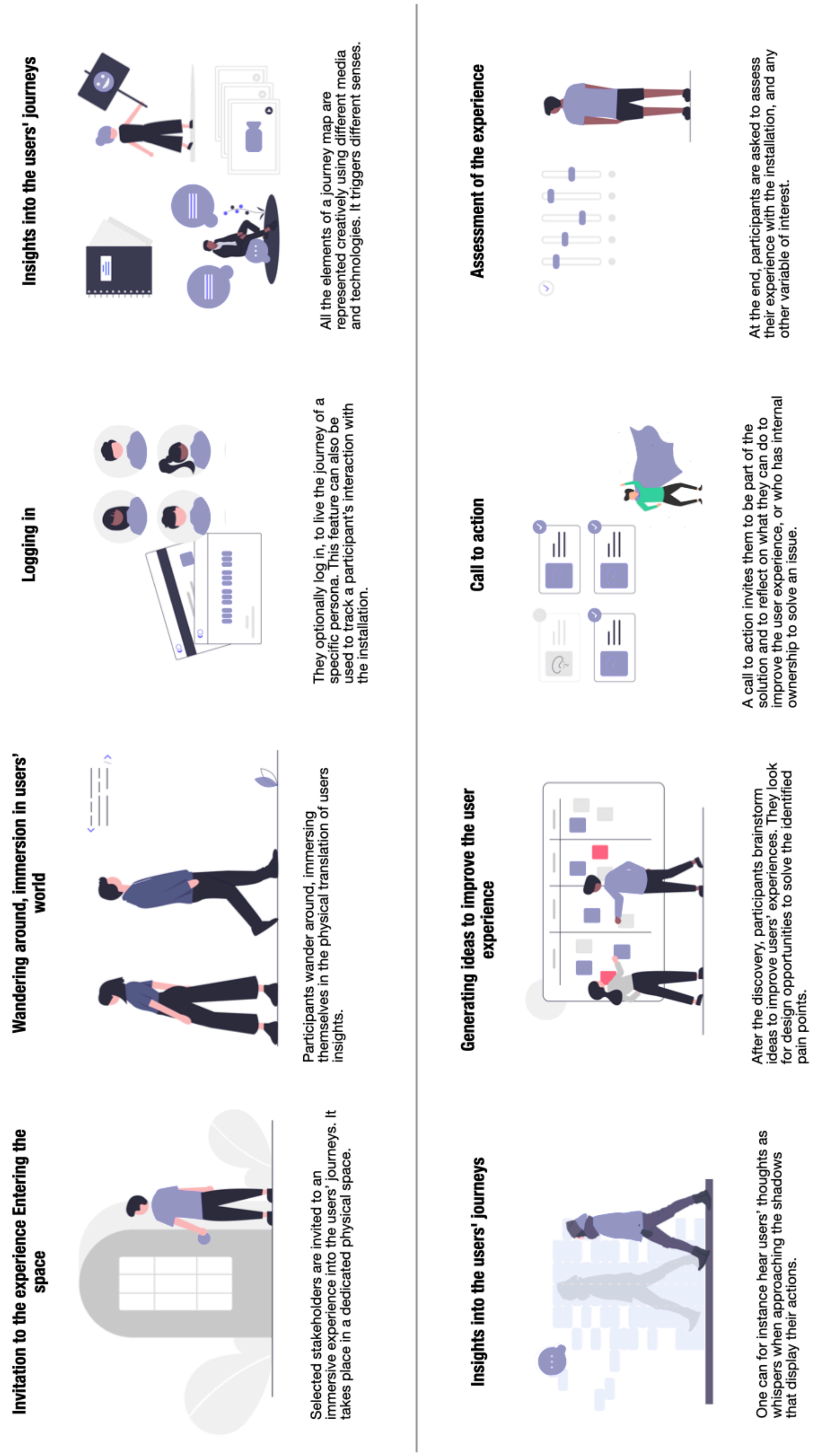
Following the ideation session, we sketched several ideas and assessed them according to their ability to translate the user research data in a compelling way, their level of originality, their ability to trigger emotions and empathy, and finally, their feasibility. We created a generic storyboard of a first physical installation, including the ideas selected (Figure 2).

Figure 1. Extract of the affinity diagram synthesizing the outcomes of the expert ideation session




Which passenger would you like to help?
Please choose one (or more) passenger(s), using the buttons.
Blue: Sophie
Louis
Charlotte


Which passenger would you like to help?
Please choose one (or more) passenger(s), using the buttons.
Louis



Invitation to the experience Entering the space

Selected stakeholders are invited to an immersive experience into the users' journeys. It takes place in a dedicated physical space.

Wandering around, immersion in users' world

Participants wander around, immersing themselves in the physical translation of users insights.

They optionally log in, to live the journey of a specific persona. This feature can also be used to track a participant's interaction with the installation.

All the elements of a journey map are represented creatively using different media and technologies. It triggers different senses.

One can for instance hear users' thoughts as whispers when approaching the shadows that display their actions.

After the discovery, participants brainstorm ideas to improve users' experiences. They look for design opportunities to solve the identified pain points.

A call to action invites them to be part of the solution and to reflect on what they can do to improve the user experience, or who has internal ownership to solve an issue.

At the end, participants are asked to assess their experience with the installation, and any other variable of interest.

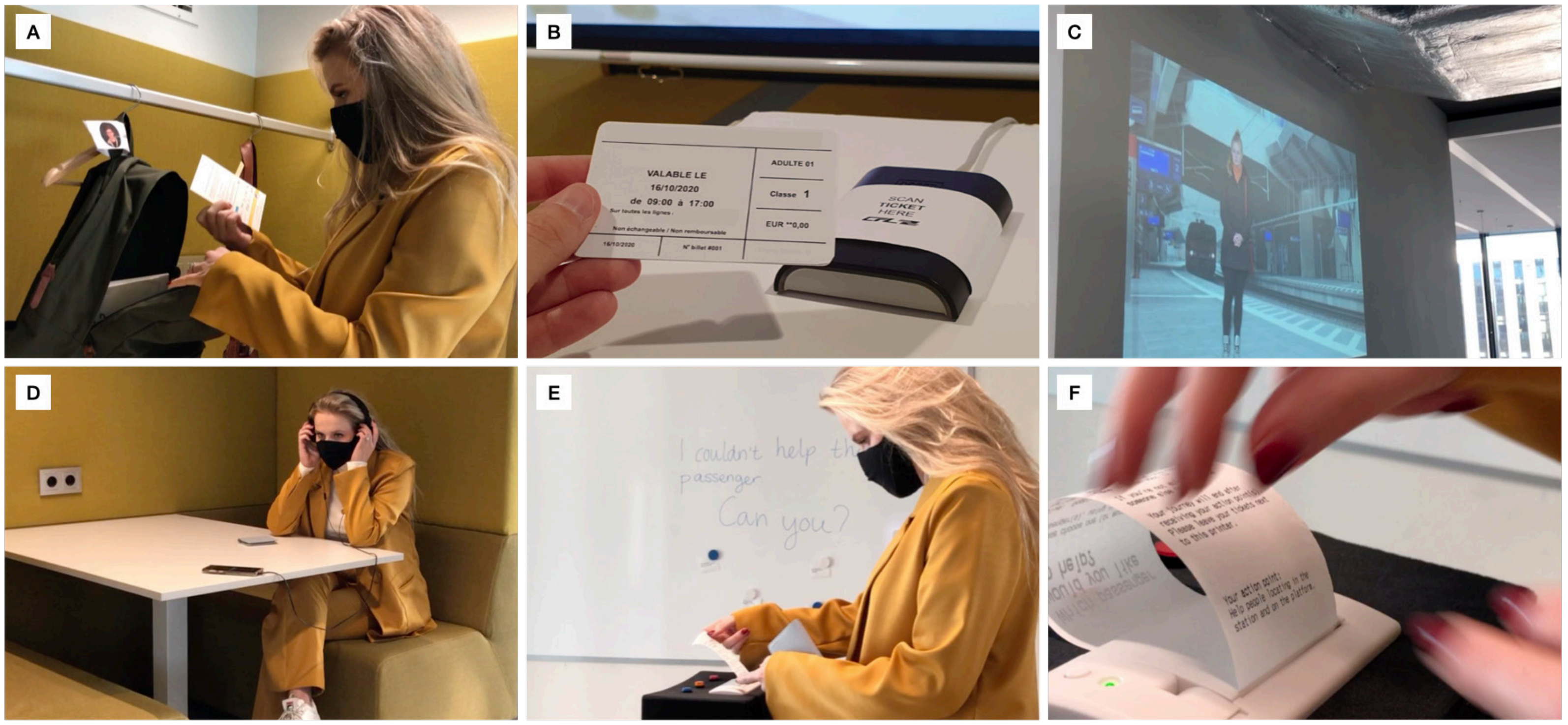
Figure 2. Storyboard of a physical experience map installation

3. Illustrative case study: staging railway passengers' experience

We illustrate our approach through an industrial case study in the context of a transportation service in Luxembourg. To support the passengers' experiences and offer a high-quality service, railway employees should empathize with the passengers and understand their needs and expectations. XPressia is a human-scale interactive journey map that stages passengers' experiences based on user research data (qualitative and quantitative). It is designed in the context of employees' training. The experience is staged in a way that follows the temporal journey of the train passengers: walking through the installation, participants walk through the map *timeline*. Scan your ticket and embark on the journey of three passengers: discover their identity, follow their actions, hear their thoughts, feel their emotions, and understand their pain points.

The experience starts by getting to know three passengers (representing *personas* on a traditional map) by looking at their travel bags (Figure 3a). These bags include personal items: their phones with a screenshot of a travel app with their planned journey, a wallet, a train ticket, and other items hinting at the person and their travel motivation. When scanning one of the three tickets (Figure 3b) equipped with an NFC tag, a projection on the wall shows the passenger waiting for their train to arrive. This is representative of one specific key *action* in the user journey. By approaching the wall, one can hear their *thoughts* in the form of whispers (Figure 3c). The participant then takes a seat in a simulated train compartment (another typical *action* in the map) and listens to relaxing music using headphones (Figure 3d). In the background, the participant will overhear conversations between nearby passengers about their *journey*, *pain points*, and *feelings*. At the destination, we invite the participant to select which passenger(s) they would like to support and to press the corresponding button on a thermal printer (Figure 3e). The participants receive a printed receipt including an *action point* related to the needs of the chosen passenger(s) (Figure 3f). They can decide to quickly brainstorm *potential solutions*, take this action point with them to work on it, or give it to someone else who they think might be able to act upon it. Behind the printer is a whiteboard with the question, "I couldn't help the passenger, can you?." It features printed action points that colleagues, who previously participated in the experience, left for others to solve.

Figure 3. A participant experiencing the physical experience map prototype



3.1. Exploratory user study

We conducted a preliminary user study of the physical journey map. Five employees of a railway company (1 man, 4 women), aged 18-52 years old, participated in this study (convenience sampling). After obtaining informed consent, the employees were invited to discover and interact with the installation individually. Participants were free to spend as much time as desired in the installation. The material presented was designed for a 20-30 min tour. At the end of the experience, the participants were asked to fill in a questionnaire about (a) their overall experience with the physical journey map, (b) what they could recall regarding each of the three personas passengers introduced throughout the installation, (c) to what extent they felt connected to the passengers, and (d) which one (if any) they would feel like helping and why.

Our results show that participants did see potential in XPressia. One participant appreciated the experience, for it "allows you to know how everyday customers are feeling and to understand their feelings." For another one, the added value is in breaking the silos between frontline personnel and other employees, by "allowing colleagues who are not on the train to see the issues faced by customers." According to that person, "XPressia can help build empathy" and support employees in looking for improvements for their customers. Regarding the format of the experience, participants mentioned that they enjoyed being able to experience what the passengers actually thought and said (as collected during user research). They also appreciated that the passengers were described in great detail, which helped to build empathy. One participant encountered some difficulties navigating through the installation or understanding its purpose: "I felt like I had to pay attention to everything because I didn't know exactly what to do next."

All participants were able to recall something about the different passengers and their experiences. "All passengers have a completely different experience while traveling by train. They also reacted very differently." Three participants could recall a passenger being "cold on the platform." Four were able to recognize that one of the passengers was "visually impaired" and encountered issues while traveling. Three participants described the third passenger as "more relaxed." None of the participants recalled one of the passengers being a mother with a toddler. Some participants only wrote down some vague observations such as: "she was waiting for the train" or "3 different experiences." All participants answered "yes" when asked whether they would like to help the passengers, yet no participant chose more than one passenger to help. All participants took the printed action point with them but did not take an extra action point from the whiteboard.

4. Discussion

By physicalizing a journey map, we intended to make customers' stories accessible to employees who are not familiar with design tools nor feel involved in the improvement of end-users experience. According to Jansen et al. (2015), *"physical interaction with data can increase user engagement, facilitate understanding and learning and make data more accessible."* Despite its simplicity, our prototype XPressia was described as immersive and insightful. It seemed effective in supporting a diverse audience of non-designers in exploring user research data to understand customers better. The physicality of the experience aimed to trigger empathy through embodied cognition, as discussed by (Coulton et al., 2014; Heylighen and Dong, 2019; Huck et al., 2015). Understandably, the current contribution is a work-in-progress and only provides first insights about the success criteria established in section 2.1.

Our experience of designing XPressia showed the flexibility of such a tool. There are endless possibilities in the type and granularity of data represented, as well as the medium used to translate user insights into a physical journey. Potential scenarios of use are equally diverse. Besides the current state of the customer experience, one could stage and trigger debates on the future vision of the organization (Stickdorn et al., 2018). Another scenario came from a stakeholder who challenged us to develop users' empathy towards employees rather than the opposite. Perturbations in traffic are often outside of employees' control, yet they face travelers' frustration. As a physical journey map is more attractive than textual information, we can create an employee-focused map for customers to empathize with employees by refining the mental model of the service.

4.1. Designing a physical journey map: initial design considerations

Many elements of choice in the design of a physical journey map are similar to the ones made by a design team to create a traditional journey map. The scope and scale of the map have to be adapted to the purpose and audience of the installation, which is a big challenge in journey mapping (Kaplan, 2016a; Mcginley and Dong, 2011). Should the installation focus on a specific situation (e.g., perturbation of traffic) or on the generic travel experience? How many details should it include? Should it focus on a main actor or compare several personas? In XPressia, we focused on the journey of three personas and used a combination of raw data (stories, verbatims) and aggregated data (personas), with ambiance sounds to reflect the atmosphere. Raw data was used to share rich accounts of experience (Mcginley and Dong, 2011) and avoid "averaging" the user (Ismirle, 2018). If this setup was successful in catching participants' attention and triggering curiosity, the installation seemed too generic to pinpoint specific challenges which could resonate with employees beyond known issues such as unpleasant waiting time. It might be sufficient when a company aims at training new employees but might not fit innovation contexts. Bringing a sense of internal ownership to employees and breaking down organizational silos may require parts of the experience to be more detailed or specialized (Stickdorn et al., 2018). We should be careful though, not to lose people's interest along the way. Visual journey maps are often used in collective setups like presentations or workshops. The design team walks the stakeholders through the journey before asking them to ideate solutions to specific pain points. For complex services, this might involve a phase of curation of the journey section to work on. If the sequence of the XPressia visit followed the journey timeline, our visitors navigated freely through the installation until reaching the call to action part. A participant felt overwhelmed and wondered, "what to do next?," most did not engage much with the ideation. We can thus question the need for a sort of guided tour or personalization of content based on someone's interest. This is a common requirement in museum technologies to account for the variety of visitors' motivations (Ardissono et al., 2012). Yet, there is no single interpretation of users' experiences, and the physical journey map approach also has the advantage of letting employees engage with multiple narratives. As all of them walk through the same installation, each will see, hear and feel different emotions, identify different problem areas, and generate different ideas. A recommendation from the field of data physicalization is to introduce complex datasets through layered multi-sensory interactions, which support users to interpret the data in manageable parts (Jansen et al., 2015). Another way to support visitors in engaging with the material while making their own interpretations is to invite them to visit with a goal in mind. The study *"Seeing with New Eyes"* (Spence et al., 2019), for instance, invited museum visitors to explore the collection by searching for objects to (virtually) gift to someone. Neubauer et al. (2017) used a challenge in a VR simulation to actively immerse designers in the context of use.

4.2. Feasibility of the approach

The effort required to bring a journey map to live might look intense, especially to represent a high level of detail. We can consider several elements here. First, service design tools do not aim at encompassing the entire complexity of a service system. Their power lies in their ability to *"filter complexity in order to support the team in understanding the experience of even complex multichannel services, on a practical and a human, empathic level"* (p.47, (Stickdorn et al., 2018)). Our approach does not aim to transform every employee into a designer but rather to design a way to afford empathetic feelings to emerge (Coulton et al., 2014; Huck et al., 2015).

On a practical side, it is possible to balance the cost-benefit ratio of the tool (and design process) by using relatively inexpensive materials or technologies to support different lenses depending on the case study. The receipt printer is such an example: we used it as a call to action at the end of the installation, but we could have printed anything else, e.g., users' verbatims or statistics regarding the use of the service. In our process, we found out that what worked best was a balance between generic, transferable elements that can be used in multiple case studies and specific metaphors related to the context (e.g., scanning train tickets to access users' stories). It is clear that a physical journey map is harder to scale than a traditional document format that can be spread widely or even a virtual immersive experience such as (Neubauer et al., 2017). We, however, expect the benefits of this embodied experience (which are still to be investigated further) in terms of curiosity, multi-sensoriality, immersion, and memorability to outweigh the efforts.

Concretely, a physical journal map could be installed either at a company office or in a dedicated space provided by a service design agency. Our industrial partner was a company with enough resources and a workforce located in a single area, which was an optimal context. Other case studies are needed to better grasp the feasibility of such projects in other contexts. Another consideration related to feasibility is the fact of adjusting the physical journey map to reflect the evolution of the user experience across time. Indeed, a journey map is supposed to be a living document translating the experience over time as the context and service evolves (Ismirle, 2018; Stickdorn et al., 2018). Yet even traditional journey maps are rarely updated due to the user research efforts involved, especially when the design work is outsourced. To bring a more lively touch to the experience and dynamism of the content presented, physical journey maps could, for instance, benefit from adding a layer of live data (e.g., from social media, online customer reviews, from traffic information, or from sensors located in train stations).

4.3. Limitations and future work

Our initial explorations on the concept of physical journey maps have several limitations. First, the choice of elements to include in the prototype XPressia and how to mediate them through technology was partially based on feasibility. We did not strive for an optimal design, but a minimal viable prototype to conduct preliminary studies. The prototype should be iterated on to create a more compelling experience. Second, we conducted the user tests on a small sample size and individually. A traditional journey map is often used in a collective setting. Studying how the installation triggers social dynamics between visitors is key to our agenda for future work. Finally, a debriefing interview with more precise assessment criteria related to our established success factors would have been more insightful than the use of a questionnaire after the user test, especially on a target population that has little experience with such situations.

In future work, we first aim to consolidate our research in the railway context. This includes testing XPressia on different audiences and for different purposes, and iteratively improving the installation. Besides deploying to our client, we could exhibit the prototype at a professional event for railway industries in order to gather useful insights into our method (Lockton and Lallemand, 2020). Consolidation also requires adopting a more rigorous research protocol to understand the effects of the physical journey map on different stakeholders. Indeed, the current study setup does only hint at the success criteria established in section 2.1. We envision combining self-reported measures of social curiosity (Kashdan et al., 2020) and empathy with behavioral measures showcasing a potential increase in employees' engagement. Once validated, the Empathy in Design Scale (Drouet et al., 2022) could be an effective evaluation instrument in this context. Ideally, the impact of a physical journey map on the organization should be addressed in a long-term study, possibly using longitudinal methods (Lallemand, 2012).

Next, we intend to design physical journey maps in a variety of contexts to better understand how to design them effectively and what their effect on different target audiences can be. We can learn from connected domains, e.g., museum design or art installations. Of course, there is no one-size-fits-all solution, and many choices have to be defined by the design team. Creating a library of accessible technologies and mediums as examples to physicalize specific parts of an experience in a compelling and multi-sensorial way could be relevant to provide a quick start to professionals willing to create a physical journey map. We used the examples of the thermal printer or NFC tags earlier as promising and flexible tools to be used in this context. In addition to easy, low-tech techniques, which should not be neglected, numerous of-the-shelves sensors and actuators on the market could be listed as examples to serve a similar purpose. Scenarios beyond service companies are also worthwhile exploring. Think, for instance, of citizen participation in government-led projects.

5. Conclusion

To conclude, in this contribution, we explored the idea of decomposing elements of a journey map and staging them in the form of a physical installation to bring customers' stories to life in a compelling and empathic way. These rich and multi-sensory transfers of user research insights aim at developing employees' curiosity and empathy towards the users of a product or service. We conducted a preliminary study, for which we designed and tested a physical journey map of railway passengers' experiences. With the concept of physical journey maps and the various scenarios of use, it can support, we ultimately aim to support organizations in breaking organizational silos and improving their user-centered maturity.

Acknowledgments

We would like to thank Sophie Lacour, Tom Nickels, and the Luxembourgish Railway Company - CFL for supporting this project.

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Leveraging Passengers’ Love and Breakup Declarations to Trigger Service Employees’ Empathy in the Context of Railway Transportation

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Submitted for journal publication. **See the updated version once published.**

Keywords: empathic design methods, service design, empathy, love and breakup declarations, empathic accuracy

Abstract

Effectively triggering empathy from service employees towards users presents challenges. Yet it remains indispensable to support the user-centric approaches plebiscited by service companies. To address this issue, we played back to railway employees (N = 230) six anonymized audio recordings of train passengers’ love or breakup declarations (L&B) addressed to their railway company. We hypothesized that emotional and engaging users’ insights, such as L&B declarations, would trigger employees’ empathy towards users. Using a questionnaire, we investigated the employees’ ability to recognize passengers’ emotions (empathic accuracy), their resonance with their emotions (emotional resonance), their learning about, their interest in and empathy towards passengers, and their ability to help improve the passenger experience. Our findings show no direct increase in employee empathy and no differences between love or breakup declarations, respectively. We also highlight key factors influencing their emotion recognition and resonance. Last, we discuss the opportunities and challenges of using L&B declarations to trigger service employees’ empathy.

Highlights

- We played back passengers’ love and breakup declarations to railway employees and investigated the impact of conveying such user insights on their empathy.
- We measured employees’ empathy before and after listening to passengers’ declarations and several indicators informing empathy: emotional recognition and emotional resonance with passengers’ emotions, perceived learning about passengers, interest towards them, and perceived ability to help improve passenger experience.
- We investigated the impact of individual factors on employees’ empathy and related measures.
- While findings do not show increased employees’ empathy, we discuss the benefits, limitations, and challenges of the L&B.

1. Introduction

Service employees shape and deliver the user experience of services (Kimbell and Seidel, 2008; Penin, 2018; Stickdorn et al., 2018; Wetter-Edman, 2014). Hence, conveying an empathic understanding of customers to service employees supports an empathic design approach within a service organization (Bove, 2019). Empathy leads to better customer-employee interactions, customer satisfaction, forgiveness, and loyalty (Bove, 2019; Marandi and Harris, 2010; Wieseke et al. 2012), and positively impacts service quality (Bove, 2019; Parasuraman et al., 1988). Empathy facilitates collaboration between stakeholders and leads to common references and agreed solutions for the users (Smeenk, 2019). It is instrumental to break silos inside organizations (Stickdorn et al., 2018).

Building service employees' empathy implies engaging them in user research, going *"from being informed of user research to being engaged in user research"* (Postma et al., 2012). Without turning companies' stakeholders into designers, opening their minds and developing their ability to take the perspective of users is crucial. This goes through understanding users' emotions and their value (Dandavate et al., 1996), their experiences, and recognizing their feelings and thoughts.

While empathic research methods have traditionally focused on designers, the discipline lacks intelligible empathic methods tailored to an audience of stakeholders, not trained in user research nor design thinking (Lee et al., 2020). Healthcare is a rare domain (Bove, 2019) that researches methods to convey empathy to employees (Lunn et al., 2022; Pratiwi et al., 2022; Rodríguez-Ferrer et al., 2022). The empathic methods mainly use narrative strategies to share patients' or stakeholders' perspectives (McQuaid, 2003). They are also based on different role-play techniques like personae (Lunn et al., 2022), online escape rooms (Rodríguez-Ferrer et al., 2022), videos or games (Pratiwi et al., 2022).

In this paper, we researched the use of an empathic method to convey user research insights to service employees of a railway company. Previously used in the railway service sector to investigate passenger experiences (Drouet et al., 2023b), the love and breakup (L&B) declarations is a creative storytelling technique. This method has been described in the literature (Gerber, 2011; Laughey et al., 2020; Mattelmäki et al., 2014; Su et al., 2017) as able to enhance emotional understanding and foster empathy towards individuals. Our study investigates how listening to L&B declarations from service users might trigger service employees' empathy towards them. For this purpose, we measured employees' empathy before and after listening to the declarations. We also collected five indicators of empathy: employees' emotional recognition and emotional resonance with users, employees' self-reported learning about users, interest in users, and their perceived ability to help them. This work contributes to the design field by providing a rare empirical study focused on how an empathic method can support the development service stakeholders' empathy for customers.

1.1. Techniques to convey user insights from user research

Designers immerse themselves in users' worlds during the user research phase (Kouprie and Sleeswijk Visser, 2009). They collect raw data like users' stories and anecdotes (Sleeswijk Visser, 2009), allowing them to imagine the users' thoughts and better picture the situational contexts in which users experience the service. For this purpose, user researchers developed techniques to make intelligible user research findings (Lee et al., 2020), facilitate the designers' *empathic handover* (Smeenk et al., 2017), and tell narratives (Penin, 2018). They are based on visual, narrative, or tangible creations (Sanders and Dandavate, 1999). They synthesize and map user insights (e.g., Kolko, 2007; Mattelmäki et al., 2014; Penin, 2018; Sleeswijk Visser et al., 2005; Stickdorn et al., 2018) or simulate them (e.g., Lallemand et al., 2022; Moore and Conn, 1985; Smeenk et al., 2017). They are inspired from ethnographic methods (e.g., McGinley and Dong, 2011; Mattelmäki and Battarbee, 2002; Raijmakers, 2007, Vaajakallio et al., 2016), or co-creation techniques (e.g., Lee et al., 2014; Smeenk et al., 2017; Vaajakalli and Mattelmäki, 2014; van Rijn et al., 2011). Fictional, narrative, and storytelling techniques increase empathic in the long term (Bal and Veltkamp, 2013). Direct contact with users in the empathy process is emphasized in the literature (Fulton Suri, 2003; Kouprie and Sleeswijk Visser, 2009; Mattelmäki and Battarbee, 2002) as the exchanges between users and designers support designers' empathy (Kouprie and Sleeswijk Visser, 2009). van Rijn et al. (2011) conducted a study comparing three sources of information (background information, direct contact, and video) on how they support designers to empathize with users. The direct contact supported the most empathy, followed by the video, and last, the background information. Table 1 summarizes existing techniques to convey empathy towards users.

Designers have developed all these methods, requiring a background in the field and an open mind to understand user experience and map user insight. Traditional methods, such as ethnographic techniques can be perceived as mostly not very creative and engaging (e.g., observations) or, on the contrary, too creative (e.g., probes) and not understandable for an audience of stakeholders as service employees. However, all these methods can participate to develop the empathy of stakeholders, if well adapted to their UX maturity. Journey maps or personae synthesize well user research can facilitate the understanding of user experience (Kaplan, 2016a, 2016b). Collaborative techniques involve transverse teams from diverse background generate enriching discussion for the stakeholders (Stickdorn et al., 2018). The playful and immersive aspects of methods like simulators (Moore and Conn, 1985; Smeenk et al., 2017), physical journey maps (Lallemand et al., 2022), love and breakup method (Gerber, 2011) or design games (Papoutsi and Drigas, 2016) can invite the stakeholders to physically to get in users' shoes and feel more engaged.

1.2. Empathic accuracy techniques

The design field lacks dedicated measurement tools of empathy (Chang-Arana et al., 2022; Surma-aho and Hölttä-Otto, 2022), and usually borrows methods from psychology, like self-report scales (e.g., Empathy Quotient (Baron-Cohen and Wheelwright, 2004), Empathy Assessment Index (Lietz et al., 2011)). Designers' ability to recognize users' thoughts and emotions is, among others, an indicator of an empathic understanding of users. This empathic understanding feeds designers' ideations of adapted solutions to users' needs. Empathic accuracy techniques are common in psychology (Ickes, 1993) and were recently adopted in design to investigate designers' empathy (Chang-Arana et al., 2020; Li et al., 2021).

In the 1990's, Ickes (1993) defined the concept of empathic accuracy and invented the dyadic interaction paradigm (Ickes et al., 1990) still used today. It consists of recording an interaction between two persons. The first person watches the recording and indicates when and what they felt and thoughts along the interaction. Then, the second person is asked to watch the recording. Each time the first person mentioned having felt or thought something, the second person had to guess what the first person's feelings and thoughts were. The researcher compares the first and second person's answers to assess the second person's empathy accuracy. Stinson and Ickes (1992) used this method to show better accuracy between men friends than strangers. Hall and Schmid Mast (2007) demonstrate that verbal elements of an interaction contribute to better accuracy, than nonverbal elements. Physiological synchronization between people has also been used to measure empathy accuracy. Researchers like Levenson and Gottman (1983) studied the physiological responses of marital couples through sensors measuring heart rate, skin conductance, and facial muscle activity for detecting affective empathy and understanding empathic accuracy. Neurosciences also demonstrated the link between emotion recognition and affective brain region (Zaki et al., 2009).

Chang-Arana et al. (2020) studied the empathic accuracy technique used during the design process with designers. After interviewing users, the users were asked to watch the video recording and describe their thoughts during the key moments of the interviews. A few weeks later, the recording videos were shown to designers, who were asked to infer the users' thoughts at each key moment. Chang-Arana et al. (2020) compared the similarities on a 3-point scale. The researchers found the technique adequate to measure designers' empathy, however time-consuming.

Recently, Li et al. (2021) and Li and Hölttä-Otto (2022) also applied Ickes' method in a design context through a shorter protocol, including three parts: the interview part (between designers and users), inferring part (feelings and emotional recognition), and the evaluation part (raters rating of the similarities).

Table 1. Main techniques to convey user insights in design

Techniques	Medium	Data type	Description
Ethnographic techniques	Direct observation	Raw data	When designers conduct interviews, observations, and focus groups, other stakeholders can observe the sessions (hidden observations, Pagán, 2022).
	Video/multimedia	Raw data	Multimedia material is increasingly used to help designers step into users' worlds. Their format varies from simple recordings of life instants to compilation of videos from user research (also called empathy videos) (McGinley and Dong, 2011; Vaajakallio et al., 2016) and design documentaries (Raijmakers, 2007).
	Probes	Raw data	Design, cultural, or empathy probes are users' self-documentation of their experience. It sparks a dialogic process with users (Mattelmäki and Battarbee, 2002). These probes include multiple tangible user insights under various formats like love letters, diaries, pictures, notes.
Mapping techniques	2D printed documents: e.g., journey maps, empathy maps, personae, service blueprints (including employees' journeys)	Aggregated data	These techniques synthesize user research findings and are visualizations of user experience to facilitate the understanding of users (Penin, 2018; Stickdorn et al., 2018; Vilar et al., 2022). It maps the context in which users use the service or technologies (Kalbach, 2016; Sleeswijk Visser et al., 2005) and simplifies the complexity of systems and service organizations.
	Printed documents mapped in a physical space (e.g., room, wall)	Aggregated data	The mapping of user insight can be displayed in a dedicated room or wall (product synthesis wall (Kolko, 2007)) where people can walk around and interact with the material (Pagán, 2022). They are a sort of exhibition triggering empathic responses and inspiring new concepts (Mattelmäki et al., 2014).

Simulation techniques	Physical journey maps	Aggregated and raw data	Journey maps can be physicalized under the form ofInteractive installations where people navigate in users' experiences (Lallemand et al., 2022). They get immersed in users' life while discovering users' accessories. They hear users' thoughts and experience the service in a fictive service location (e.g., the train station of a railway service). The visit ends with discussing the most controversial user insights and debating how to improve the service.
	Simulators	Aggregated and fictional data	Simulation techniques simulate users' worlds. These techniques enhance design creativity and empathy (Raviselvam et al., 2022) Researchers experimented with such an approach to design for elders or people with disabilities (e.g., (Moore and Conn, 1985), capability-loss simulation toolkit (Cardoso and Clarkson, 2012).
	Virtual Reality (VR)	Aggregated and fictional data	VR triggers an emotional engagement motivating others' perspective-taking and appealing to affective empathy (Wiehl, 2022). VR develops designers' empathy towards users (Hu et al., 2021) and helps them to identify real problems to imagine solutions (Neubauer et al., 2017; Tettegah et al., 2006). Mainly used in healthcare research (Dyer et al., 2018; Sansoni et al., 2022) and social design (e.g., Gaanderse et al. (2022)).
	Games	Aggregated and fictional data	Games mediate others' perspectives and support empathy (cognitive process) through role-play (Vaajakallio and Mattelmäki, 2014). Their qualities have the potential to impact society: think, for instance, about games that sensibilize people to social changes (Papoutsi and Drigas, 2016).
Collaborative techniques	Direct contact between designers and users	Raw data / real context	The direct contact with users during codesign sessions significantly increases the quality of designing user-centered solutions (van Rijn et al., 2011). Users themselves are a good medium of empathy. Codesign or co-creative sessions are often combined with other techniques to enrich the discussion and creativity, like simulation techniques (Smeenk et al., 2017), probes (Lee et al., 2014), or design games (Vaajakallio and Mattelmäki, 2014).

These researchers investigate designers' empathy accuracy through a mixed-methods approach: the Ickes' paradigm and physiological synchronization. Li and Hölttä-Otto (2022) uncovered that designers' emotional accuracy impacts their performance in understanding users' needs. More experimental research investigates the feasibility of measuring empathy between designers and users during interviews by comparing autonomic nervous system synchrony with the heart rate (Chang-Arana et al., 2020).

While empathic accuracy techniques in design have only been used to assess designers' empathy, the technique might also help to assess other stakeholders' empathy, like service employees.

1.3. Research objectives

In this paper, we explore how the audio playback of L&B declarations can trigger service employees' empathy towards users. As employees are confronted with the real voice of passengers expressing their frustrations, satisfactions, or needs, we consider L&B declarations as an emotional and likely empathic way to convey user insights (Gerber, 2011; Laughey et al., 2020;, 2020; Su et al., 2017). The characteristics of the method, using storytelling (Bal and Veltkamp, 2013), raw data (Sleeswijk Visser, 2009), with a sensorial modality (i.e., the audio) and playful dimension (Koskinen et al., 2003), could, as a result, have empathic properties.

This study investigates the following research questions:

> RQ1: How do the love and breakup declarations trigger service employees' empathy towards users?

To assess whether and how the L&B declarations can impact employees' empathy, we quantitatively measured the empathy before and after listening to the passengers' declarations to assess a potential difference in empathy towards the user. We investigated what are the memorable passengers' insights the employees recall from the declarations. We also gathered the employees' preference between L&B declarations and traditional marketing-oriented user insights (i.e., satisfaction statistics and customers' complaints).

We also aimed to understand whether employees can recognize the emotions expressed by the passengers, whether these emotions resonate with their own, and whether they, in turn, influence employees' perceived learning about passengers, interest in passengers, and ability to help improve the passenger experience. Following prior work, we consider these related measures as indicators of empathy.

> RQ2: What individual factors influence employees' empathy when listening to L&B declarations?

Building on prior work, we explored employees' individual factors (e.g., train use, proximity with users, and seniority in the company), which can influence their emotional recognition, emotional resonance, and resulting indicators of empathy (learning, interest, and ability to help).

2. Method

In a preliminary study, we interviewed 53 passengers using the L&B method to better understand the current passenger experience with their railway service. Based on Gerber (2011)'s and Ahgharian (2016)'s previous work, we choose this research method specifically to collect emotional and engaging passengers' insights, – with the potential to trigger empathy from the employees of the service towards the users (Vasques et al., 2022). Combining approaches from design probes (Gaver et al., 1999; Mattelmäki, 2006), letters to objects and services (Delaney, 2010; McAllister, 2017; Paris, 2006), and roleplaying (Gerber, 2011; Kuutti et al., 2002), the L&B method invites people to reflect on their experiences (Sanders and Stappers, 2012) and their emotional attachment to technologies (Gerber, 2011), and elicit recites (Gaver et al., 1999).

In the present study, we played back six of the passengers' declarations to the railway company employees during a presentation of the study's preliminary results. These declarations are raw data reflecting the user experience (Figure 1). They are played back to trigger empathy. Along with the presentation, we invited the employees to answer questions about the declarations through a questionnaire. Making the employees listen to the passengers' declarations aimed to assess their empathy towards the customers in four ways: (1) their emotional recognition - empathic accuracy (Chang-Arana et al., 2020), (2) their emotional resonance with passengers, (3) their memorability of passengers' insights (Lallemand et al., 2022), and (4) their perceived learning about passengers, interest in passengers, ability to help improve the passenger experience, and empathy towards passengers (measures inspired by Sleeswijk Visser and Kouprie (2008)'s research).

2.1. Participants

356 employees from the railway company attended one of 16 sessions. All employees work in the "Accompanying Passenger" department (i.e., passengers' service experience). Most of them are customer frontline employees (e.g., staff in trains and stations); a minority of back-office employees (e.g., office staff who plan the service and manage the communication and passenger information). Each session involved heterogeneous profiles of employees and random group sizes as employees attended based on availability. While the sessions were mandatory for all department employees, participation in the study was voluntary and informed consent was collected. 328 employees (92% of the sample) participated in the questionnaire, but 66 did not consent to use their answers. We thus did

Figure 1. Examples of L&B declarations transcribed (translated in English)

Example of one love declaration – P.19

Dear CFL,

I am making a declaration of love to you because for more than fifteen years.... - I have been counting - since I entered high school, I have used your transport almost every day.

What I like is that the train leaves in front of my door and in two minutes I am at the station.

Thank you for being close to my home.

I remember that several years ago, you only came every twenty minutes, and now, really, you commit yourself every fifteen minutes; you are in front of my door, so I can take your train.

Thank you for that.

When I'm late to catch your train, I always have a station master who sees me running, waits for me, and tries to take me on board, even if I arrive last minute.

Thank you for that too.

In winter, when you arrive, I arrive in a warm, well-heated, clean carriage.

I feel like I'm in a good place that takes me where I want to go.

During your journey, I listen to music most of the time. But still, you guide me by announcing all the stops you will reach.

The train staff is really nice to me, and most of the time, I feel safe. They make sure that I can travel in peace.

So thank you for all this.

I love you my CFL.

Example of one breakup declaration – P.25

Dear CFL,

Everything started se well. You were more on time for our appointments than my ex SNCF. You looked great with your clean Luxembourg station and lifts.

Unfortunately, this does not compensate for my loneliness in facing your lack of availability. Too busy dealing with your various problem, perhaps? You are never on the platform when I need information when there is a delay or an unexpected problem.

You have problems, but you don't confide in me. I don't know what's going on. You have problems. Okay. Like everyone else. Why doest this reflect in me? Explain to me, find solutions for me, like buses, when you are unavailable.

On top of that, your trains are always full of people. However, it's not warm and friendly. There is no seat available. The staff is ghosts. They never smile. They don't give us any information. The slightest problem in the station and you are lost. Sometimes there is no digital display. Sometimes there is information, but it's very rare. Last-minute platform changes. Yes, this happens to you very often.

So how do you go about planning things? Get organized? What about our plans?

Of course, now there are some improvements. You have taken into account some of my requests. For example, you have put in a footbridge. Now, there is also a digital display on the trains, which is very practical. We know when we are supposed to arrive and what the various stops are.

Unfortunately, this is not enough, and the routine will have taken over our story. I'm sorry to tell you that it's all over now.

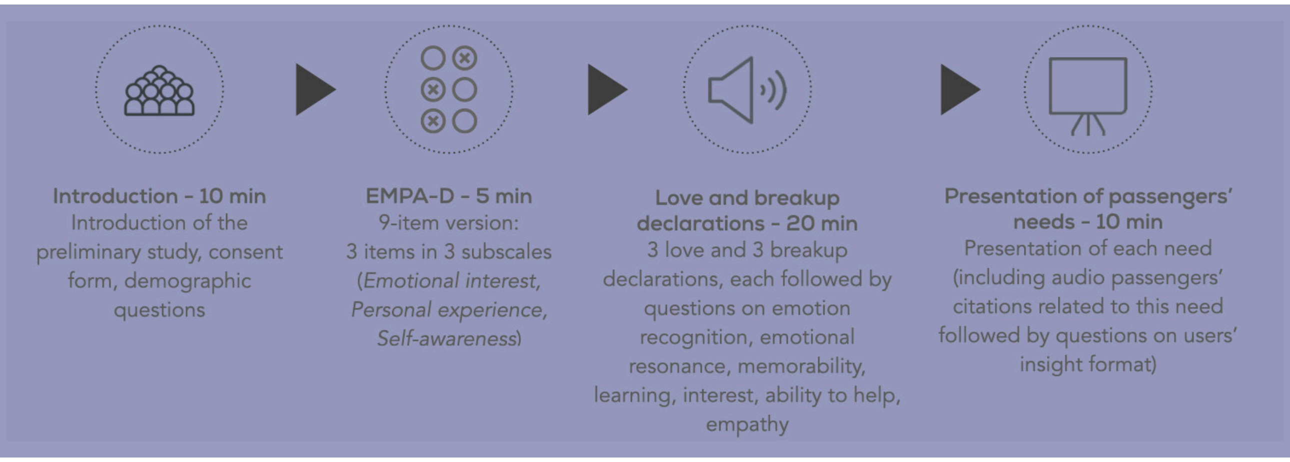
not include them in the study sample. We also excluded 32 answers because of wrong answers to one attention check item (used to ensure employees' attention and filter out low-quality responses). Due to time and technical constraints – we used a familiar questionnaire tool for the employees not ideal for research – each question counts missing answers. We report missing answers per demographic questions in the following description of the general sample.

In our final sample of N = 230 employees (age range 18 to 60, M = 37, SD = 11.17), 135 men, 73 are women, 1 non-binary, and 10 preferred not to answer (11 missing data). All employees have at least a basic understanding of French. 28% use the train regularly vs. 66% using another mode of transportation. 76% declared working in proximity with passengers vs. 24%. The number of years they work for the company ranges from less than one year to 37 (M = 11.17, SD = 8.28) years.

2.2. Procedure

The sessions took place in person at the railway company headquarters office for a week in 2022. Each session lasted around 45 min as part of two hours and a half mandatory sessions about the department's vision and customer satisfaction. Our sessions included four steps (Figure 2).

Figure 2. Four stages of the session



Introduction - 10 min
Introduction of the preliminary study, consent form, demographic questions

EMPA-D - 5 min
9-item version:
3 items in 3 subscales
(*Emotional interest, Personal experience, Self-awareness*)

Love and breakup declarations - 20 min
3 love and 3 breakup declarations, each followed by questions on emotion recognition, emotional resonance, memorability, learning, interest, ability to help, empathy

Presentation of passengers' needs - 10 min
Presentation of each need (including audio passengers' citations related to this need followed by questions on users' insight format)

First, we briefly introduced the preliminary study to collect the passengers' declarations. Then, the employees filled in demographic questions about age, gender, seniority in the company, regular proximity with passengers (Yes/No), and main transportation mode (car vs. train).

Second, we administered the EMPA-D (9-item version) scale (Drouet et al., 2022, 2023a) to measure employees' empathy towards passengers as a baseline. Items were administered randomly to mitigate order biases.

Third, we played back three love and three breakup declarations. To avoid order bias, we played back them in a different order for each session to avoid order bias. L&B declarations alternated. The first one was always a love declaration to keep the audience motivated to listen to customer feedback on the service (the railway company noticed internally that negative customers' criticisms were too deceptive for the employees). Then, we invited the employees to recognize which emotions the passengers expressed in their declaration. Following a few minutes to let the employees answer, we shared the passengers' answers and took stock of what the passengers had commented on in their declaration (Figure 3). Then, we asked the employees to share their emotions while listening to the six declarations. We asked this question only in the first four sessions of time and dynamic constraints. Last, the employees shared the passengers' insights they memorized about passengers' declarations and questions on their perceived learning about passengers, their interest, involvement, and empathy towards passengers (see Table 2).

Fourth, we introduced four passengers' needs to the employees (resulting from the analysis of the passengers' declarations, see Figure 4) and play-backed a compilation of passenger audio illustrating these needs. Then, we surveyed the employees about the user insights format they found relevant (see Table 3).

The University's ethics review panel approved the study, and we obtained employees' and passengers' informed consent.

Figure 3. Example of passengers' emotions selected (including their intensity) after a breakup declaration (P.25)

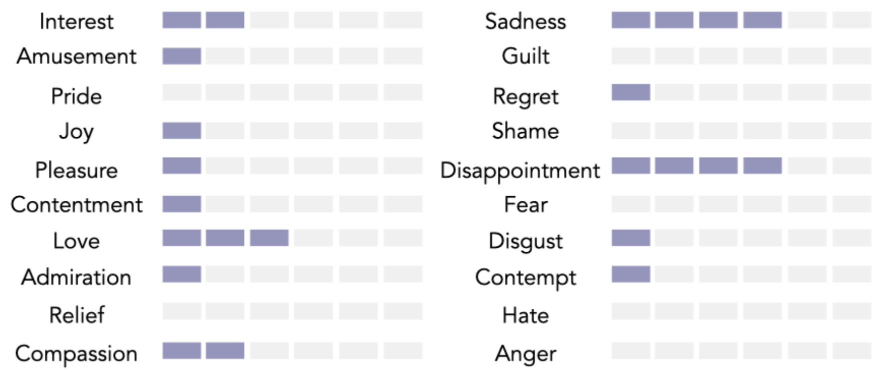
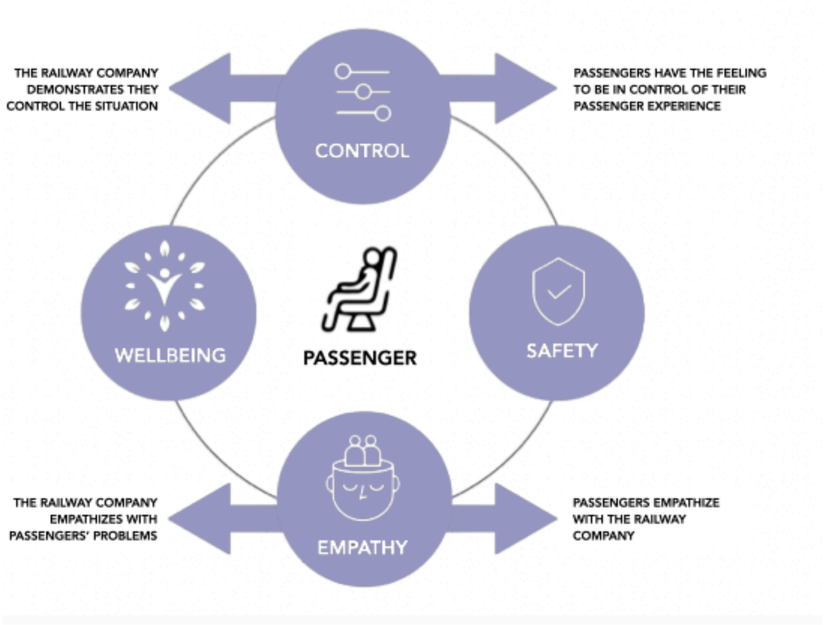


Figure 4. The four passengers' needs are presented based on the preliminary study


THE RAILWAY COMPANY DEMONSTRATES THEY CONTROL THE SITUATION
CONTROL
PASSENGERS HAVE THE FEELING TO BE IN CONTROL OF THEIR PASSENGER EXPERIENCE
WELLBEING
PASSENGER
SAFETY
THE RAILWAY COMPANY EMPATHIZES WITH PASSENGERS' PROBLEMS
EMPATHY
PASSENGERS EMPATHIZE WITH THE RAILWAY COMPANY

2.3. Material

2.3.1. Empathy scale (EMPA-D) 9-item version

Before sharing passengers' declarations, we administered the 9-item EMPA-D scale ((Drouet et al., 2022, 2023a), Cronbach's α = .88, Table 4). EMPA-D measures employees' empathy towards users in the service design context. The scale encompasses three subscales measuring:

- Emotional interest - *"employees imagining how users think and feel, and employees' curiosity about the users, resulting in a willingness to explore and discover the users, their situations and experiences"* ((Drouet et al., 2022, 2023a), Cronbach's α = .88),
- Personal experience - *"resonating with users, and connecting with them on an emotional level, by recalling explicitly upon employees' own memories and experiences in order to reflect and be able to create an understanding"* ((Drouet et al., 2022, 2023a), Cronbach's α = .72), and
- Self-awareness - *"distinguishing between the representations of employees' actions, perceptions, sensations and emotions, and those of users"* ((Drouet et al., 2022, 2023a), Cronbach's α = .75).

Statements are rated on a 7-point scale, from 1 - "Does not describe me at all" to 7 - "Completely describes me."

2.3.2. Emotion recognition

To assess employees' empathic accuracy (Chang-Arana et al., 2020), we asked employees, after listening to each declaration, to recognize the emotions expressed by the passengers (Q1 in Table 2). The list of twenty emotions (and an option to select none) was based on the Geneva Emotion Wheel (Scherer, 2005; UNIGE, 2016) – which was also filled previously by passengers after their declarations. It is thus possible to compare passengers' replies with employees' ones.

2.3.3. Emotional resonance

We asked the employees to select the emotions they felt while listening to the declaration by selecting them from a list of twenty emotions (and an option to select none) based on the Geneva Emotion Wheel (Scherer, 2005; UNIGE, 2016) (Q2 in Table 2).

2.3.4. Memorability of passengers' insights

To assess the memorability of passengers' insights, we asked the employees to freely recall three main ideas shared by the passengers in their declarations (Q3 in Table 2).

2.3.5. Measures of perceived learning, interest, ability to help, and empathy

Adapted from Sleeswijk Visser and Kouprie (2008), we asked the employees to rate on a 7-point scale their level of learning about passengers (Q4 in Table 2), interest in passengers (Q5), ability to help improve the passenger experience (Q6), and empathy towards passengers (Q7).

2.3.6. Ranking of user insights formats

To assess the most relevant user insights format to trigger empathy, we then asked the employees to rank which of four formats (customers' complaints, customer satisfaction statistics, love declaration, and breakup declaration) was triggering the most employees' perceived interest in passengers (Q8 in Table 3), ability to help improve the passenger experience (Q9), and empathy towards passengers (Q10).

Table 2. Questions about the L&B declarations

Id.	Questions
After each declaration: emotional recognition (multiple choice from a list of 20 emotions with a none emotion option)	
Q1	What emotions does the passenger express? Choose the corresponding emotions from the list. *(repeated after each audio declaration, six times in total)*
After the six declarations: emotional resonance (multiple choice from a list of 20 emotions with a none emotion option)	
Q2	What emotions did you feel when hearing these six declarations? Choose the corresponding emotions from the list.
Memorability (open text field)	
Q3	Cite three main ideas shared by passengers that you remember from listening to these declarations. This could be a word, a phrase, or an anecdote.
Measures of perceived learning, interest, ability to help, and empathy (7-point Likert scale)	
	On a scale of 1 to 7, how would you rate…
Q4	…that these declarations taught you anything about passengers? (1 - "Nothing," 7 - "A lot")
Q5	…your interest in these passengers' declarations? (1 - "No interest," 7 - "High interest")
Q6	…your ability to help improve the experience of these passengers? (1 - "No ability," 7 - "Strong ability")
Q7	…your level of empathy* for these passengers? (1 - "No empathy," 7 - "High empathy") **empathy = putting yourself in the other person's shoes*

Table 3. Ranking of user insights format impacting employees' perceived interest in passengers, ability to help improve the passenger experience and empathy towards passengers

Id.	Questions
Q8	What type of customer feedback about the passenger experience interests you the most?
Q9	What type of customer feedback about the passenger experience makes you feel you can help improve the passenger experience?
Q10	What type of customer feedback about the passenger experience makes you more empathic?

2.4. Data Analysis

We carried out the statistical analysis with SPSS version 27. Each question had missing answers; we thus report the sample per results. We ran univariate statistics to examine each item and question means and standard deviations (in descriptive results). We checked the possible outliers and entry errors and did not find outliers and entry errors. For brevity and following APA norms, detailed statistics in tables are not repeated in the text. We use scale acronyms and question codes for the result description.

We computed a percentage of emotion recognition and a percentage of emotional resonance to investigate how the employees succeed in recognizing passengers' emotions and how their emotions resonate with those of passengers. We based these percentages only on the most intense emotions selected by the passengers in their declaration (L1: 4 emotions, B1: 3 emotions, L2: 4 emotions, B2: 3 emotions, L3: 5 emotions, B3: 1 emotion). The passengers defined this intensity with the Geneva Emotion Wheel (Scherer, 2005; UNIGE, 2016) after making their declarations.

3. Results

3.1. Descriptive statistics

3.1.1. EMPA-D scale

The reliability estimates suggest that EMPA-D and its subscales have good or acceptable levels of internal consistency in the current sample (n = 227, Table 4). On average, employees have an EMPA-D score of 5 out of 7 (Min = 1, Max = 6.89, SD = 0.98). The dimension rated as the highest is *Self-awareness* (Min = 1, Max = 7, M = 5.22, SD = 1.12), the lowest is *Personal Experience* (Min = 1, Max = 1, M = 4.71, SD = 1.10).

Table 4. Descriptive statistics and alpha reliabilities of EMPA-D subscales (EI, PE, SA), n = 227

Scale	Nb items	Min - Max	M	SD	α
EMPA-D *Emotional interest* (EI)	3	1 - 7	5.05	1.30	.88
EMPA-D *Personal experience* (PE)	3	1 - 7	4.71	1.10	.72
EMPA-D *Self-awareness* (SA)	3	1 - 7	5.22	1.12	.75
EMPA-D Total	9	1 - 6.89	5	0.98	.88

3.1.2. Emotional recognition and emotional resonance

On average, the employees selected fewer emotions (M = 4.84, SD = 2.10) than the passengers (M = 11.83, SD = 1.60, Table 5). Overall, our participants recognized slightly more than half of the emotions (53%) expressed by the passengers, with a higher percentage for breakup declarations (58%) than love declarations (48%).

Table 5. Descriptive statistics of the employees' emotional recognition (Q1)

		Nb of emotions selected by the passenger	Nb of emotions selected by the employees	% emotional recognition by the employees				
Id. of declaration	n		Min - Max	M	SD	Min - Max	M	SD
Love declarations								
L1	220	10	1-10	4.75	2.70	0 - 100	47	34
L2	220	12	1-10	4.30	2.51	0 - 100	52	34
L3	222	12	1-12	4.40	2.95	0 - 100	46	32
Total Love	228		1-10.5	4.45	2.03	0 - 100	48	23
Breakup declarations								
B1	221	10	1-16	5.09	2.88	0 - 100	61	34
B2	218	13	1-20	5.14	3.08	0 - 100	43	28
B3	216	14	1-14	5.21	2.56	0 - 100	71	46
Total Breakup	226		1-11	5.12	2.37	0 - 100	58	27
Total declarations	229		1-9.67	4.84	2.10	0 - 95	53	23

When listening to the declarations, employees' emotions have little resonance with passengers' emotions with M = 10% (SD = 18%) overlap on average (Table 6). There was no significant correlation between emotional recognition and resonance (r = .127, *p* = .055).

We next investigated correlations between emotional recognition and emotional resonance scores and the other measures indicators of empathy (employees' perceived learning about, their interest in passengers, their ability to help improve passenger experience and empathy towards passengers after listening to the declarations). We found very weak significant correlations between emotional recognition and employees' interest, r = .199, *p* = .004, employees' empathy (Q7), r = .185, *p* = .006, and ability to help, r = .169, *p* = .012. We found no evidence of correlations between emotional resonance scores and these four measures indicators of empathy.

Table 6. Descriptive statistics of the employees' emotional resonance with passengers' emotions (Q2)

		Nb of emotions selected by the employees			% emotional resonance by the employees		
Id. of declaration	n	Min - Max	M	SD	Min - Max	M	SD
Love declarations							
L1	83	1 - 7	2.46	1.83	0 - 100	10	21
L2	80	1 - 8	2.89	2.11	0 - 100	13	25
L3	81	1 - 11	2.95	2.55	0 - 100	9	20
Total Love	84	1 - 7.33	2.81	1.90	0 - 93	11	19
Breakup declarations							
B1	79	1 - 10	2.29	1.86	0 - 100	10	22
B2	79	1 - 10	2.48	1.90	0 - 100	7	18
B3	81	1 - 9	2.07	1.64	0 - 100	12	32
Total Breakup	84	1 - 8.67	2.28	1.55	0 - 89	9	20
Total declarations	84	1 - 7.67	2.54	1.60	- 77	10	18

3.1.3. Measures of perceived learning, interest, ability to help, and empathy

Employees' ratings related to the employees' perceived learning about, interest in passengers, and their ability to help improve the passenger experience are all mainly neutral, with medians and modes between 4 and 5. Employees felt less like they were learning about the passengers while listening to the declarations (M = 3.36, SD = 1.57) than they felt able to help (M = 4.27, SD = 1.53), interested (M = 4.47, SD = 1.52) or empathic (M = 4.69, SD = 1.64, Table 7).

We found moderate point-biserial correlations between these different measures indicators of empathy. The stronger correlations are between the employees' interest and their ability to help, r = .582, *p* = <.001, and their empathy, r = .656, *p* = <.001. The lowest correlation is between the employees' perceived learning and empathy, r = .357, *p* = <.001.

Table 7. Descriptive statistics of the employees' perceived learning, interest, ability to help, and empathy (Q4 - 7)

Employees' perceived…	n	Min - Max	M	SD
learning	217	1 - 7	3.36	1.57
interest	209	1 - 7	4.47	1.52
ability to help	221	1 - 7	4.27	1.53
empathy	223	1 - 7	4.69	1.64

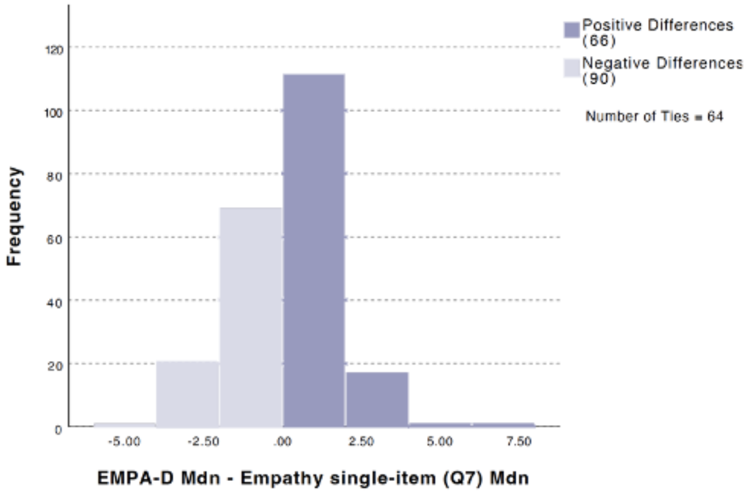
3.2. How do employees' empathy change after listening to L&B declarations?

We ran a Wilcoxon signed-rank test (adapted to our related sample) to compare the medians between the initial measure of empathy (EMPA-D scale) and the post-declaration measure of empathy (Q7). This test allowed to determine the effect of listening to the passengers' declarations on employees' empathy levels (Table 8 and Figure 5). The difference scores were approximately symmetrically distributed, as assessed by a histogram with a superimposed normal curve (Figure 5). Listening to passengers' declarations elicited a decrease in empathy in 90 employees (out of 220 employees), whereas 66 employees saw an empathy improvement. The empathy level did not change for 64 employees. There is a statistically significant decrease in empathy level (Mdn = 1.11) between the first (Mdn = 5) and the second measure of empathy (Mdn = 4.69), z = -2.49, *p* = .013.

Table 8. Median values and Wilcoxon Signed Rank test summary - EMPA-D and post-declaration measure of empathy (Q7)

	n	Mdn	z	*p* asymp. sig.
EMPA-D	227	5		
Empathy post-declaration measure (Q7)	223	4.69		
Empathy level difference	220	1.11		
Related-Samples (EMPA-D and Q7)	220		-2.49	.013

Figure 5. Related-Samples Wilcoxon Signed Rank test



3.3. What did employees memorize from the L&B declarations?

We conducted a thematic analysis (Braun and Clarke, 2019) on the passengers' insights memorized by 61% of employees (n = 141) from the passengers' declarations, resulting in six themes: (a) remarks related to the service (e.g., delays, the staff smiling, improvements noticed), (b) emotions shared by the passengers (e.g., "compassion"), (c) passengers' comments about the service satisfaction, (d) expressions related to love or breakups (e.g., "I love you"), (e) company-oriented remarks (e.g., interpretation of passengers' declarations: "the customers are still positive"), and (f) explicit absence of response (e.g., "nothing"). Figure 6 presents the frequencies of the main categories of ideas shared by the employees after listening to the six declarations.

Employees mainly memorized remarks related to the service, with 64% of the employees mentioning at least one of these. 41% of employees mentioned at least one answer related to passengers' emotions. More answers related to positive emotions (n = 48, e.g., "proud, relief, joy," "interest, joy, grateful") rather than negative ones (n = 35, e.g., "deception, sadness"). Some employees recalled both positive and negative emotions (n = 25, e.g., "compassion, sadness," "anger, compassion").

To a lesser extent, 15% of employees mentioned passengers' insights related to the vocabulary of love or breakup declarations. Some shared both expressions simultaneously (e.g., "I love you CFL, I leave you"), others only love or only breakup expressions. Three employees recalled the notion of love relationships shared by the passengers (e.g., "We're like an old couple").

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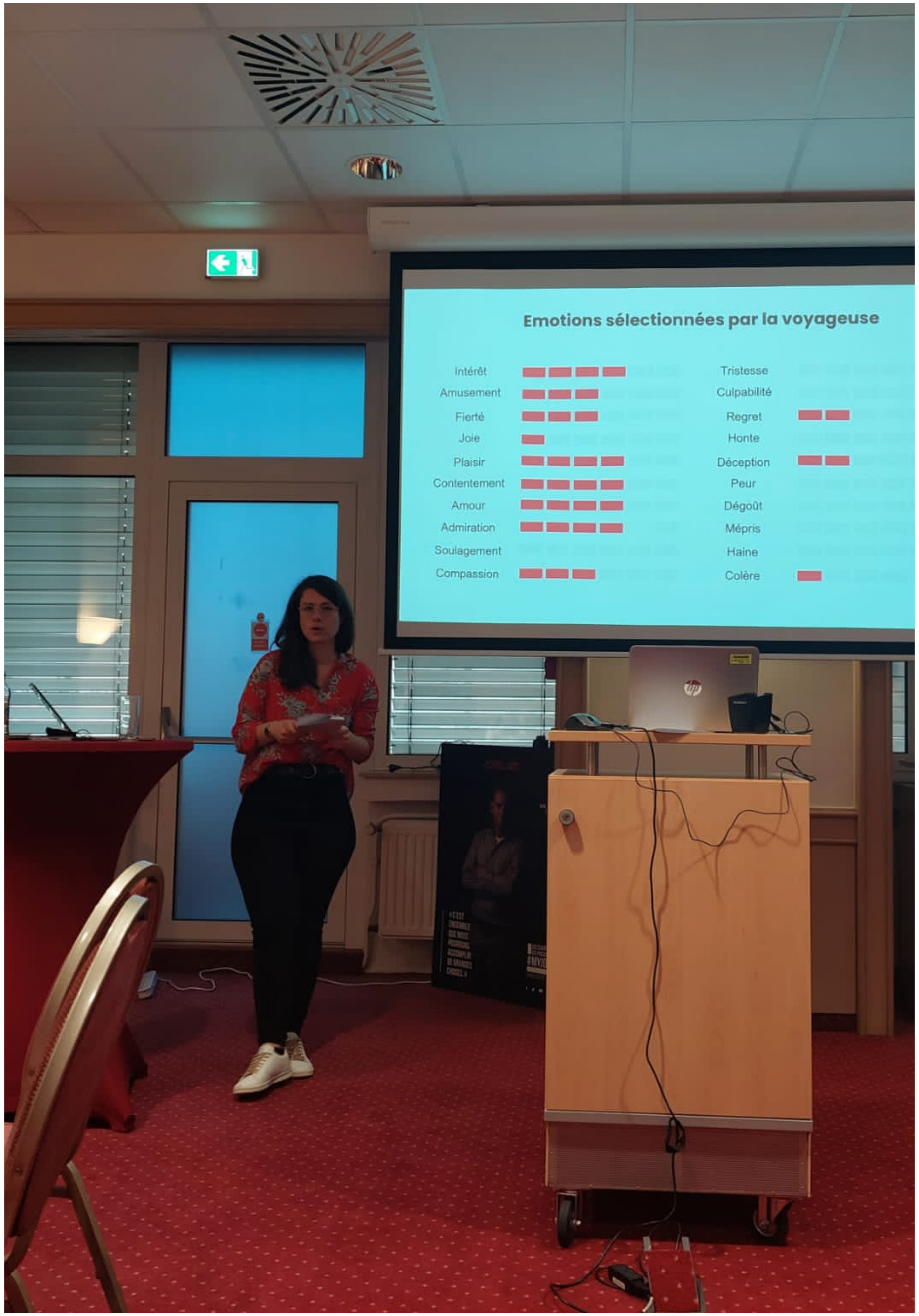
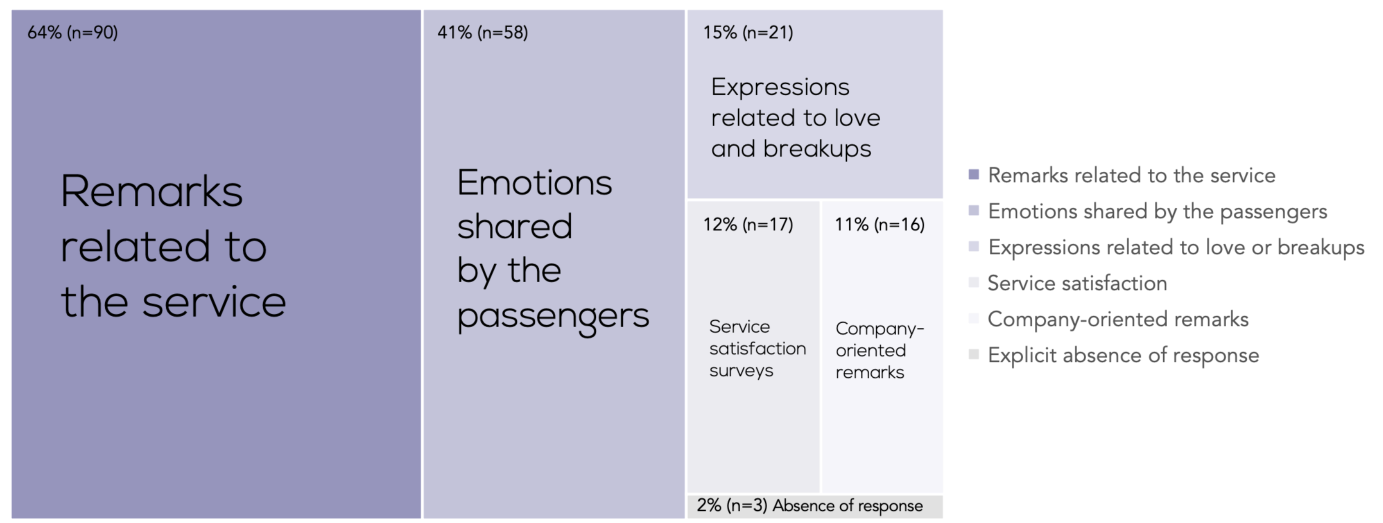

Emotions sélectionnées par la voyageuse
Intérêt
Amusement
Fierté
Joie
Plaisir
Contentement
Amour
Admiration
Soulagement
Compassion
Tristesse
Culpabilité
Regret
Honte
Déception
Peur
Dégoût
Mépris
Haine
Colère

Figure 6. Themes of passengers' insights memorized by the employees (n = 141, Q3)



3.4. Which format of user insights did employees prefer to empathize with users?

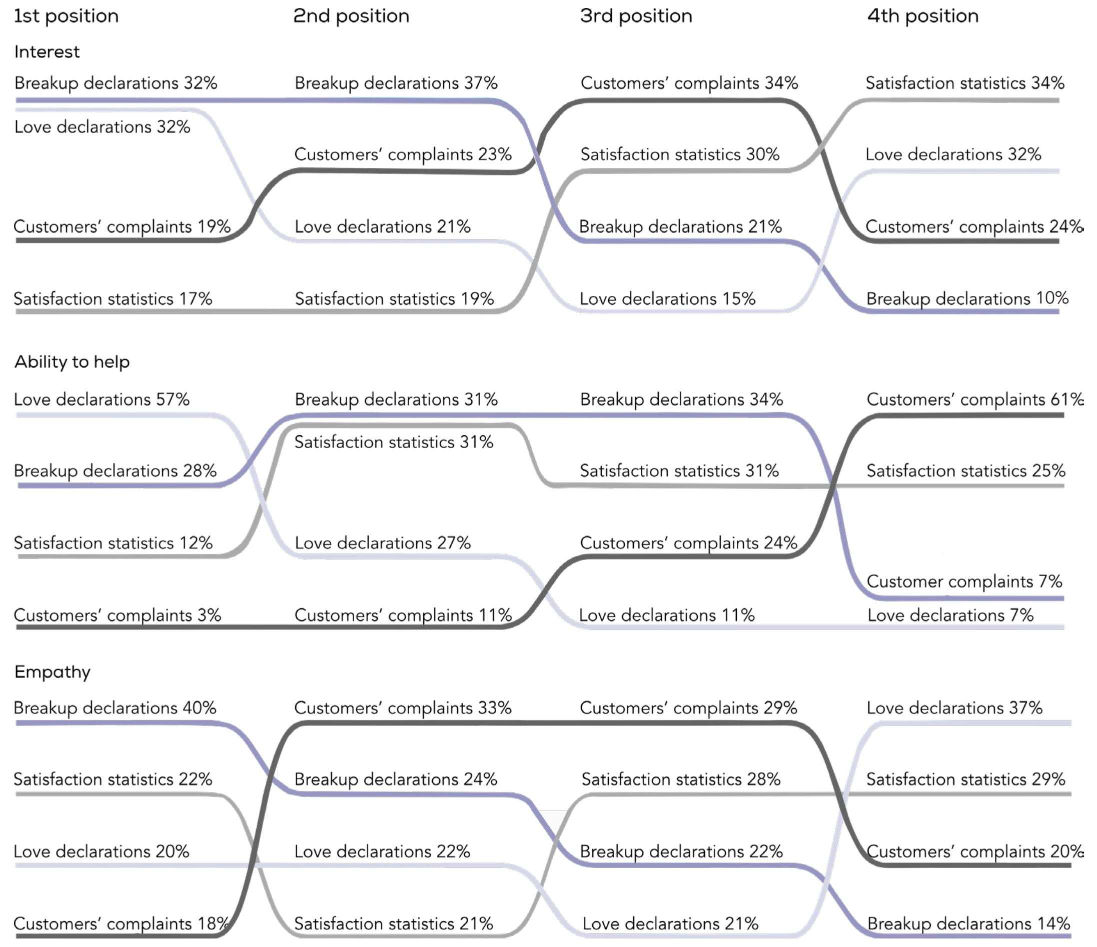
We asked employees to rank four types of user insights, according to the following criteria: which ones they found the most interesting, which ones make them feel they can help improve the passenger experience, and which ones make them more empathic (Figure 7).

Regarding interest, 64% of employees ranked the passengers' declarations (ex-acquo between love and breakup) as the user insights that interest them the most. The interest in love declarations is ambivalent as it is both ranked by 32% of respondents as the format triggering the most interest and ranked by 32% of respondents as the format triggering the least interest. Breakup declarations are mostly ranked first and second place (32% and 37% respectively), which seem to emphasize their potential to trigger interest from the employees.

When asked what form of user insights makes them feel they can help improve the passenger experience, employees surprisingly rated customers' complaints as one of the least useful, often ranked last (61%) from the four formats suggested. Unlike customers' complaints, love declarations motivate employees to help passengers and were ranked first in 57% of cases.

Finally, 40% of employees ranked the breakup declarations in the 1st position to trigger their empathy, as opposed to the love declarations which were mainly ranked last, in the 4th position in 37% of cases. Customers' complaints are often ranked in the second position (33%), which could reflect that negative feedback is perceived as having more power to trigger empathy than positive feedback.

Figure 7. Ranking the user insights formats for interest, ability to help, and empathy



3.5. What individual factors influence employees' empathy when listening to L&B declarations?

Following prior literature in service research and user-centered design (Surma-aho et al., 2019; Li and Hölttä-Otto, 2022), we investigate the influence of three main individual factors on the various measures indicators of empathy collected: the employees' level of seniority inside the company, their personal experience as users of the service (train passengers) and their regular proximity with passengers as part of their job missions.

3.5.1. Influence of employees' seniority inside the company

We first ran a point-biserial correlation to explore the relationships between the employees' seniority and all our measures of empathy (Table 9). Apart from a very weak correlation between employees' seniority and the emotional resonance with the love declarations (r = .199, *p* = .003), no significant relation between seniority and the other measures of empathy were found in our sample.

Table 9. Point-biserial correlations between employees' seniority emotional recognition and resonance, and other measures indicators of empathy

	Employees' seniority (n = 228)	Sig.
EMPA-D Total	.055	.409
Emotional recognition Total	-.116	.080
Emotional recognition Love	-.106	.112
Emotional recognition Breakup	-.107	.107
Emotional resonance Total	.120	.070
Emotional resonance Love	.199**	.003
Emotional resonance Breakup	.028	.670
Learning	-.041	.548
Interest	.091	.191
Ability to help	-.054	.427
Empathy	.013	.850

3.5.2. Influence of employees' personal experience as a train passenger

We run independent samples T-tests to investigate the differences between the employees' using the train regularly and those not using it (dichotomous variable) on the scores of emotional recognition and resonance, and the other measures indicators of empathy. If at the descriptive level, the emotional resonance seems slightly higher for the employees using the train (M = 13%, SD = 21%) than for those not using the train (M = 9%, SD = 18%, Table 10), we did not find significant differences between the two groups of employees for the emotional recognition.

We found a significant difference between employees using the train and those not using the train on the employees' interest in passengers and empathy rating. Employees using the train had significantly higher scores of interest (M = 4.90, SD = 1.45, Table 11) than those not using this mode of transportation regularly (M = 4.35, SD = 1.54), *t*(96) = 2.30, *p* = .023. Similarly, they had significantly higher scores of empathy (M = 5.10) than the other employees (M = 4.54), *t*(204) = 2.224, *p* = .027. We, however, did not find significant differences between the two groups on the perception that employees have learned things about the passengers or their perceived ability to help improve the passenger experience.

Table 10. Independent samples T-tests between train use and employees' emotional recognition and resonance, and other measures indicators of empathy

		Descriptive statistics			T-test			
		n	M	SD	*t*	df	Sig. (2-tailed)	Mean difference
Emotional recognition	Train	60	53	24	-0.09	211	.930	-.31
	Other transport	153	54	22				
Emotional resonance	Train	60	13	21	1.30	95.65	.198	3.9
	Other transport	153	9	18				
Learning	Train	59	3.93	1.55	1.74	199	.083	.42
	Other transport	142	3.51	1.55				
Interest	Train	52	4.90	1.45	2.30	96.24	.023	.55
	Other transport	141	4.35	1.54				
Ability to help	Train	58	4.47	1.70	0.91	203	.366	.21
	Other transport	147	4.25	1.45				
Empathy	Train	59	5.10	1.47	2.22	204	.027	.56
	Other transport	147	4.54	1.69				

Table 11. Descriptive statistics of emotional recognition and resonance scores depending on train use and proximity with passengers

	% emotional recognition			% emotional resonance			% emotional recognition			% emotional resonance		
	Min - Max	M	SD	Min - Max	M	SD	Min - Max	M	SD	Min - Max	M	SD
n = 213												
Love	0 - 100	49	24	0 - 77	14	21	0 - 100	48	23	0 - 93	10	19
Breakup	0 - 100	58	28	0 - 78	12	23	0 - 100	59	26	0 - 89	9	20
All declarations	0 - 95	53	24	0 - 75	13	21	3 - 95	54	22	0 - 77	9	18
n = 209												
Love	0 - 100	49	23	0 - 72	9	13	0 - 87	46	22	0 - 77	15	21
Breakup	0 - 100	60	26	0 - 89	9	20	0 - 100	55	30	0 - 67	14	24
All declarations	3 - 95	54	22	0 - 77	9	17	0 - 88	50	24	0 - 72	14	22

3.5.3. Influence of employees' proximity with passengers

We run independent samples T-tests to investigate the differences between the employees working in proximity with passengers and those whose jobs do not involve contact with passengers, on the scores of emotional recognition and resonance, and the other measures indicators of empathy.

At the descriptive level, employees in regular contact with passengers got slightly higher percentages of emotional recognition on average (M = 54%, SD = 22%, Table 12) than employees with no proximity to passengers (M = 50%, SD = 24%). Employees' emotional resonance seems to follow an opposite trend at the descriptive level and is slightly higher for those not working in proximity with passengers (M = 14%, SD = 22%) vs. working in proximity with passengers (M = 9%, SD = 17%). Regarding the employees' proximity with passengers, we did not find significant differences between the two groups of employees and any of the variables of interest, namely emotional recognition, emotional resonance, employees' interest, learning about passengers, perceived ability to help, or empathy after listening to the declarations.

Table 12. Independent samples T-tests between proximity with passengers and employees' emotional recognition and resonance, and self-reported measures of empathy.

		Descriptives statistics			T-test			
		N	M	SD	*t*	df	Sig. (2-tailed)	Mean difference
Emotional recognition	Proximity	158	54	22	1	80.94	.304	3.77
	No proximity	51	50	24				
Emotional resonance	Proximity	158	9	17	-1.68	71.61	.098	-5.54
	No proximity	51	14	22				
Learning	Proximity	150	3.61	1.51	–.56	68.23	.580	-.16
	No proximity	47	3.77	1.77				
Interest	Proximity	147	4.37	1.45	-1.73	61.80	.089	-.49
	No proximity	43	4.86	1.67				
Ability to help	Proximity	153	4.28	1.51	.34	71.02	.736	.09
	No proximity	48	4.19	1.72				
Empathy	Proximity	154	4.60	1.63	-1.41	201	.161	-.38
	No proximity	49	4.98	1.63				

3.5.4. Influence of initial EMPA-D score

We investigated the influence of the initial EMPA-D score on the scores of emotional recognition and resonance, and the other measures indicators of empathy by running point-biserial correlations and linear regressions to investigate the model prediction of EMPA-D score with other variables of interest.

First, we found very weak point-biserial correlations between EMPA-D and emotional recognition, r = .153, *p* = .021 or emotional resonance, r = .274, *p* = <.001. We run a linear regression to investigate the model prediction of EMPA-D score with employees' emotional recognition and emotional resonance scores. Employees' EMPA-D initial score accounted for 2.3% of explained variability of employees' emotional recognition, *F*(1, 223) = 5.41, *p* = .021. It accounted for 7.5% of explained variability of employees' emotional resonance *F*(1, 225) = 18.29, *p* = <.001, (-15.27 + 5.10).

We found weak to moderate correlations between EMPA-D and employees' learning, r = .413, *p* = <.001, employees' interest, r = .555, *p* = <.001, ability to help, r = .388, *p* = <.001, and post-declaration measure of empathy (Q7), r = .379, *p* = <.001. Looking at the subdimensions of EMPA-D, we also found correlations with all the other measures indicators of empathy (see Appendix A).

Regarding the simple linear regressions:

- EMPA-D score accounted for 17.1% of explained variability of employees' learning, *F*(1, 212) = 43.66, *p* = <.001. The fitted regression model was: predicted employees' learning = .339 + .665(EMPA-D score).
- EMPA-D score accounted for 30.8% of explained variability of employees' interest, *F*(1, 204) = 90.92, *p* = <.001. The fitted regression model was: predicted employees' interest = .214 + .862(EMPA-D score).
- EMPA-D score accounted for 15% of explained variability of employees' ability to help improve the passenger experience, *F*(1, 216) = 38.26, *p* = <.001. The fitted regression model was: predicted employees' ability to help = 1.22 + .614(EMPA-D score).
- EMPA-D total score accounted for 14.4% of explained variability of employees' empathy after listening to the declarations, *F*(1, 218) = 36.60, *p* = <.001. The fitted regression model was: predicted employees' empathy = 1.522 + .639(EMPA-D score).

4. Discussion

In this paper, we studied the audio playback of six L&B declarations to trigger service employees' empathy towards users. Among storytelling techniques, we choose the love and breakup method as part of the design probes to spark a dialogic process with users (Mattelmäki and Battarbee, 2002). Unlike immersive or collaborative methods - which are often costly - love and breakup declarations are cheaper to deploy at an organizational level. They vehicle emotional and engaging user stories (Gerber et al., 2011; Laughey et al., 2020; Su et al., 2017). The components of the method also correspond to Koskinen et al. (2003)'s criteria for empathic methods: user-centered, cheap and low-tech, tangible (sound), playful, and fun.

We quantitatively assessed employees' empathy and investigated other measures indicators of empathy (emotional recognition and resonance, employees' perceived learning, interest, and ability to help). We also explored passengers' insights memorized by the employees. Furthermore, we investigated which format of user insights the employees perceived as most relevant between the declarations and traditional marketing ones (i.e., customers' complaints and satisfaction statistics). Last, we explored the employees' individual and contextual factors influencing empathy.

First, we discuss the tendency for decreased empathy observed and the factors that might explain it. Then, we discuss the impact of the love and breakup method on employees' empathy.

Prior work on empathic design describes design probes techniques supporting empathy in design such as the love and breakup method (Mattelmäki and Battarbee, 2002; Koskinen et al., 2003). These are rather documented in a generic and positivist way, with no much elaboration on what mechanisms trigger empathy nor in which contexts. In the present study, we observed a quantitative decrease in empathy for most employees after listening to the passengers' declarations. We even observed that passengers' breakup declarations generated some revolting comments among a few employees (e.g., "this is stupid", "seriously?"). These reactions might hint at a potential counterproductive effect of using L&B declarations to trigger empathy. This decrease however is not so surprising, as it echoes previous studies in engineering about empathy education programs (Alzayed et al., 2021; Lunn and Bell-Huff, 2022). Why would listening to users' declarations decrease service employees' empathy? We discuss multiple factors that can explain this decrease.

4.1. The influence of the study context

First, the user experience maturity context (Chapman and Plewes, 2014) of the employees and the railway company was low. Our empathic design intervention was the first conducted within this company and at a large scale. Most employees encountered creative users' insights like the L&B declarations for the first time, and were equally unfamiliar with the fact of reflecting on passengers' emotions. Overall, the railway sector is not used to qualitative passenger insights (Drouet et al. 2023b; Ross et al., 2020). Few researchers investigated passenger experience through emotional prisms (Kurup et al., 2016; Thompson et al., 2012; van Hagen and de Bruyn, 2015); most of the transportation research being based on quantitative metrics from satisfaction surveys (e.g., Azmi et al., 2018; dell'Olio et al., 2018) or passenger behaviors metrics (e.g., Foell et al., 2013; Zheng et al., 2023b). The staff is thus more used to hear about passengers' satisfaction or dissatisfaction through self-reported surveys than to get the "why" behind passengers' ratings. We can hypothesize that initial empathic interventions in low-maturity contexts do not produce immediate observable results and that the percentage of employees who showed an increase in empathy (43%) is rather promising. Our observations might echo Penin (2018)'s description of emotional labor as often not being compensated enough in service jobs. In this case, asking employees to empathize with users when they do not feel listened to themselves is a challenging endeavor. Empathic interventions such as the one described in our case study should be seen as the first step in a long-term project. Applying empathic methods within an organization would require setting up an open mindset (Sanders and Stappers, 2008), staging the activities, communicating the value of empathic understanding (Postma et al., 2012), and managing stakeholders' expectations (Manrique et al., 2018) (e.g., professional learnings (Walther et al., 2020)). Confidence in the approach and those involved is also necessary for the stakeholders to adopt an empathic understanding. This is built up over time and through the recurrence of interventions. Deploying empathic interventions in smaller groups (Postma et al., 2012) could have increased the adoption of the declarations. For instance, the Smart Design agency, which invented the L&B method, asked the authors of the declarations to read them in groups, leading to a discussion about the shared user experiences and inspiring the designers.

Other factors might also explain the decreased empathy observed, for instance the nature of the user insights format. Indeed, raw data is less intelligible for stakeholders without a researcher background (Manrique et al., 2018; Postma et al., 2012). The transferability of what is listening to solutions requires researcher skills. Finally, the setup of the activity might also have played a role in the decrease. After each emotional recognition exercise, we shared which emotions the passengers had felt. When their answers did not correspond to those of the passengers, the employees might have perceived themselves as less empathic than before the empathic intervention.

4.2. The role of individual factors

While contextual and organizational factors may explain employees' decrease in empathy, it is useful to investigate the role of individual factors. The correlation between our measures of employees' interest, ability to help, and empathy (post-declaration measure, Q7) might suggest that employees who are interested in the problems shared by the passengers, show more empathy and desire to improve the service experience. This resonates with the mechanism described in empathy frameworks in design (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019). Designers first develop an interest in users to step into the users' world (Kouprie and Sleeswijk Visser, 2009).

Furthermore, the influence of employees' initial empathy level on interest or ability to help aligns with previous empirical work (e.g., Sleeswijk Visser and Kouprie, 2008; Drouet et al., 2023a) showing that initial empathy towards users impact the employees' motivation to take action to enhance the service experience.

The personal experience of employees as service users influenced the interest and empathy rating after listening to the declarations. These findings echo Smeenk et al. (2019)'s description of the personal experience stage of their empathy in design framework - *"connecting to own experiences and feelings"* and as a factor in fostering empathy. In the literature on generative tools literature, emotional techniques often elicit memories and have users reflect on their experiences with products and services (Sanders and Stappers, 2012). This might explain why personal experience influences the employees' empathy Drouet et al. (2023a). This also resonates with the connection stage described by Kouprie and Sleeswijk Visser (2009): *"resonating with the user, achieve emotional resonance and find meaning."*

Contrary to previous work (e.g., Hess et al., 2017; Walther et al., 2020) on seniority and empathy, we did not find a link between employees' seniority and their empathy. Hess et al. (2017) found that experienced engineers value empathy and care better, while novices tend to make assumptions about users (Walther et al., 2020). However, these previous studies investigated seniority in terms of professional experience when we collected seniority within the organization. Similarly, while previous research demonstrated the positive impact of direct contact with users on empathy (Kouprie and Sleeswijk Visser, 2009; van Rijn et al., 2011), we did not find an influence of regular proximity with passengers on employees' empathy.

4.3. Reflections about the use of the love and breakup declarations method in service design

Based on previous literature about the L&B method (Gerber, 2011; Laughey et al., 2020; Su et al., 2017), we assumed that L&B declarations would trigger employees' emotions and empathy. Gerber et al. (2011) argue that love and breakup letters techniques are emotional and engaging users' insights. Indeed, we observed through the memorization exercise that employees best memorized passengers' emotions (41% of the memorized passengers' insights - with a better score for positive emotions) and concrete remarks about the service (64%).

Employees' emotions resonated only a little with passengers. Unlike designers who are personally engaged through the empathic design process (Koskinen et al., 2003, Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019), we could postulate that employees have limited use of affective empathy. This difference between designers' and stakeholders' empathic behaviors is not necessarily problematic, as the goal of such an approach is not to turn stakeholders into designers. Triggering state empathy is enough to support an empathic approach within an organization. Furthermore, the little emotional resonance could also be understood as a positive result. Indeed, anger emotions inhibit state empathy activation and develop barriers to recognizing and adopting others' points of view (Shen, 2010, 2011). For instance, if the employees resonated too strongly with breakup declarations, it would have reduced their ability to empathize with passengers.

When comparing the declarations with traditional marketing formats of user insights (i.e., satisfaction statistics and customers' complaints), our employees perceived the love declarations as better supporting their ability to help improve passenger experience. The love declarations perhaps share smaller issues to fix and a generally positive attitude that motivates employees' prosocial behaviors. Love letter writers use hyperboles to express polite negative feedback to point readers' attention to what matters (Altikriti, 2016). Love declarations could also be more audible for the employees than breakup declarations echoing the company's internal observation that complaints demotivate employees. Nevertheless, the breakup declarations triggered most employees' empathy, contrary to the love declarations. People who love the service might be perceived as less in need because they are already happy.

Overall the L&B declarations are perceived by employees as the most interesting user insights amongst the proposed choices. Interestingly, 15% of memorable passengers' insights cited by our employees directly quotes love and breakup expressions used by the passengers. This is perhaps due to the method's novelty or likeliness to entail personal anecdotes. The playfulness of user insights is one of the nine qualities (e.g., inspiring, memorable, experiential) supporting the actionability of design research (Rutkowska et al., 2020).

Although we did not observe an increase in empathy for all employees, the L&B declarations became a strong symbol of user experience value within the company. Following the study, managers have reused users' declarations during internal training sessions and meetings to support a user-centric approach when making decisions about the future of the service. It echoes the transformative power of techniques to convey user insights described by Rutkowska et al. (2020)

5. Limitations and future work

Our work involves several limitations. The participation of employees in our study was mandatory; consequently, our results are subject to selection, non-response, and social desirability biases (Krumpal, 2013). Moreover, the study occurred in the company's headquarters building, with heterogeneous profiles mixing managers and employees, which might also lead to social desirability. To counteract these, we extensively explained before the session that replying to our questions was not mandatory, the data collected would not be shared with the company, and the answers were anonymized. On the contrary, a large group effect with employees openly demonstrating their skepticism might have biased our findings. The play-backed in smaller groups could have limited this bias. The level of employees' involvement in the topics shared by the passengers in their declarations might also bias the empathy effect of the method: the impact can differ whether a user comments on a topic very related or on the contrary completely unrelated to one's task. According to Sleeswijk Visser and Kouprie (2009) the connection in the project is needed to get empathic.

Furthermore, the study was also conducted in French with some non-native French speaker employees (German and Luxembourgish speakers); the possible misunderstanding of the contents presented might bias the results.

Despite all the field constraints encountered, we hope this work will encourage the research community to study empathy in service design in the real context of organizations. Methods to trigger non-design stakeholders' empathy in end-user experience are under research. More empirical research on that topic would help to define scopes in which other stakeholders can support user-centric approaches and design practitioners' work. On the academic side, it would deepen the understanding of empathy in design and refine models and theories of empathy.

6. Conclusion

In this paper, we studied the potential of L&B declarations to trigger service employees' empathy towards users. We played back to service employees' (N = 230) six passengers' declarations addressed to their railway company. We measured employees' empathy before and after listening to these declarations. We also investigated other indicators of empathy: employees' emotional recognition and resonance, and employees' perceived learning, interest, and ability to help. We also analyzed which passengers' insights were memorized by the employees from the declarations. We compared employees' preference between the L&B user insights format and the traditional marketing insights usually provided to them (i.e., customers' complaints and satisfaction statistics).

Our investigations showed a nuanced impact of the L&B declarations on service employees' empathy. First, we observed a statistically significant decrease in empathy level between the first and the second measure and discussed potential explanations to this phenomenon. Our participants mostly memorized passengers' emotions and their factual remarks on the service. Individual factors such as initial employees' empathy level and personal experience with the service have impacted our results; employees using the train have a significantly higher score of interest and empathy than those not using this mode of transportation regularly. Our employees perceived the love declarations as better supporting their ability to help improve passenger experience than traditional marketing formats of user insights. The breakup declarations triggered most employees' empathy.

This work contributes to answering how to trigger empathy in service design with non-designer stakeholders. Service companies count many other professionals working on service end-user experience. To avoid these profiles to lose sight of users, finding ways of triggering empathy towards users is primordial (Bove, 2019). This prevents silos organizations and communications difficulties between the teams (Stickdorn and Schneider, 2012; Stickdorn et al., 2018).

Acknowledgments

We thank the HCI research team at the University of Luxembourg. We particularly thank Margault Sacré for her statistical analysis and peer review advice. We also thank Etienne Le Bihan for their help with statistics. Thank you to Prof. Himanshu Verma and Francesco Viti for their role in the supervisory committee of this project. We also thank Sophie Lacour, Tom Nickels, and the Luxembourgish Railway Company CFL for supporting this project and all their employees who participated in this study.

Appendix

Appendix A. Point-biserial correlations between empathy measures and self-reported measures of empathy

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. EMPA-D Total (n = 227)	-													
2. EMPA-D EI (n = 227)	.876**	-												
3. EMPA-D PE (n = 227)	.849**	.639**	-											
4. EMPA-D SA (n = 227)	.815**	.542**	.546**	-										
5. Emotional recognition Total (N = 230)	.153*	.112	.155*	.127	-									
6. Emotional recognition Love (N = 230)	.113	.090	.123	.076	.904**	-								
7. Emotional recognition Breakup (N = 230)	.164*	.112	.158*	.151*	.929**	.681**	-							
8. Emotional resonance Total (N = 230)	.274**	.230**	.214**	.253**	.127	.108	.123	-						
9. Emotional resonance Love (N = 230)	.289**	.247**	.225**	.263**	.139*	.135*	.121	.920**	-					
10. Emotional resonance Breakup (N = 230)	.219**	.179**	.173**	.205**	.096	.066	.107	.928**	.708**	-				
11. Learning (n = 217)	.413**	.401**	.367**	.278**	.073	.084	.051	.108	.070	.129	-			
12. Interest (n = 209)	.555**	.617**	.399**	.375**	.199**	.196**	.171*	.074	.067	.071	.497**	-		
13. Ability to help (n = 221)	.388**	.389**	.332**	.258**	.169*	.158*	.150*	.044	.022	.059	.435**	.582**	-	
14. Empathy (n = 223)	.379**	.426**	.312**	.216**	.185**	.152*	.183**	.027	.048	.002	.357**	.656**	423**	-

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Do Co-creation Workshops Trigger Empathy? Unraveling Empathic Attitudes Between Service Employees and Users During Co-creation Workshops

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Submitted for journal publication. **See the updated version once published.**

Keywords: empathic design, service design, co-creation, generative techniques, employees' empathy

Abstract

Co-creation workshops support an empathic understanding between designers and users. It also facilitates the ideation of new solutions to improve user experience. However, few empirical studies investigate whether and how co-creation design methods elicit empathy between stakeholders without design skills (e.g., service employees) and users. We invited railway service employees (n = 15) and passengers (n = 15) to co-create the future of train passenger information. We transcribed their exchanges during the workshop and used thematic analysis to qualitatively assess the employees' empathy towards users. Using the Empathy in Design Scale, we triangulate these insights by measuring the employees' empathy before and after the workshop. We found seven empathic attitudes and three potential empathy barriers during the co-creation sessions. The employees also attached importance to sharing detailed explanations about the service organization. We observed an overall quantitative decrease in employees' empathy. However, these co-creation sessions encourage beliefs in empathy toward passengers. This study furthers knowledge about empathy dynamics in co-creation workshops.

Highlights

- We conducted co-creation workshops with railway service employees and passengers to trigger employees' empathy.
- We assessed employees' empathy through qualitative and thematic analysis of their exchanges with passengers during the co-creation workshops.
- We measures employees' empathy pre- and post-workshop and 4 months later using the Empathy in Design Scale.
- Our thematic analysis highlights seven empathic attitudes and three potential empathy barriers.
- Quantitative findings do not show a significant increase in employees' empathy.

1. Introduction

Co-creation methods support the empathic understanding of users to create new ideas (Akoglu and Dankl, 2021; Lee et al., 2014; Mattelmäki et al., 2014; Sleeswijk Visser and Kouprie, 2008). While co-creation sessions support the development of designers' empathy (Sustar and Mattelmäki, 2017), their relevance and effects on other stakeholders involved in such workshops lack evidence. Getting this evidence is challenging as there is no standardized measure of empathy in the design field. Most of the time, designers' empathy is evaluated through qualitative analysis (e.g., Surma-aho and Hölttä-Otto, 2022; van Rijn et al., 2011) and empathic accuracy techniques (e.g., Chang-Arana et al., 2022). Quantitative assessment of empathy in design is a relatively uncommon practice, often relying on psychological instruments for measurement purposes (e.g., Sleeswijk Visser and Kouprie, 2008).

Considered crucial to delivering quality services and achieving customer satisfaction in service literature (Bove, 2019), empathy supports the understanding of users in the design and the shared vision of user experience with other stakeholders in service design. Empathy is built through the participation of stakeholders and users. This participation is beneficial in the service design process (Holmlid, 2009; Saad-Sulonen et al., 2020), bringing between the stakeholders *"mutual respect for different knowledges, opportunities to learn about the others domain of knowledge and joint negotiation of project goals, tools, and processes"* (Blomberg, 2010). Co-creation sessions bring people together and break silos between teams. It is *"a collaborative platform that engages various people in face-to-face dialogues"* (Lee et al., 2014). It set a space for mutual empathic understanding, simulating users' expression and building a creative mindset. This supports empowering users and employees in decision-making and engaging them in collaboration (Mattelmäki et al., 2014) to shape and deliver user-centered services.

In this study, conducted in a railway service company, we investigate employees' empathic attitudes and behaviors during co-creation sessions with passengers. We unveil how employees interact with passengers and which dimensions of empathy are the most prominent. We qualitatively analyzed the interactions between the employees and passengers and looked for indicators of empathy dimensions, attitudes, and anti-empathic behaviors. We also measured empathy with the EMPA-D scale (Drouet et al., 2022, 2023). This work contributes empirical evidence on employees' empathy attitudes and barriers in co-creation workshops with users in a service design context. It deepens the understanding of empathic method mechanisms to trigger employees' empathy towards users.

1.1. Defining co-creation design

Co-creation practices are most commonly occurring in sessions of workshops exploring possibilities (e.g., sketching and testing) or meeting moments between the core design team and relevant other stakeholders (including users) (Halse and Brandt, 2010). They are temporary creative moments (Mattelmäki et al., 2014). These sessions are usually based on generative techniques (including visual and verbal components) (Sanders, 2000). They focus on making (Koskinen et al., 2003; Sanders and Stappers, 2012), telling, and enacting (Brandt et al., 2012; Sanders and Stappers, 2014) and result in artifacts (collages, mappings, sketches, and pictures). Co-creation can be part of co-design, which is *"the creativity of designers and people not trained in design working together in the design development process"* (Sanders and Stappers, 2008), and from the broader approach of participatory design, which supports a holistic approach to design, including political and social implications (Hansen et al., 2019).

Setting up co-creation sessions involves various human challenges, such as communication issues between the stakeholders (e.g., people with different backgrounds and jargon (Lee et al., 2014)), contradictory expectations (Johnson et al., 2017; Lee et al., 2014), and time constraints hindering motivation (Lee et al., 2014). The unfamiliarity with the approach often leads to insecurity and skepticism (Lee et al., 2014), making it difficult to set up the right mindset and belief in collective activities (Mattelmäki and Sleeswijk Visser, 2011).

However, when all favorable factors come together, co-creation activities build deep and latent knowledge about users (Sleeswijk Visser et al., 2005). The engagement of various profiles is the strong value of co-creation acknowledged by designers taking part in workshops with users (Mattelmäki and Sleeswijk Visser, 2011). Co-creation is a way to bring diverse stakeholders in contact with end-users (Lee et al., 2014) to support an enriching and creative collaboration with various experts. It facilitates identifying the conflicts and developing a mutual understanding for sharing common goals. Visual and tactile components of co-creation activities make employees realize their assumptions and the complexity of their working process.

1.2. Co-creation design to build empathy towards users

Co-creation sessions are designed to build empathy towards users through dialogue and direct interaction (Akoglu and Dankl, 2021; Lee et al., 2014; Mattelmäki et al., 2014; Sleeswijk Visser and Kouprie, 2008; Sleeswijk Visser et al., 2005). Through multiple use cases, Mattelmäki et al. (2011) observed that co-creation workshops create a space where designers or stakeholders listen to and recognize users' expertise. They noted that the outcomes of such practice are more related to a common understanding than to design. Yuan and Dong (2014) observed mutual empathy between designers and users during co-creation workshops. This mutual empathy is reflected by the expression of designers' interest and curiosity, inviting users to share stories. At the same time, the users were satisfied to learn about designers' work.

According to Vink and Oertzen (2018), co-creation generates two manifestations of empathy in design: *I-It* and *I-Thou* relationships. In the first case, the stakeholders in co-creation *« objectify the other »* and stay focused on their assumptions (e.g., assuming knowing and understanding the others), neglecting lived others' experiences. In the second relationship, the stakeholders build on their experience with others' experience. In a *dialogic process*, the stakeholders recognize everyone's unique experience and go beyond the misconception of *us vs. them*. Yuan and Dong (2014) observed three designers' positioning during co-creation workshops: listening (i.e., listening attentively and letting people express themselves), controlling (i.e., leading the direction and process and sometimes ignoring users), and inspiring (i.e., listening with relevant interventions like inquiring).

Co-creation workshops can include various activities, each supporting a different understanding of users. The context mapping facilitates understanding the factors influencing the experience, the challenges and opportunities, or the stakeholders involved (Mattelmäki and Sleeswijk Visser, 2011; Sleeswijk Visser et al., 2005). The emotional toolkits and storyline toolkits elicit memories and stories to get a deep and emotional understanding of others (Sanders and Stappers, 2012; Sanders and Stappers, 2014). The design probes support communication and an in-depth understanding of users' culture and values, when they are revealed during workshops (Mattelmäki and Battarbee, 2002; Sanders and Stappers, 2014; Yuan and Dong, 2014). Design games support equal collaboration, discussion, reflection, and communication between the participants (Branco et al., 2015; Brandt, 2006; Hakio and Mattelmäki, 2011; Mattelmäki and Sleeswijk Visser, 2011; Vaajakallio and Mattelmäki, 2014). Last, role-play activities open the mind to other perspectives in inviting the stakeholders to simulate interactions and play the role of others (Akoglu and Dankl, 2021). Although the co-creation sessions are sometimes mentioned in design literature as supporting empathy towards users, empirical evidence about whether and how co-creation activities are effectively triggering empathy is scarce. Similarly, few studies have attempted to assess this empathy.

1.3. Assessing empathy during workshops and qualitative studies

Prior work mentions the potential of co-creation workshops to support empathy towards users (mostly from designers). However, the impact of co-creation in triggering empathy is still under-researched. How do co-creation workshops elicit empathy? Are there prerequisites for this method to be effective in this regard? Are specific dimensions of empathy impacted more than others? To address these questions, a few empirical studies explored ways to assess empathy in people's interactions during workshops. Qualitative assessment techniques remain the main practice to research designers and stakeholders' empathy. We review some of them to illustrate the empathy indicators researched and share detailed textual examples of empathy expressions as an inspiration source for the design field.

Discourse analysis is the most common technique used to investigate for instance facial or vocal expressions of empathy. Sleeswijk Visser and Kouprie (2008) studied the designer teams' interest, involvement, and inspiration as markers of empathy towards users. They observed specific verbal expressions and appraised the teams' artifacts. They regularly combined their empathy assessment with ad hoc scales during ideation workshops. Before the workshops, they also measured empathy with the Empathy Quotient questionnaire (Baron-Cohen and Wheelwright, 2004). Sleeswijk Visser and Kouprie (2008) observe that the empathic design teams often refer to the users and themselves; they share more personal stories and are more aware of different experiences. They conclude that the designers in direct contact with the target users might get a higher empathy. The personal state (e.g., mood, fatigue), empathic ability, the attitude of the participants and the facilitator (i.e., convinced by empathy), the workshop context (e.g., place, time), and the group dynamic might impact the success of the empathic approach. In the discourse of designers during teamwork, van Rijn et al. (2011) look for empathic expressions (e.g., saying, "I think/feel/guess the users think/feel/want…"), own experience shared (e.g., relating users' needs and experiences to their personal experiences or comparing them to people they know), and questions about users' needs and experiences vs. making (false) assumptions. They show that direct contact with users or user research material and data helps designers discuss users throughout a design session. It also makes them aware of other stakeholders' roles in the service. More recently, Surma-aho et al. (2022) investigated novice design teams' perspective-taking mechanism (towards users and stakeholders) depending on their design performance. They reveal three ways through which novice designers understand others' perspectives: (1) *gathering data to form user perspectives* - to understand user cognition, affect, and behaviors, and building an in-depth perspective taking, (2) *scoping and making sense of perspectives* - to navigate between generalizations and data, and (3) *using perspectives in creative processing* - to imagine user-centered concepts and solutions. These previous works shed light on empathy mechanisms in design but are limited in understanding design practitioners.

Empirical studies rarely examine empathy in a broader design context, for instance, stakeholders' empathy. Walther et al. (2020) investigate engineering students' empathy development using role-play techniques in a series of empathy courses. They analyzed 146 students' reflection reports and distinguished three themes; (1) *relationships with others (distance, difference, power)* - the dilemma of engaging with users but in a professional manner, and the imbalance of power between their knowledge and the users' ones, (2) *the act of learning about others* - the expectation to learn for feeding their professional aspirations, and (3) *the content of learning about others* - the challenge of understanding the empathy value. With their BubbleGames VR project, Gaanderse et al. (2022) investigates empathy building between elders and young people in a neighborhood. They used three indicators of empathy: the motivation to join the project, which remained stagnant; the curiosity towards each other, which increased a little; and the perspective change, which increased significantly. These two examples reveal other stakeholders' main challenges when empathizing with people.

Beyond design, machine learning also supports discourse analysis and understanding of empathy at scale. For instance, Lee et al. (2022) analyzed 1 503 dialogs between 541 crowd workers and 11 personas (conversational agents). They defined eight empathic expressions; empathic concern (e.g., "I'm so sorry to hear that"), showing gratitude (e.g., "Thanks for recommending your favorite song"), sharing common interests (e.g., "we have a lot in common"), referring to partners as adorable, perspective-taking (e.g., "It must have been troublesome for you"), relationship building (e.g., "I'm happy talking with you"), showing enthusiasm and interest (e.g., "How were the dishes?"), and acceptance or agreement (e.g., "I totally agree"). Similarly, Wambsganss et al. (2021) analyzed 92 student peer reviews to train predictive models and design tools to support students to be more empathic in their reviews. Their analysis was based on five levels of emotional empathy (level 1: the students do not show their feelings towards the other students, level 5: the students write in an emotional and personal manner) and cognitive empathy (level 1: students' feedback is short and does not elaborate their thoughts; level 5: the students fully understand other students' thoughts).

1.4. Research objectives

While prior literature reports the benefits and importance of co-creation in user-centric design processes, few empirical studies present insights into the nature of interactions, specifically the empathic attitudes, and behaviors, between stakeholders and users during co-creation activities. To better understand whether and how co-creation sessions support empathy building, this study investigates service employees' empathic attitudes towards users during interactions in co-creation workshops. We address the following research questions:

> RQ1 - Which empathic attitudes do service employees and users adopt during co-creation workshops? Here the users are considered relevant, too, as empathy in service design is a bilateral concept (Wieseke et al., 2012).
>
> RQ2 - Are there changes in employees' self-reported empathy levels before and after participating in a co-creation session?

To address these questions, we conducted four co-creation sessions involving employees and passengers (N = 30) of a national railway transportation service in a European country. We combined qualitative content analysis of employees and passengers' exchanges with self-reported empathy measures before and after the workshops.

2. Method

2.1. Participants

We recruited 15 passengers and 15 employees from a railway company (N = 30) to participate in co-creation sessions. The employees (n = 15, 8 women, 7 men, aged 26 to 55 years old, M = 40, SD = 8.5) were recruited voluntarily through an email sent only to employees working on the passenger information during maintenance works. They completed a pre-session survey including age, gender, seniority, proximity with users, and train use (Table 1). Their seniority in the company ranged between a few months and 37 years (M = 14, SD = 9.63). On a scale from 1 to 7, they rated their proximity with the passengers in their mission as M = 3.29 (1 missing answer, Min = 1, Max = 7, Mdn = 2, SD = 2.09). 13 employees out of 15 participated in a workshop with passengers for the first time. Eight employees are service users and take the train "three or more times per week." All employees participating in the session work directly on the topic, some particularly on the passenger information posters that are the object of the last workshop activity.

The passengers were recruited by voluntary sampling through company communication channels, local passenger communities, and flyers at train stations. Interested passengers registered online by filling out a questionnaire including (a) demographic information: age, gender, employment status, country of residency, native language (i.e., the study was conducted in a cross-border region in the EU), (b) use of the railway service (familiarity with the service, frequency of use, traveling reasons, perception of the frequency of maintenance work, overall service satisfaction). Among the passengers (n = 15), 4 were women, 10 were men, and one preferred not to answer (age range from 20 to 32, M = 30, SD = 7.72). The participants were residents in Luxembourg (n = 10) or cross-border residents (n = 5). Their professional status included students (n = 3), workers (n = 11), and unemployed (n = 1). Most participants were commuters (n = 10). Eleven respondents took the train for "more than a year" and eight "three to seven times per week." Their perception of the frequency of maintenance works on the lines they use was M = 6 out of 10 (Min = 2, Max = 10, SD = 2.33), and their service satisfaction was M = 6.6 out of 10 (Min = 4, Max = 10, SD = 1.80). The summarize of the demographics per participant can be found in Appendix A.

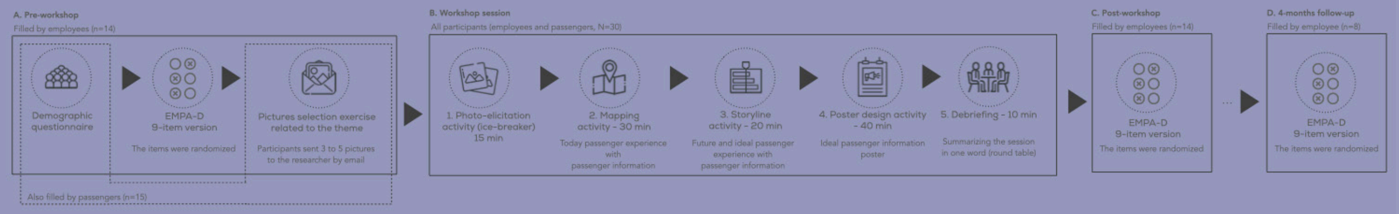
Table 1. Demographics about employees

ID	Age	Gender	Seniority (years)	Frequency of service use	Proximity with users	Session
E01	37	Man	13	3-4 times per week	2	1
E02	46	Woman	22	2-3 times per month	2	1
E03	54	Man	37	3-4 times per week	7	1
E04	45	Man	20	5-7 times per week	2	1
E05	44	Man	0.5	2-3 times per month	7	2
E06	35	Woman	8	Less than every 2-3 months	1	2
E07	39	Woman	17	5-7 times per week	4	2
E08	27	Woman	0.5	5-7 times per week	1	2
E09	42	Woman	1.25	5-7 times per week	4	3
E10	43	Woman	12	5-7 times per week	3	3
E11	55	Man	12	5-7 times per week	5	3
E12	35	Man	12	2-3 times per month	5	3
E13	26	Woman	1	Once per month	2	4
E14	32	Woman	3.5	2-3 times per month	1	4
E15	35	Man	13	1-2 times per week	missing data	4

2.2. Procedure

We conducted four workshop sessions of about 2h30 each, on the theme "passenger information during maintenance works." The University's ethics review panel approved the study, and we obtained participants' informed consent. The study was composed of 4 stages (Figure 1).

Figure 1. Overview of the study procedure


A. Pre-workshop
Filled by employees (n=14)
Demographic questionnaire
EMPA-D 9-item version
The items were randomized
Pictures selection exercise related to the theme
Participants sent 3 to 5 pictures to the researcher by email
Also filled by passengers (n=15)
B. Workshop session
All participants (employees and passengers, N=30)
1. Photo-elicitation activity (ice-breaker) 15 min
2. Mapping activity - 30 min
Today passenger experience with passenger information
3. Storyline activity - 20 min
Future and ideal passenger experience with passenger information
4. Poster design activity - 40 min
Ideal passenger information poster
5. Debriefing - 10 min
Summarizing the session in one word (round table)
C. Post-workshop
Filled by employees (n=14)
EMPA-D 9-item version
The items were randomized
D. 4-months follow-up
Filled by employee (n=8)
EMPA-D 9-item version
The items were randomized

The participants completed an online demographic questionnaire in the pre-workshop. Employees additionally filled out the EMPA-D 9-item version scale (Drouet et al., 2022, 2023) to measure their empathy. We also asked the participants to bring pictures illustrating passenger information for an ice-breaker activity.

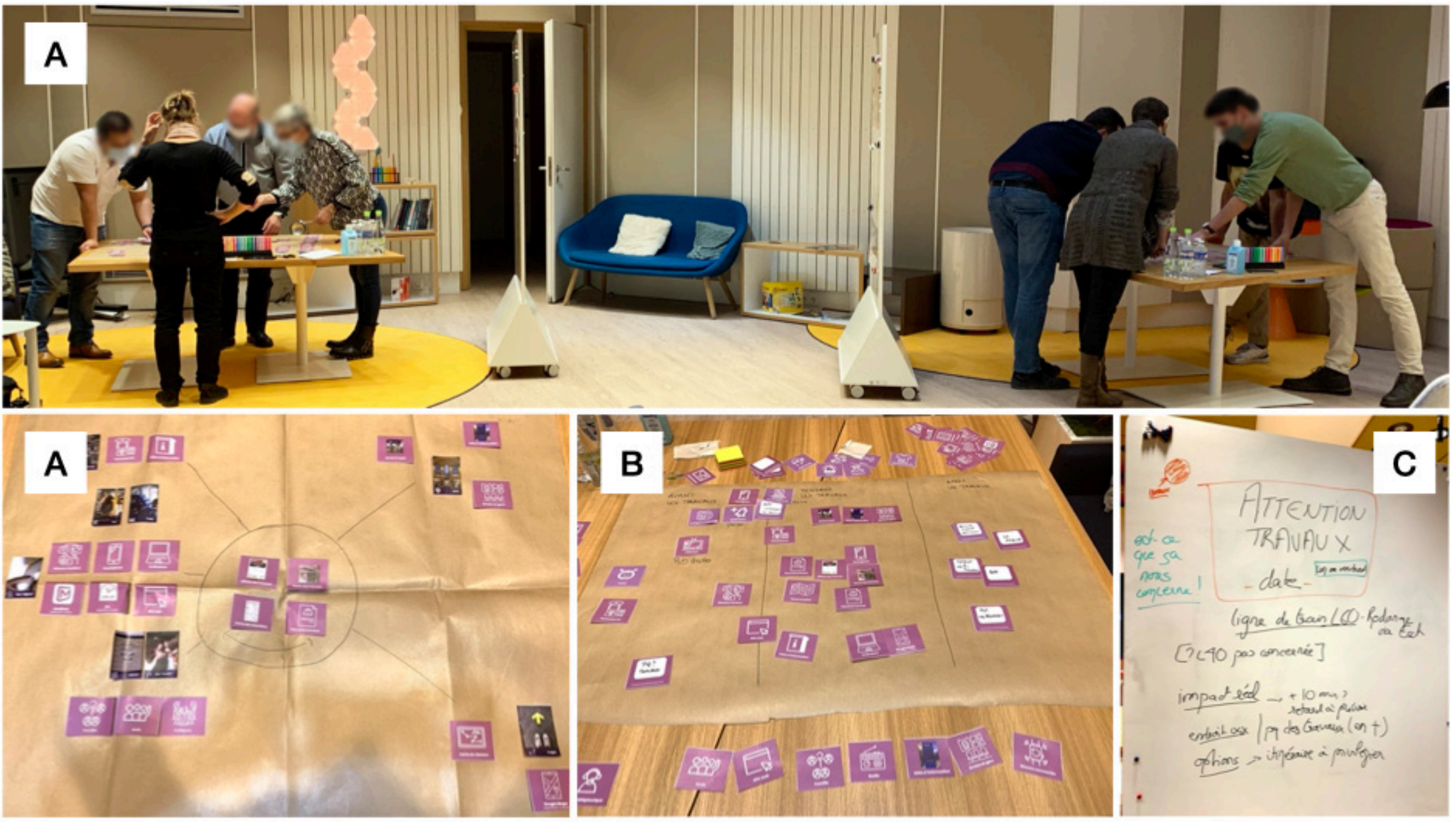
2.2.1. Workshop activities

Figure 2 illustrates the workshop activities. First, employees and passengers were split into two groups to map their perception of the current passenger experience with information during maintenance works (Figure 2A, based on context mapping techniques (Sleeswijk Visser et al., 2005)). They could use two types of cards; the places (e.g., train station, train, home, workplace) and the information media cards (e.g., staff, phone, smartphone, website). Blank cards were provided to add their own ideas. Each group presented their mapping, and both groups debriefed about each mapping.

Second, all participants were invited to imagine the ideal future passenger information during maintenance works (Figure 2B). Based on Sanders and Stappers (2012)'s storyline toolkit, the participants had to place new information media cards (or customized blank ones) on a timeline (before/during/after maintenance works) and discuss their choices. Third, with the help of a designer, all participants were invited to co-create an information poster (used in train stations and platforms to inform passengers about maintenance works, Figure 2C). We introduced a scenario about maintenance works on two railway lines. Each participant was invited to re-read the scenario, note questions, and define the necessary information to take the train. Then, they discuss together the key information to include on the poster. A UX designer took notes and sketched the participants' ideas. Then, the participants (one after the other) debriefed about the session, choosing one word to summarize the session.

Post-workshop, the employees had to fill the 9-item EMPA-D scale again on an online questionnaire. Four months later, the workshop insights into the passenger experience were presented to the employees. They were asked to complete a follow up questionnaire with a repeated measure of the 9-item EMPA-D scale.

Figure 2. (A) Mapping activity (split into two groups; employees and passengers separated), (B) Storyline activity (all together), (C) Poster design activity (all together)


A
A
B
C
ATTENTION
TRAVAUX
date
est-ce que ça nous concerne!
ligne de train L60 - Rodange ou Esch
[? L40 pas concernée]
impact réel → + 10 min ?
options → itinéraire à privilégier

2.3. Material

2.3.1. Co-creation workshop sessions

We started the workshop with an ice-breaker activity based on photo-elicitation techniques (Harper, 2002). Before the workshop, we asked the participants to choose 3 to 5 pictures representing passenger information during maintenance works. Each participant picked a picture and explained why they thought it was chosen. Passengers commented on employees' pictures and vice versa.

Mapping techniques (e.g., context mapping (Sleeswijk Visser et al., 2005), cognitive mapping (Sanders and Stappers, 2012), journey mapping (Kaplan, 2016)) – support participants' expression of their thoughts, feelings, and ideas to understand users' interactions with services better. As part of the generative techniques, mapping allows others to investigate and illustrate users' experiences (Kalbach, 2017). We used the technique to map employees' and passengers' perceptions of information tools used by the passengers while traveling by train to get informed of maintenance works.

Inspired by Sanders and Stappers (2012)'s generative techniques, we used the storyline toolkit to help employees and passengers to think about the ideal and future passenger information during maintenance works. The storyline toolkit comprises one timeline and visual and verbal elements (facilitating thinking and expression).

We did a dedicated co-creation activity to design the idealistic passenger information poster during maintenance works. The objective was to support discussion between employees and passengers about passengers' experiences and expectations with this poster.

2.3.2. EMPA-D 9-item scale

The EMPA-D 9-item scale (Drouet et al., 2022, 2023) was used to measure employees' empathy in pre- and post-workshop sessions. EMPA-D measures three dimensions in design; *Emotional interest* (i.e., the will and curiosity to learn about users, three items), *Personal experience* (i.e., the ability to use their personal experience with the service or one of their acquaintances to understand users' experience, three items), and *Self-awareness* (i.e., the ability to different stakeholders with users' one and design solutions for them, three items). Employees rated their degree of agreement with statements on a 7-point Likert scale (1 - "Does not describe me at all," 7 - "Completely describes me").

Post-workshop, the employees completed the EMPA-D scale. Four months later, following the presentation of the results, we administered an online follow-up questionnaire, including the EMPA-D scale. In the follow up questionnaire, we adapted the statements to present them in the future tense. For instance, "I am interested in learning about passengers' experiences and needs" became, e.g., "In the future, I will be interested to learn about passengers' experiences and needs."

2.4. Data Analysis

2.4.1. Thematic analysis

We analyzed the four main moments of employees' interactions during the co-creation sessions: employees' group work during the mapping activity, presentation of the mapping to passengers, storyline activity, and co-creation activity with passengers. We thematically analyzed the co-creation workshops according to Braun and Clarke (2019)'s six steps; familiarizing with data, generating initial codes, searching for themes, reviewing the themes, defining and naming the themes, and producing the report. We developed the codes following this approach to define the employees' empathic attitudes and potentially discover other empathy markers than those shared in literature. Regarding positionality, the authors have extensive knowledge of empathy frameworks in design and underlying dimensions. The first author is also a UX design advisor of the railway company, with prior knowledge of the barriers to a customer-centric culture.

We extracted 1 115 coded segments from 5 hours and 27 minutes of transcribed audio recordings for our thematic analysis. It resulted in 11 main themes divided into four categories (Table 2): (1) empathic attitudes: *emotional interest, perspective-taking, personal experience, self-awareness, prosocial behavior, ideation of solutions,* and *self-reflection*, (2) barriers to empathy; *assumptions about users' needs, behavior or knowledge, self-centered behavior* and *anti-empathic behavior* (e.g., mocking, judging, blaming), (3) *explanations about the service* and (4) *beliefs about empathy*. The first author transcribed the workshop sessions and made free-form notes while listening to the audio records. Based on the first author's observations, the two authors free-coded one workshop session (more than 15% of the sample, following the guidelines by (O'Connor and Joffe, 2020)) using MAXQDA 22.6. Through the process, the authors discussed the coding and the categories to refine the coding scheme and improve its reliability and validity. Then, they double-coded another workshop session, reaching an almost perfect agreement of 0.96 (Cohen's Kappa, min. code overlapping rate of 25% (Viera and Garrett, 2005)). As the manifestation of empathy goes hand in hand with interactions, we coded passengers' interventions and interactions with the employees during the workshop according to four themes; *explanation about their needs and themselves, empathy with employees, blaming themselves,* and *expression of disagreements*. In the results, we illustrate the findings with participants' verbatims (where E.# corresponds to employees and P.# to passengers). We had one participant employee who intervened very little during the workshop.

Table 2. Treeview of the qualitative codes for employees' interventions

Examples from data	Inductive codes	Themes
"It is an interesting point" E.15	Interest towards users	
"Do you like this app?" E.14, "Do you agree?" E.04	Question asked to/ about users	
"You mean: 'Delay to be expected'" E.08, "So, only one mobile application with all needed information." E.05	Reformulation	Emotional interest
"I am thinking like a user, not like a planner" E.04	Perspective-taking	Perspective-taking
"Sometimes we think 'I don't understand why they are angry, information is everywhere' " E.10	Challenge to take users' perspective	
"We know the number of the QR code scan" E01, "People still call the call center" E.10	Sharing information about users	
"You said something true" E.04, "As you indicated…" E.12	Prior users' information reused	
"You are right" E.04, "It's true, it is a good idea" E.09	Acceptance of users' point of view	
"I understand your opinion" E.04	Explicit understanding	
"I check the mobile app" E.01, "I use it everywhere" E.10	Employees' own experience	Personal experience
"My family, my friends" E.10	Experience of employees' relatives	
"We know it because we work here" E.10, "As a professional…" E.04	Self-users distinction	Self-awareness
"We have to think like the customer, not like us" E.03, "Ok you, but you are not alone, there are other people" E.10, "The line number, everyone knows it" E.11	Challenge for detachment/distinction	
"The RB are the trains that stop everywhere" E.10	Explanation of service jargon	
"We are waiting for your call in future" E.02	Expression of availability	Prosocial behavior
Laughing after a passenger's comment: "Yeah they are in a panic!"	Positive laugh with users	
"It could be communicated on the app" E.08	Ideation from discussion with users	Ideation of solutions

"That's why too much information kills information" E.04, "Perhaps we are not as good as them" E.12	Reflection on service process and passenger experience	Self-reflection
"But people stopped reading information" E.03	Assumptions about users' behaviors and thoughts	Assumptions about users
"This is the most important for the customer" E.15	Assumptions about user needs	
"Normally people know everything once they are at the train station" E.04	Assumptions about user knowledge	
"No, but it would be unmanageable" E.06, "at the end of the day, we do everything we can to make sure you don't get upset" E.12	Sensitivity to criticism	Self-centered behavior
"There's a lot of stuff behind it that the passenger doesn't see and doesn't understand" E.12, "Which is also a bit unfortunate" E.15	Sorrows shared	
"We have good people" E.01, "We are hard working" E.04	Self-congratulations	
"I am against that" E.12, "No, no" E.01	Rejection and disagreement	Anti-empathic behavior
"It would be visible for sure!" E.10, "We are dreaming, right? I should remember that." E.03	Mockery or sarcasm	
"We will never do it." E.01, "It's wrong." E.12,	Irritation or impatience	
Interrupting passengers with comments like "It's done." E.12	Interruption	
"People can have all the information but are not prepared. They come to the station and start yelling: Where are my trains?" E.03	Judgment and blaming	
"These are all our channels where we publish information" E.01	Explanations about the service	Explanations about the service
"Not all stations have station masters" E.03, "RE" E.09	Use of railway jargon	
"We like complaints because it will help us to improve" E.02, "I'm happy to have heard all your daily problems" E.04		Beliefs about empathy

2.4.2. Quantitative analysis of the EMPA-D scale

To analyze the results of the EMPA-D scale, we conducted the statistical analysis with SPSS 27. Due to the small sample size, we run nonparametric tests. We compared the pre- and post-workshop responses to the EMPA-D scale with the Wilcoxon Signed Ranks Test (two related samples). We compared the post-workshop and 4-month follow-up responses with the Mann-Whitney U test (two independent samples). We had one missing data point for the pre- and post-workshop questionnaire and six for the 4-month follow-up questionnaire.

3. Results

3.1. Qualitative analysis of participants' interactions during the workshops

3.1.1. Passengers' interventions

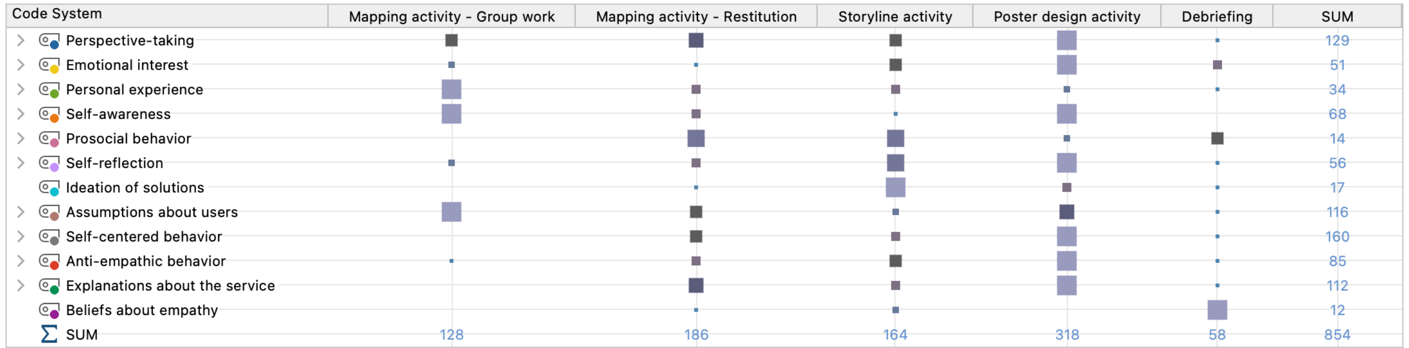
During the co-creation sessions, employees directly interacted with the passengers. While the attitudes and interaction styles adopted by passengers are not at the heart of our investigation, how they participated in the workshop might impact our findings. All the passengers were engaged in the discussions and participated actively in the workshop. During the interactive activities (storyline and poster design), the passengers shared 52% of the speaking time vs. 48% for the employees (excluding the facilitator's interventions).

In our study, passengers had four main ways of interacting with employees. They mainly ***expressed their needs and shared explanations about them*** and their service use (86% of the passengers' content coded). "I will prefer that" P.03. Sometimes, they showed ***empathy with the employees***, for example, when employees explained their constraints (9%), "You have to deal with people who are not easy to get along with." P.09. To a lesser extent, they ***blame themselves*** when explaining their habits or reacting to employees' explanations about their constraints (3%). "It is also our fault" P.10. Noteworthy, they rarely ***express disagreement*** with employees (2%). "We don't have the same customer journey at all" P.04.

3.1.2. Employees' interventions

During the different co-creation activities, we observed seven employees' attitudes which we qualify as empathic: *emotional interest, perspective-taking, personal experience, self-awareness, prosocial behavior, ideation of solutions, self-reflection*, and three potential barriers to empathy: *assumptions about users, self-centered behavior,* and *anti-empathic behavior*. We also noted numerous interventions of employees sharing *explanations about the service* organization. More anecdotally, they expressed *beliefs about empathy* (i.e., recognizing empathy value and the importance of understanding users and their feelings (Surma-aho and Hölttä-Otto, 2022). Figure 3 illustrates the relative occurrences in empathic attitudes and barriers throughout the four main workshop activities (per session in Appendix B). Note that the "mapping activity group work" was done in separate groups where employees and passengers were not yet mixed, which influences the presence of specific behaviors or attitudes (e.g., no codes refer to *prosocial behavior* - which we defined as the expression of the willingness to help passengers and a positive mood towards them - in this activity). We did not code *self-centered* behavior and *explanations about the service* during the group work, as the activity was focused on discussing the current service journey and touchpoints. *Perspective-taking* and *self-awareness* have been the most empathic attitudes demonstrated by employees, in particular during the poster design activity. The main barriers to empathy are *self-centered behaviors* and *assumptions about users.*

Figure 3. Main coded attitudes throughout the workshop activities

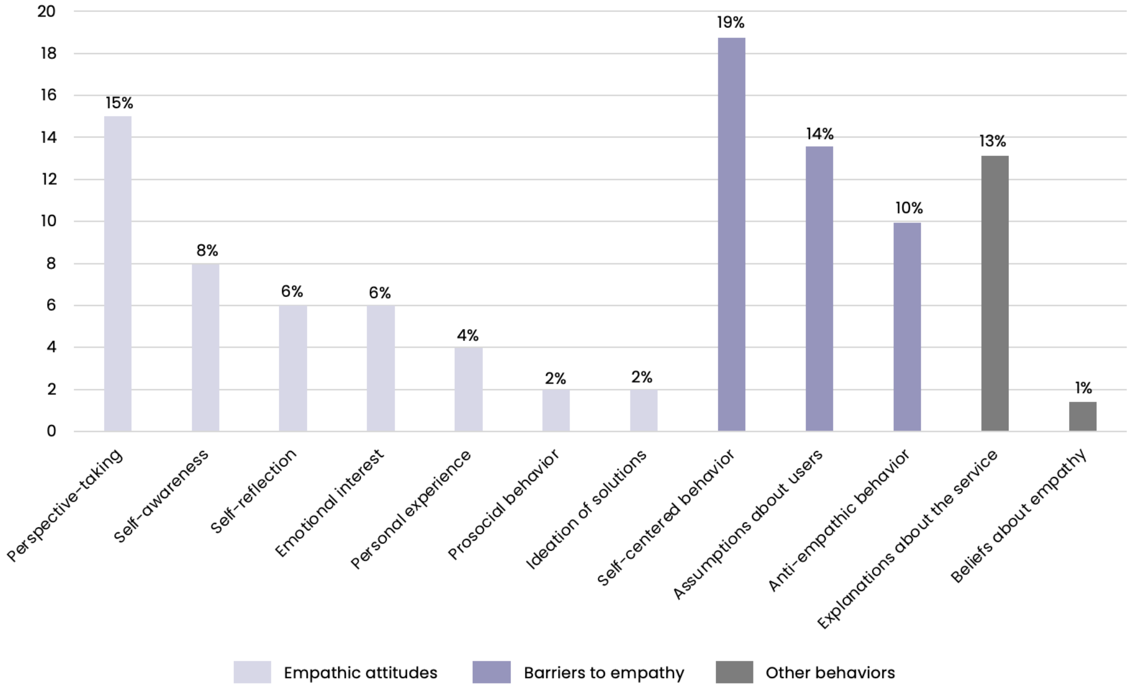


Code System	Mapping activity - Group work	Mapping activity - Restitution	Storyline activity	Poster design activity	Debriefing	SUM
Perspective-taking	■	■	■	■	■	129
Emotional interest	■	■	■	■	■	51
Personal experience	■	■	■	■	■	34
Self-awareness	■	■	■	■		68
Prosocial behavior		■	■	■	■	14
Self-reflection	■	■	■	■	■	56
Ideation of solutions		■	■	■	■	17
Assumptions about users	■	■	■	■	■	116
Self-centered behavior		■	■	■	■	160
Anti-empathic behavior	■	■	■	■	■	85
Explanations about the service		■	■	■	■	112
Beliefs about empathy		■	■		■	12
Σ SUM	128	186	164	318	58	854

N.B. This MaxQDA code matrix is a heatmap where the square size represents the relative weight of each code

Figure 4 displays the relative occurrence of each empathic attitude and barrier. The employees demonstrated a somewhat equal number of occurrences of behaviors hindering empathy than empathic attitudes (43%).

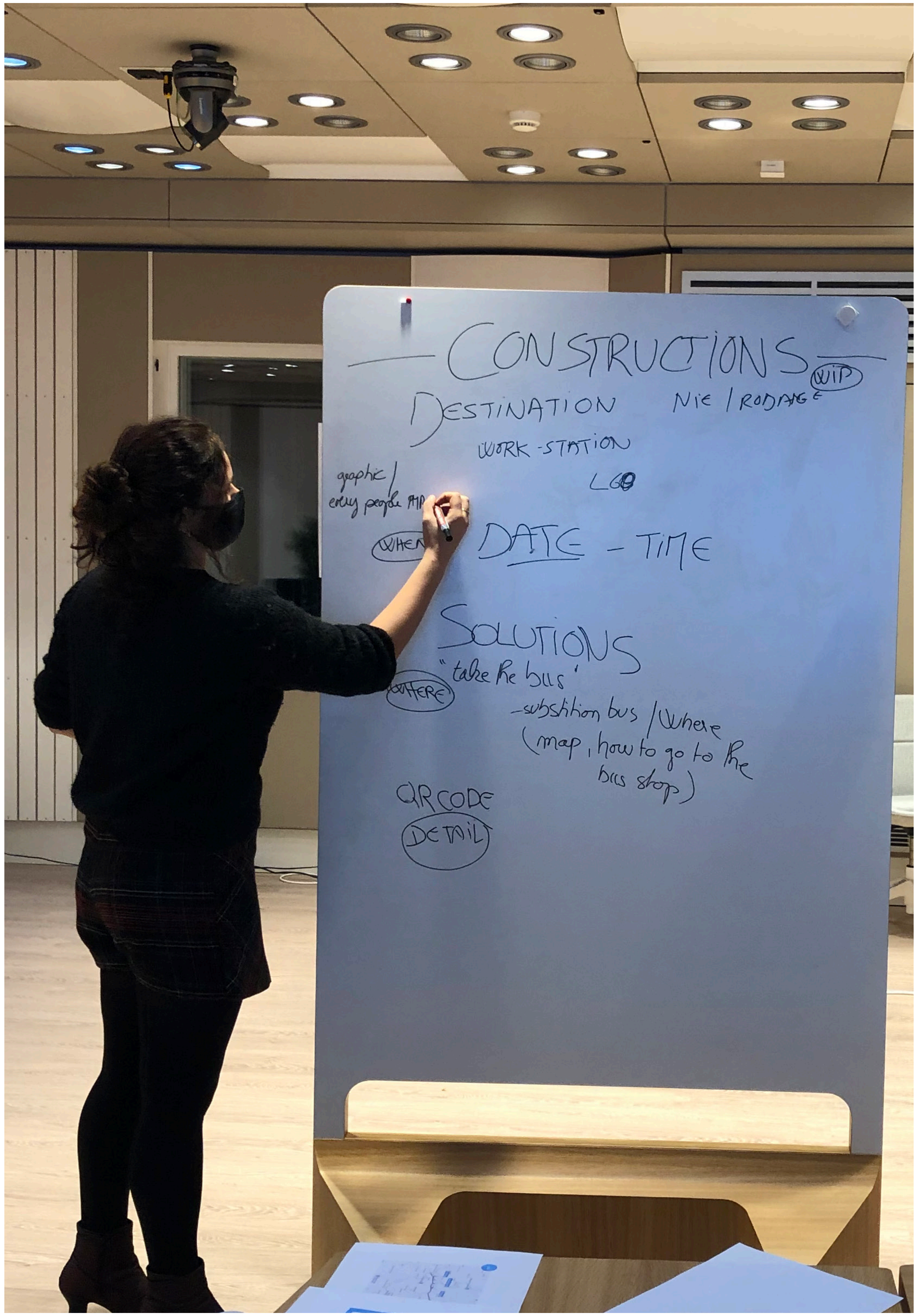
Figure 4. Percentages of occurrences of empathic attitudes and barriers



Employees' empathic attitudes

We found seven types of employees' ***empathic attitudes*** towards the users from the data. We describe here these attitudes and their indicators.

The employees adopted active and informed ***perspective-taking*** (15%), reaching its peak during the poster design activity (Figure 3). Employees mainly expressed the *challenge of taking passengers' perspectives* and their difficulties in understanding passengers (e.g., talking in the work group with employees only about the mapping activity restitution). "The passengers will have something completely different from what we think of" E.04. They also showed their ability to *take users' perspectives* by projecting in "passengers' shoes." "We talk about train stations overall, including the platforms; if not, the passengers won't understand" E.09. They often used *information previously shared by users* during the interactions to discuss the service, considering users' points of view. "As the lady said…" E.10. The employees sometimes *used information about users* (collected from their observations on the field or previous studies) to support their statements (e.g., anecdotes, complaints, key numbers). "When I worked in the claims office, I had customers who said…" E.06. This demonstrated employees' past attempts to understand passengers' perspectives. Last, some expressions of an *explicit understanding* ("I understand, you're going into the station, you want to catch your train." E.10) and the *acceptance of passengers' point of view* (e.g., agreements with passengers' comments, "what you say it's really true." E.04) illustrated some understanding of passengers' experience.


CONSTRUCTIONS
WIP
DESTINATION
NIE / RODAGE
WORK-STATION
LGB
graphic / every people MP
WHEN
DATE - TIME
SOLUTIONS
"take the bus"
WHERE
-substitution bus / Where (map, how to go to the bus stop)
QR CODE
DETAIL

We also observed that the employees expressed ***self-awareness*** (8%) of having a different role regarding the service. Often linked to the challenge of taking passengers' perspectives, employees verbalized the *challenge to distinguish* their knowledge from the passengers' one ("It's difficult because I'm too deeply involved" E.13), also when reminding some colleagues to detach and distinguish themselves from passengers. "The passengers are not from the railway, they are people from everywhere" E.04. The *self-user distinction* was sometimes natural and explicitly expressed. "As a railway worker who works there…" E.10. Employees *explaining the railway jargon* to passengers was also an indicator of this self-awareness. However, for other employees, it was a harder exercise. The employees manifested this self-awareness mainly when they worked in groups with only employees and during the poster design activity.

The employees also demonstrated their ***emotional interest*** (6%) towards passengers, meaning their curiosity and willingness to learn from passengers. We first observed the employees' emotional interest through the *questions they asked* directly to passengers or themselves or even simply the expression of their *interest*. Also, *reformulating* passengers' wishes was an indicator of an effort to understand passengers' points of view. "When you say 'real impact,' do you mean: how long does it take me to get there?" E.06.

Particularly during the storyline and poster design activities, the employees ***self-reflected*** (6%) on the service, their organization, and the passenger experience. They *reflected on how the company processes* sometimes lead to degraded passenger experience compared to competitors or overall. They also *reflected on their employee's roles and responsibilities* for improving the service. "Perhaps this is something we should think about" E.12.

The employees taking the train or knowing relatives using the service shared ***personal experiences*** (4%), mainly during the work in employee groups. Some of them used their *own experience* to imagine passengers' experiences. "When I arrive at the train station…" E.01. Some also used examples from their *relatives' experiences* to imagine the user experience of specific passengers' profiles (e.g., elderly). "My mother still makes phone calls" E.01.

To a lesser extent, we observed some ***prosocial behaviors*** (2%) towards passengers during the workshops, specifically during the restitution of the mapping and storyline activities. Participants used the activities or expressions of passengers to laugh together positively. Some employees also expressed their availability to help passengers in the future. "Just come and ask if you have questions" E.02.

The discussions with the passengers sometimes gave ideas to employees who started to ***ideate about solutions*** (2%) or improvements to the service. "For example, your smartphone says 'Hello E.08, on Tuesday there is maintenance work on the line'" E.08. This happened mainly during the storyline activity.

Employees' empathy barriers

In contrast to empathic attitudes, the exchanges during the workshops also illustrated three types of ***empathy barriers*** in their interaction between employees and passengers.

The most frequent barrier is the ***self-centered behaviors*** (19%), mainly focused on the service functioning and their work, forgetting that the objective of the session was to listen and co-create with passengers. The three main indicators of these self-centered behaviors were first when the employees shared explanations about the service to *sensitivity to users' criticism* that the employees do their best for them. "We are working on it, but it's a long way" E.04. This behavior was sometimes accompanied by the sharing of sorrows about the situations they face ("perhaps we are not as good as the competitor" E.12) or *self-congratulations* for their good work. "I rework all the locations" E.06.

Employees also demonstrated the tendency to make ***assumptions*** (14%) about passengers, which we define as statements about passengers usually presented as truth yet without supporting evidence. Employees shared *assumptions about users' behaviors and thoughts* (e.g., how passengers use the service and their supposed opinion about it, "customers planning an exceptional trip or journey, they'll plan from home" E.01), also about *users' needs* ("It is very important for the passenger" E.12) and *users' knowledge*. "They know how to get the information" E.03. The employees manifested these assumptions mainly during the mapping in group and poster design activities. If the task and absence of collaboration with passengers in the first activity could justify this practice, the employees barely took the opportunity to later ask the passengers present in the room to confirm some of the assumptions even during the restitution. When collaborating directly with passengers on the poster's design, employees make also assumptions about users' needs, behaviors, and knowledge, sometimes corrected by the passengers.

The last barrier to empathy was ***anti-empathic behavior*** (10%). Few employees manifested *disagreement*, openly *rejected users' opinions*, and *interrupted* passengers in their explanations. "No, no, they have a station master" E.03. Some expressions or tone of voice demonstrated *irritation, impatience, mockery*, and *sarcasm*. "But you get the information here!" E.04. These behaviors sometimes result in *judgment or blame on users*. "The passengers who don't take the train every day and don't care" E.12. We noticed these behaviors mainly during the poster creation activity, which was the most collaborative but confrontational activity in the workshops.

Employees' other behaviors

The employees attached importance to sharing detailed ***explanations about the service*** (13%) even though they did not answer user questions and responded to user comments. "On LinkedIn, they present current maintenance works or even explain how a switch works" E.09. These employees sometimes used railway jargon they did not always explain to passengers because they were too focused on their explanations. These explanations took place mainly during the poster design activity.

During the debriefings, some employees emphasized the value of listening to passengers and the approach of co-creating with passengers. It illustrates their ***beliefs about empathy*** (1%) and how important it is to understand the passengers. "To get the customers' feedback on it" E.10.

3.1.3. Individual employees' behaviors and predominant themes per session

Table 3 shows the occurrences of attitudes per employee and session. We observe that the predominant themes vary per session. *Perspective-taking* is, among each session, one of the most coded themes. *Self-centeredness* is one of the main themes in Session 1 to 3. Sessions 2, 3, and 4 have the most *assumptions* and *explanations about the service* on their total of occurrences.

At the session level we can observe different group dynamics impacting the dominant attitudes and obstacles. For instance, employees in session 2 used the most *perspective-taking* and *emotional interest* and also ideated the most. Self-reflection was mostly observed in sessions 1 and 4. The employees shared the most explanations about the service in Session 3.

Our activities gradually invited the employees to co-create with passengers (from no interactions with passengers to making decisions with passengers), and each of them revealed specific empathic attitudes and barriers (Appendix B). During group work without passengers, the employees had to use their *personal experiences* and *assumptions* to understand passengers' experiences. *Self-awareness* behaviors were also present to balance the assumptions. The storyline activity projected the employees and passengers in the future and consequently generated the most *self-reflection, prosocial behavior*, and *ideation about solutions*. The poster design is the activity that triggered the most empathic attitudes and barriers. It was the most engaging and collaborative activity, inviting the participants to co-create an existing passenger information tool. For this type of activity to generate empathy rather than being counterproductive, the role of the facilitator as mediator was essential.

For the employees who rarely work with passengers (proximity with users rated at 1), *perspective-taking* has been a main theme according to the total occurrences of their interventions. The *self-centered* theme is predominant for the two employees working closely with passengers (proximity with users rated at 7). *Perspective-taking* and *assumptions* have been the most coded themes for the employees with the lowest seniority in the company (<= 5 years). *Perspective-taking, self-reflection*, and *assumptions* are dominant for the most senior employees (>= 20 years). We did not distinguish visible patterns between the employees who use the train regularly (5-7 times per week) and those being punctual users of the service (<= 2-3 times per month).

Key employees' feedback about co-creation session

During debriefings and later outside of the workshop, we received positive feedback on the workshops. All the employees shared they learned and were interested in the exchange with the passengers. Some were surprised by the difference between their perspective of the service and the passengers. Others were surprised by the positive exchanges with the passengers thinking they would be even more criticized and were afraid of it. This feedback translates into service employees' need to participate more regularly in such activities.

Some employees also expressed their frustration of not having enough time to discuss with the passengers about the service. The co-creation sessions were the opportunity to share more information about the service organization and process, which made the passengers aware of some service challenges and problems. It also triggered some passengers' empathy towards the employees. Finally, some employees believe that these initiatives should also involve line managers to make them more aware of passengers' experiences.

3.2. Quantitative analysis of self-reported measures

We measured empathy with the 9-item EMPA-D scale (including *Emotional interest* (EI), *Personal experience* (PE), and *Self-awareness* (SA) subdimensions) in pre- and post-workshop and 4 months later the workshop for a longitudinal observation. We aimed to assess the potential empathy increase after an empathic intervention as the co-creation workshop sessions.

3.2.1. Descriptive results

Estimates of internal consistency for the EMPA-D subscale were measured using the McDonald's coefficient Omega (Table 4, ranging from .69 to .91 for all subscales in pre- and post-workshop measures).

Table 3. Occurrences (in %) of empathic attitudes and barriers per employee

	Perspective-taking	Emotional interest	Personal experience	Self-awareness	Prosocial behavior	Self-reflection	Ideation solutions	Self-centered	Assumptions	Anti-empathic	Explanations service	Beliefs empathy
E01	10	3	4	7	0	3	0	38	9	13	13	1
E02	13	6	6	0	10	6	0	10	26	6	6	10
E03	7	0	6	6	2	13	0	21	15	24	6	0
E04	31	4	1	14	1	15	2	13	8	2	7	1
Session 1	15	3	4	8	2	10	1	23	12	13	9	1
E05	11	8	8	5	0	0	11	22	19	5	8	3
E06	23	12	0	3	0	1	1	24	11	5	16	2
E07	25	13	0	0	0	25	13	0	25	0	0	0
E08	23	15	3	5	3	5	15	10	13	0	10	0
Session 2	20	12	2	4	1	3	7	19	14	4	13	2
E09	16	3	3	23	0	3	0	3	16	3	26	3
E10	15	9	6	10	1	0	1	16	12	7	20	2
E11	7	7	7	13	7	0	0	7	27	0	27	0
E12	6	5	3	8	0	4	1	22	17	23	12	0
Session 3	11	6	4	11	1	2	1	16	15	13	18	1
E13*	0	0	0	33	0	33	33	0	0	0	0	0
E14	25	8	0	0	0	21	0	4	25	0	13	4
E15	14	6	14	8	0	17	0	3	11	0	28	0
Session 4	17	6	8	6	0	19	2	3	16	0	21	2

*E13 is a particular case as the employees intervened only three times during the workshop.

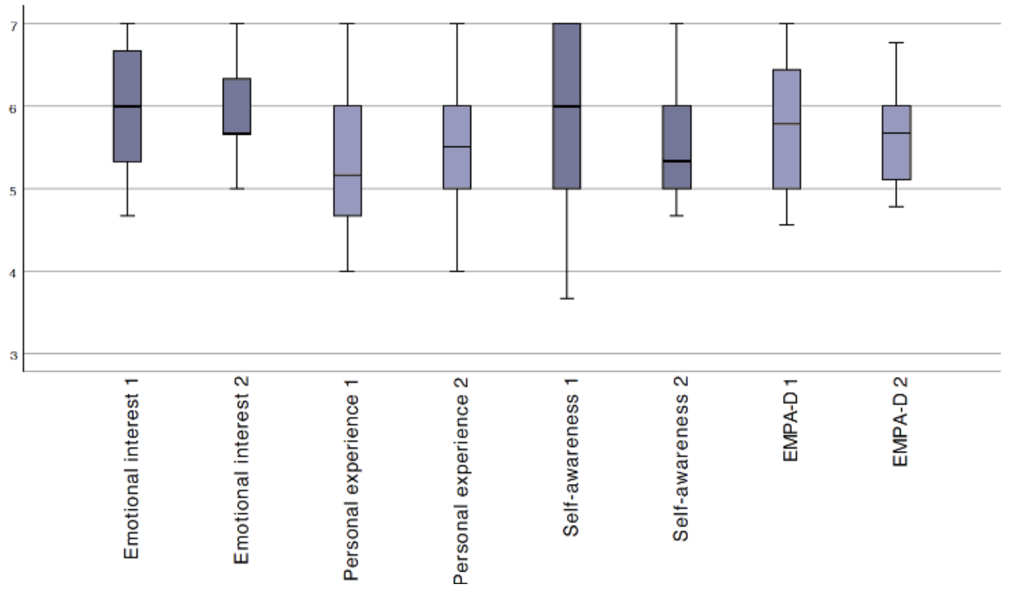
These estimates suggest that the subscales have good or acceptable levels of internal consistency in the current sample. EMPA-D score is M = 5.72 (SD = 0.74) in pre-workshop, M = 5.64 (SD = 0.59) in post-workshop, and M = 5.17 (SD = 0.69) 4 months later. The mean of the EMPA-D score decreased along the three measures. We obtained the highest EI score M = 6.05 (SD = 0.82), in pre-workshop and the lowest, M = 5.83 (SD = 0.60), in post-workshop. PE is highest M = 5.57 (SD = 0.92) in post-workshop and lowest M = 5.17 (SD = 0.71) 4 months later. SA has the highest M = 5.81 (SD = 1.2) in pre-workshop and the lowest M = 4.46 (SD = 1.28) 4 months later.

Table 4. Descriptive statistics and Omega reliability scores of the EMPA-D scale measures

Scales	Nb items	Measures 1: pre-workshop (N = 14)			Measures 2: post-workshop (N = 14)			Measures 3: 4-months later (N = 8)	
		Min - Max	M (SD)	ω	Min - Max	M (SD)	ω	Min - Max	M (SD)
EI	3	4.67 - 7	6.05 (0.82)	.89	5 - 7	5.83 (0.60)	.70	4.67 - 7	5.88 (0.91)
PE	3	4 - 7	5.31 (0.92)	.85	4 - 7	5.57 (0.92)	.89	3.67 - 5.67	5.17 (0.71)
SA	3	3.67 - 7	5.81 (1.2)	.91	4.67 - 7	5.52 (0.64)	.69	2 - 6.33	4.46 (1.28)
EMPA-D	9	4.56 - 7	5.72 (0.74)	.80	4.78 - 6.78	5.64 (0.59)	.83	4.22 - 6.11	5.17 (0.69)

Observing the boxplots of pre- and post-workshop measures (Figure 5), we see (1) that the medians of EI, SA, and EMPA-D total measures are lower post-workshops than pre-workshop. Overall, there seems to be a decrease in social curiosity and empathy, except for PE, which tends to increase. (2) The whiskers are smaller or equal for the measures post-workshops (max of EI, max, and min of PE, max of SA). Post-workshop intervention, the individuals respond more homogeneously and less extremely.

Figure 5. Boxplots of measures pre- and post-workshops



At the session level, Session 4 obtained the highest EMPA-D score (M = 6.50, SD = 0.08), and Session 3 was the lowest (M = 5.45, SD = 0.87) in pre-workshop responses (Table 5). In the post-workshop measure, Session 1 obtained a higher EMPA-D score (M = 6.03, SD = 0.68), and Session 3 had a lower score (M = 5.36, SD = 0.64).

Table 6 compares the means of EMPA-D scores pre- and post-workshop and their difference per participant. We observe a decrease in empathy in Session 2 (df = -0.17), 3 (df = -0.09), and 4 (df = -0.78) and an increase in empathy in Session 1 (df = 0.36). Similarly, the *Emotional interest* decreases in Session 2 (df = -0.34), Session 3 (df = -0.33), and Session 4 (df = -0.34) and increases in Session 1 (df = 0.08). The *Personal experience* increases in Session 1 (df = 1.08) and Session 3 (df = 0.25) when it decreases in Session 2 (df = -0.17) and Session 4 (df = -0.51). Last, the *Self-awareness* does not change in Session 2 (df = 0) and decreases in the other sessions: Session 1 df = -0.08, Session 3 df = -0.17, and Session 4 df = 1.50.

Table 5. Descriptives statistics of EMPA-D scores per session

	Session 1 (n = 4)			Session 2 (n = 4)			Session 3 (n = 4)			Session 4 (n = 2)		
	Min - Max	M	SD	Min - Max	M	SD	Min - Max	M	SD	Min - Max	M	SD
Measures 1: pre-workshop (n = 14)												
EI 1	4.67 - 6.67	6	0.94	5 - 7	6.17	1	5 - 7	5.83	0.88	6 - 6.67	6.34	0.47
PE 1	4.33 - 5.67	5.08	0.57	4 - 7	5.50	1.29	4 - 6	4.92	0.84	5.67 - 6.67	6.17	0.71
SA 1	4.67 - 7	5.92	0.96	4 - 7	5.33	1.25	3.67 - 7	5.58	1.55	7 - 7	7	0
EMPA-D 1	4.89 - 6	5.67	0.52	5 - 7	5.67	0.91	4.56 - 6.56	5.45	0.87	6.44 - 6.56	6.50	0.08
Measures 2: post-workshop (n = 14)												
EI 2	5.67 - 7	6.08	0.63	5 - 6.33	5.84	0.64	5 - 6.33	5.50	0.64	5.67 - 6.33	6	0.47
PE 2	5.33 - 7	6.17	0.69	4 - 7	5.34	1.25	4 - 6	5.17	0.88	5.33 - 6	5.67	0.47
SA 2	4.67 - 7	5.84	0.96	5 - 6	5.34	0.47	5 - 6.33	5.42	0.63	5.33 - 5.67	5.5	0.24
EMPA-D 2	5.22 - 6.78	6.03	0.68	5 - 6	5.50	0.52	4.78 - 6.22	5.36	0.64	5.56 - 5.89	5.72	0.24

Table 6. EMPA-D subscales means and mean differences at the first and second measures per employee (n = 14)

ID	Emotional interest			Personal experience			Self-awareness			EMPA-D Total		
	EI 1	EI 2	Difference	PE 1	PE 2	Difference	SA 1	SA 2	Difference	EMPA-D 1	EMPA-D 2	Difference
E01	6.67	5.67	-1	5	5.33	0.33	6	4.67	-1.33	5.89	5.22	-0.67
E02	6.67	7	0.33	4.33	6.33	2	7	7	0	6	6.78	0.78
E03	6	6	0	5.67	7	1.33	6	6	0	5.89	6.33	0.44
E04	4.67	5.67	1	5.33	6	0.67	4.67	5.67	1	4.89	5.78	0.89
Session 1	6	6.09	0.08	5.08	6.17	1.08	5.92	5.84	-0.08	5.67	6.03	0.36
E05	7	6.33	-0.67	7	5.33	-1.67	7	6	-1	7	5.89	-1.11
E06	7	6.33	-0.67	4	4	0	5.33	5	-0.33	5.44	5.11	-0.33
E07	5	5	0	5	5	0	5	5	0	5	5	0
E08	5.67	5.67	0	6	7	1	4	5.33	1.33	5.22	6	0.78
Session 2	6.17	5.83	-0.34	5.50	5.33	-0.17	5.33	5.33	0	5.67	5.50	-0.17
E09	5	5	0	5	5	0	5	5	0	5	5	0
E10	7	6.33	-0.67	6	6	0	6.67	6.33	-0.34	6.56	6.22	-0.34
E11	5.33	5	-0.33	4.67	4	-0.67	3.67	5.33	1.66	4.56	4.78	0.22
E12	6	5.67	-0.33	4	5.67	1.67	7	5	-2	5.67	5.44	-0.23
Session 3	5.83	5.50	-0.33	4.92	5.17	0.25	5.59	5.42	-0.17	5.45	5.36	-0.09
E13	6.67	6.33	-0.34	5.67	6	0.33	7	5.33	-1.67	6.44	5.89	-0.55
E14	6	5.67	-0.33	6.67	5.33	-1.34	7	5.67	-1.33	6.56	5.56	-1
Session 4	6.34	6	-0.34	6.17	5.67	-0.51	7	5.50	-1.50	6.50	5.73	-0.78

N.B. One missing data (E15)

3.2.2. Pre- and post-workshops measure comparison

According to the Wilcoxon Signed Rank Test conducted (Table 7), the co-creation workshop interventions did not provoke a statistically significant change in empathy (EMPA-D; z = -.43, *p* = .67). The median EMPA-D score rating was M = 5.72 (SD = 0.74) pre-workshop and M = 5.64 (SD = 0.59) post-workshops.

Table 7. Wilcoxon Signed Rank Test - Social curiosity and empathy pre- and post-workshops

Subscale	+	-	0	z	*p* asymp. sig.
Emotional interest	2 (M = 6.25)	8 (M = 5.31)	4	-1.55	.12
Personal experience	7 (M = 5.21)	3 (M = 6.17)	4	-.92	.36
Self-awareness	3 (M = 6)	7 (M = 5.29)	4	-.97	.33
EMPA-D Total	5 (M = 6.7)	7 (M = 6.36)	2	-.43	.67

3.2.3. Empathy changes 4 months later

The EMPA-D mean rank is higher in the 4-month follow-up measure than post-workshop (Table 8). We cannot conclude that the EMPA-D score was lower post-workshop than the 4-month follow-up (U = 32, *p* = .10).

Table 8. Mann-Whitney U Test - Empathy post-workshop and 4-month follow-up questionnaires

Groups	M rank	Mann-Whitney U	Wilcoxon W	z	*p* asymp. sig.	*p* exact sig.
Post-workshop (n = 14)	8.50	32	68	-1.64	.10	.11
4-month follow-up (n = 8)	13.21					

4. Discussion

This study aimed to investigate the empathic attitudes and barriers adopted by service employees in their exchanges with passengers during co-creation sessions. We discuss how our findings consolidate or deepen previous work investigating empathy during design sessions. Last, we reflect on the challenges and opportunities of using co-creation sessions with users as an empathic method to trigger service employees' empathy.

4.1. Do co-creation sessions trigger only empathic attitudes?

4.1.1. Are employees' empathic attitudes similar to designers' ones observed in prior work?

Our analysis emphasized empathic attitudes similar to those observed in previous qualitative studies investigating designers' and other stakeholders' empathy. Most empathic attitudes related to *emotional interest* in our workshops are often used in design to define empathy. Empathy in design starts with the willingness to learn from others and the curiosity about others (Kouprie and Sleeswijk Visser, 2009). The ability to take the perspective of others is also an important part of empathy (Smeenk et al., 2016). In addition, our three categories of empathic attitudes, *emotional interest and perspective-taking, personal experience*, and *self-awareness* illustrate similar stages as described by the empathy frameworks in design (Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019). These three categories are also consistent with the definition of the empathy dimensions measured by the EMPA-D scale (Drouet et al., 2022, 2023). Looking at our *personal experience* category, as Sleeswijk Visser and Kouprie (2008) and van Rijn et al. (2011), we noticed that some employees used their personal experience or one of their relatives as a starting point in the activities. Regarding two main self-awareness attitudes, the self-other distinction and the *challenge of detachment/distinction*, we observed difficulties for the service employees to stay aware of their knowledge difference with passengers all along the co-creation workshops, as observed by Walther et al. (2020) with students' engineers.

Among the empathic attitudes, we also noticed the employees' expression of the importance of listening to passengers and their complaints. We named this category in reference to the *beliefs* in empathy described by Surma-aho et al. (2022) in the care context *"about how important it is (for doctors) to understand patients and their feelings."* This also echoes Mattelmäki et al. (2011) stating that co-creation facilitates the recognition of users' expertise. Yuan and Dong (2014) describe this phenomenon as a *dialogic process* where the stakeholders recognize the uniqueness of everyone's experiences and, thus, the importance of listening to them to get inspired. However, the recognition of passengers' expertise mainly appeared during the workshop debriefing. As noted by Walther et al. (2020), with engineering students, it is a challenge to understand and make them understand the passengers' expertise and thus the value of empathy.

Last, we noticed some attempts of employees to ideate solutions based on passengers' criticisms during the workshop, mainly during the storyline activity. Oriented towards the future of the service, this activity was best suited for ideation. Nevertheless, as observed by Surma-aho et al. (2022) with the

novice design students teams in lower performance, they were focused on understanding users' behaviors regarding the solutions' functionalities and utility. They could not yet generalize their understanding of users to support their decision-making. We observed the same challenges in our sample of service employees without a design background. This can likely be explained by the fact that this type of know-how is specific to the design professions.

We coded two new categories of empathic attitudes compared to previous work about designers' empathy; the *self-reflection* attitude and *prosocial behavior*. The problems highlighted by passengers invited the service employees to reflect on the service process, the passenger experience, and their role within it. It illustrates the acceptance of others' reality and the service flaws that could be improved. Regarding *prosocial behavior* and, in particular, the employees' expression of availability to help passengers, we can relate it to service logic. The two employees who expressed it on several occasions are one frontline staff and one manager of frontline staff. The essence of their work is to help passengers when using the service (in trains or train stations). Consequently, these two employees reproduced their everyday behavior and offered help to the passengers.

4.1.2. The potential barriers to empathy encountered during a first co-creation session

Prior work focused to a lesser extent on the barriers to empathy. The fact that the employees who took part in our workshops were not designers, and the essence of their profession is not to listen to passengers (except for the two employees who rate their proximity with users as 7 out of 7), could explain the barriers to empathy we found in our study. These barriers were found in novice designers (Surma-aho et al., 2022; van Rijn et al., 2011) or engineering students (Walther et al., 2020). The service employees were overall more *self-centered*, eager to explain the details of the service functioning, mostly in a defensive mode after the passengers expressed unmet needs. Furthermore, unlike designers, whose anti-empathic behavior is a taboo conflicting with their professional service values, employees expressed their misunderstanding and dissatisfaction regarding passengers' feedback more directly. Most of these behaviors happened during the poster activity, which was the only activity based on an existing information poster designed by the company's employees. Some of these employees likely took the passengers' criticism personally, disregarding the passengers' needs expressed behind their feedback and thus the opportunities to improve the poster.

Employees' assumptions were numerous. Note that we coded as assumptions any statement made about passengers that were not backed up by a comment that this statement relied on data from customers. Assumptions happened mainly during the first group activity between employees only. These were less frequent later, yet again present during the poster activity and used as a strategy by the employees to defend their work and argue against the needs of passengers. In their study, Vink and Oertzen (2018) observed that the employees objectified the passengers and stayed focused on their assumptions during these moments. These assumptions were sometimes corrected with questions that employees asked to ensure they were still anchored in reality. van Rijn et al. (2011) observed this behavior also in their study.

4.2. The challenge of quantitatively measuring employees' empathy during co-creation sessions

Aligned with previous studies in engineering empathy education programs (Alzayed et al., 2021; Lunn and Bell-Huff, 2022), we cannot conclude a significant increase in empathy. However, at the individual employee case level, we found the quantitative measure complementary to the qualitative assessment. It shares multiple indicators of empathic difficulties or opportunities for each service employee to empathize with users. This might help design practitioners better understand their stakeholders with whom they must collaborate to shape the service. For instance, an employee with low *Personal experience* with EMPA-D might also need to participate in user research activities inviting the employee to use the service to better understand its user experience. E.g., E.14 takes the train only 2-3 times per month, did not share personal experiences during the workshop, and rated their PE in decrease with EMPA-D.

4.3. Co-creation sessions as an empathic design method for service employees

After discussing our findings, we reflect on the challenges, opportunities, and inconveniences of using co-creation sessions to trigger service employees' empathy.

We noticed similar challenges reported in previous work using co-creation sessions with an empathic approach. Recruiting the employee participants has been one of our first challenges in organizing the workshop. We had to contact the managers of the service employees to recruit them. This might have biased the real motivation of certain employees to participate in our workshops. The time constraint has also made recruiting even more challenging (as noted by Lee et al. (2014)). We had to organize the workshop in the evening after work hours to allow the passengers to participate. Yet, the service employees participate in the workshop outside their normal working hours. Furthermore, the majority of employees participated in a co-creation workshop for the first time. Consequently, they were unfamiliar with the co-creation material and not used to exchanging with passengers in such a context. During the first session, we noticed we had to play the important role of facilitator to make participants feel at ease to participate and settle the right mindset (as recommended by Lee et al. (2014) and Mattelmäki and Sleeswijk Visser, (2011)). As we were not previously in contact with the employees who participated in the workshop, it was difficult for us to anticipate their expectations (noticed by Johnson et al. (2017), Lee et al., (2014)). We saw, as Walther et al. (2020), that some employees expected to learn from users to feed their professional knowledge. As Yuan and Dong (2014) observed mutual empathy between designers and passengers, we coded passengers' empathy towards the employees during a co-creation workshop.

The success of co-creation sessions depends on many parameters difficult to control, as explained by Sleeswijk Visser and Kouprie (2008): personal states like mood and fatigue, empathic ability, attitudes, facilitation style, workshop context and group dynamic (e.g., if people know each other and are in confidence with others). Last, we observed that if co-creation sessions with employees and passengers are interesting to open the dialogue and make the employees aware of the real passengers' perspectives on the service, it might be counterproductive to collect deep passengers' feedback. Employees often tended to explain everything about how the service worked, sometimes interrupting the passengers or monopolizing the floor. Using co-creation sessions to trigger employees' empathy can hardly have the second objective for designers to design solutions from the data generated during the co-creation sessions. We make the same conclusions as Mattelmäki et al. (2011); the outcomes of such an approach are more related to a common understanding than to design. Further, collecting users' data to understand the user experience during co-creation sessions with employees can bias users' expression of their problems, needs, and behaviors. It does not mean both objectives are incompatible, only that these potential biases must be balanced with additional co-creation sessions between designers and users to ensure all the users' topics have been shared.

5. Limitations and future work

This work involves several limitations. First, we considered the co-creation sessions as a whole without a precise design of the activities or the facilitation purposively for empathy. We aimed to investigate empathy in a common setting of co-creation sessions. In the qualitative analysis, we did not consider the moments the employees listened to the passengers, nor did we code facial expressions such as smiles or body postures. Active listening might be another indicator of empathy, yet it was too subjective to code rigorously in this context. Also we asked the employees to debrief on the co-creation session overall and not focus on empathy. Getting employees' reflection on their empathy would have informed further on the potential increase or decrease of empathy due to the co-creation activities and the direct contact with users. Last, the principal researcher (first author) involved in the company as an external UX designer played the role of facilitator in the co-creation session (Lee et al., 2014; Sanders and Stappers, 2008), which might influence some employees' behavior, e.g., asking more questions.

Our statistical analysis should be interpreted cautiously due to our small sample size. Field of study constraints prevented us from getting all our employee participants' responses to our 4-month follow-up questionnaire and identifying the respondents to get a follow-up of empathy evolution. Furthermore, measuring employees' empathy objectively through the EMPA-D scale was a real challenge in this study. Although literature in design explains that direct contact with users in co-creation session support empathy (Sleeswijk Visser and Kouprie, 2008; van Rijn et al., 2011), we did not succeed in proving it through the quantitative measure of empathy post-workshop and even some months later. In the same way as Gaanderse et al. (2022) observed a little increase in curiosity and a better ability to take the perspective of others, we did not find a pattern showing the increase in the *emotional interest* in the EMPA-D subscale. One explanation could be that, at first, the employees declared to be more empathic than they are (potentially self-report instrument bias). After directly exchanging with the passengers, they realized they did not understand them. Consequently, they declared themselves less empathic.

Most prior research on co-creation sessions focused on the participants' empathic behaviors. More work is needed to investigate the empathic barriers elicited through co-creation sessions. Understanding empathic barriers could inform the design process and the empathic mechanism during co-creation as much as the positive empathic attitudes. Also we conducted these workshops with employees participating for their first time in such intervention. Longitudinal research involving several co-creation sessions would inform empathy change in the long term. Last, research in increasing empathy in design is often focused on the design students population. We call for studies in industry context involving employees shaping the user experience. Investigating their empathy towards users would support design practitioners in the development of user-centered approaches within the industry.

6. Conclusion

In this paper, we studied the empathic attitudes of service employees during four co-creation workshops with passengers in the railway service context. Through a thematic analysis, we identified seven empathic attitudes: *emotional interest, perspective-taking, personal experience, self-awareness, prosocial behavior, ideation of solutions, self-reflection*, and three potential empathy barriers: *assumptions about users, self-centered behavior,* and *anti-empathic behavior* (e.g., mocking, judging, blaming). The employees also attached importance to sharing detailed explanations about the service organization. The quantitative measure of employees' empathy using the EMPA-D scale (Drouet et al., 2022, 2023) led to non-significant differences between the pre- and post-workshop measures. However, qualitative analysis shows that for stakeholders without a design background, co-creation sessions encourage beliefs about empathy towards passengers. This paper contributes to deeper knowledge about the dynamics of empathy in exchanges between employees and users in a co-creation workshop in a service design context.

Acknowledgments

The authors thank Prof. Himanshu Verma and Prof. Francesco Viti for their guidance during the project, Sophie Lacour and Tom Nickels for their support at the company, and the employees and passengers who participated in the workshops. Thanks to Kerstin Bongard-Blanchy for her help on this study. We particularly thank Sophie Doublet for supporting the sessions, reporting some findings and peer-reviewing, Margault Sacré for her help on statistical analysis and peer-reviewing, and Isabel Schwaninger for peer-reviewing.

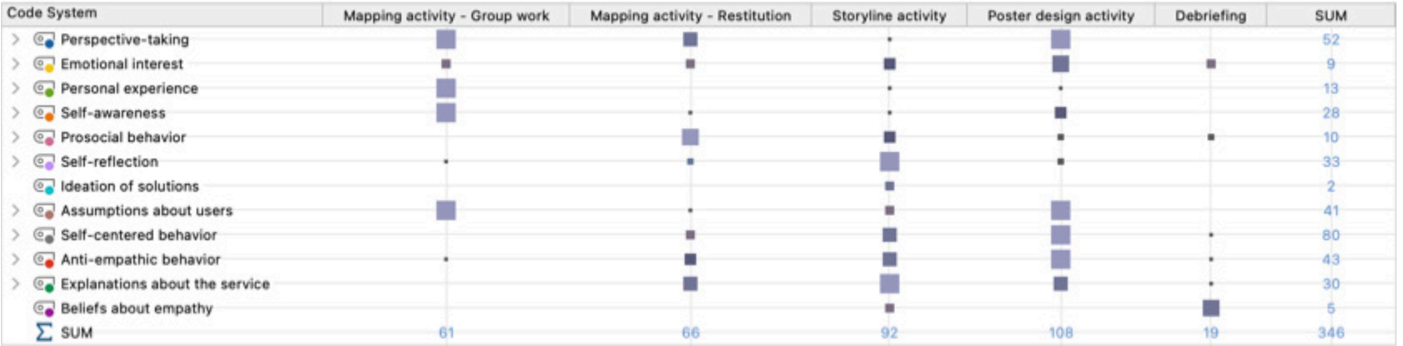
Appendices

Appendix A. Demographics about passengers

ID	Age	Gender	Employment status	Frequency of service use	Overall service satisfaction
P01	25	Woman	I have a professional activity	3-4 times per week	6
P02	33	Man	I have a professional activity	2-3 times per month	10
P03	31	Woman	I am unemployed/looking for work	Once per month	4
P04	35	Man	I have a professional activity	5-7 times per week	9
P05	37	Man	I have a professional activity	5-7 times per week	9
P06	22	Woman	I am a student	2-3 times per month	5
P07	20	Man	I am a student	3-4 times per week	6
P08	32	Woman	I have a professional activity	5-7 times per week	4
P09	30	Prefer not to answer	I have a professional activity	1-2 times per week	5
P10	21	Man	I am a student	5-7 times per week	7
P11	48	Man	I have a professional activity	5-7 times per week	8
P12	30	Man	I have a professional activity	3-4 times per week	6
P13	25	Man	I have a professional activity	1-2 times per week	7
P14	41	Man	I have a professional activity	1-2 times per week	7
P15	27	Man	I have a professional activity	Once per month	6

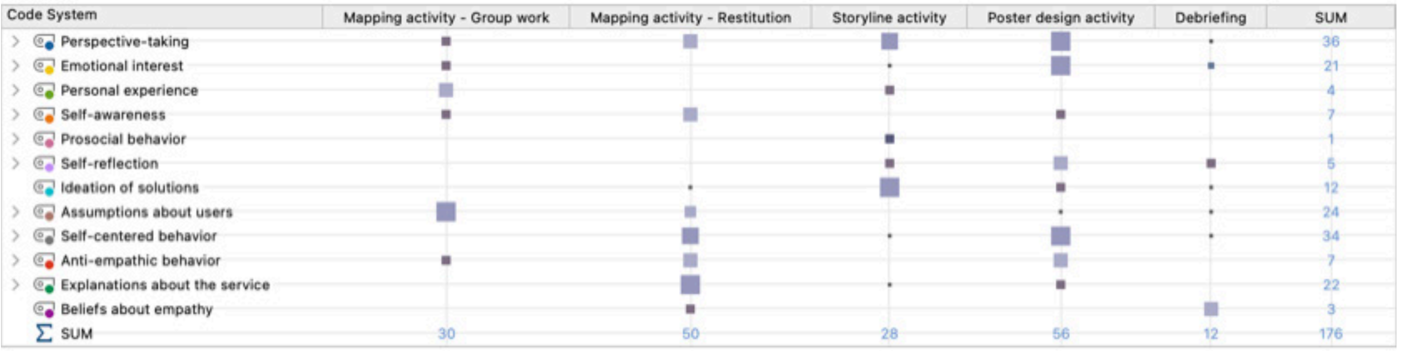
Appendix B. Main coded attitudes throughout the workshop activities per session

Session 1



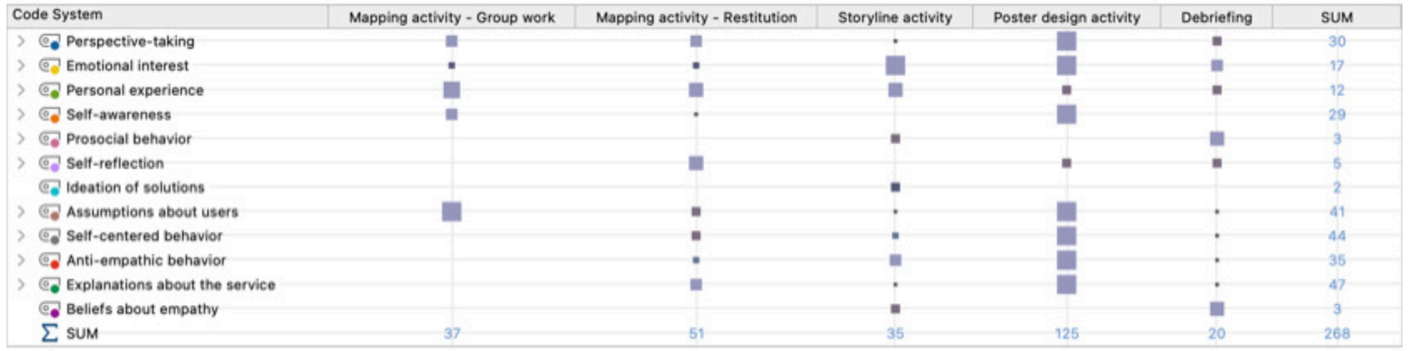
Code System	Mapping activity - Group work	Mapping activity - Restitution	Storyline activity	Poster design activity	Debriefing	SUM
Perspective-taking	■	■	·	■		52
Emotional interest	■	■	■	■	■	9
Personal experience	■		·	·		13
Self-awareness	■	·	·	■		28
Prosocial behavior		■	■	■	■	10
Self-reflection	·	■	■	■		33
Ideation of solutions			■			2
Assumptions about users	■	·	■	■		41
Self-centered behavior		■	■	■	·	80
Anti-empathic behavior	·	■	■	■	·	43
Explanations about the service		■	■	■	·	30
Beliefs about empathy			■		■	5
∑ SUM	61	66	92	108	19	346

Session 2



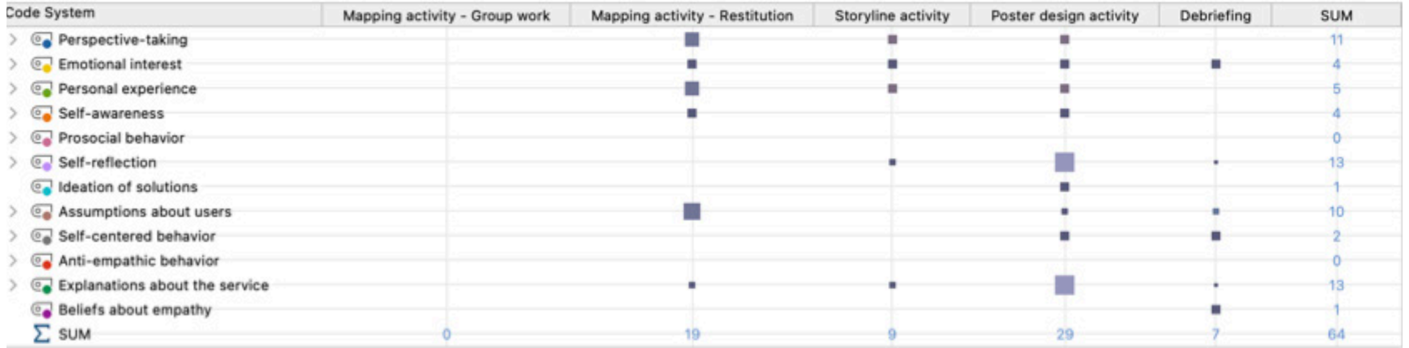
Code System	Mapping activity - Group work	Mapping activity - Restitution	Storyline activity	Poster design activity	Debriefing	SUM
Perspective-taking	■	■	■	■	·	36
Emotional interest	■		·	■	■	21
Personal experience	■		■			4
Self-awareness	■	■		■		7
Prosocial behavior			■			1
Self-reflection			■	■	■	5
Ideation of solutions		·	■	■	·	12
Assumptions about users	■	■		·	·	24
Self-centered behavior		■	·	■	·	34
Anti-empathic behavior	■	■		■		7
Explanations about the service		■	·	■		22
Beliefs about empathy		■			■	3
∑ SUM	30	50	28	56	12	176

Session 3



Code System	Mapping activity - Group work	Mapping activity - Restitution	Storyline activity	Poster design activity	Debriefing	SUM
Perspective-taking	■	■	·	■	■	30
Emotional interest	■	■	■	■	■	17
Personal experience	■	■	■	■	■	12
Self-awareness	■	·		■		29
Prosocial behavior			■		■	3
Self-reflection		■		■	■	5
Ideation of solutions			■			2
Assumptions about users	■	■	·	■	·	41
Self-centered behavior		■	■	■	·	44
Anti-empathic behavior		■	■	■	·	35
Explanations about the service		■	·	■	·	47
Beliefs about empathy			■		■	3
∑ SUM	37	51	35	125	20	268

Session 4



Code System	Mapping activity - Group work	Mapping activity - Restitution	Storyline activity	Poster design activity	Debriefing	SUM
Perspective-taking		■	■	■		11
Emotional interest		■	■	■	■	4
Personal experience		■	■	■		5
Self-awareness		■		■		4
Prosocial behavior						0
Self-reflection			■	■	·	13
Ideation of solutions				■		1
Assumptions about users		■		■	■	10
Self-centered behavior				■	■	2
Anti-empathic behavior						0
Explanations about the service		■	■	■	·	13
Beliefs about empathy					■	1
∑ SUM	0	19	9	29	7	64

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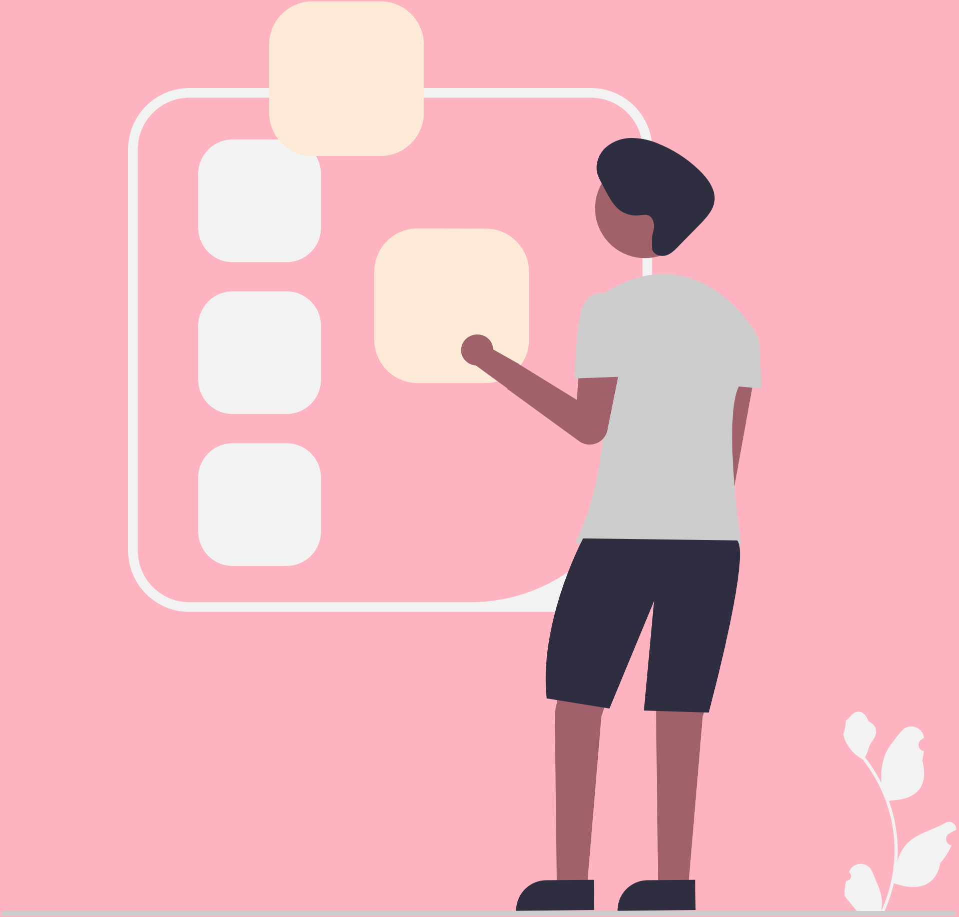
Chapter 5.
Discussion



5

In this thesis, we conducted empirical studies investigating three empathic methods: the physical journey map, the love and breakup declarations, and the co-creation workshops. We investigated the effectiveness of these methods by assessing the empathy they triggered. For this purpose, we used a mixed-methods approach, combining quantitative measures (using the EMPA-D scale) and qualitative measures (e.g., emotional recognition, emotional resonance).

This chapter reflects on the key insights and discusses our research following three primary lenses. First, we propose one mapping of empathic methods. This mapping is a synthesis of methods appropriate to build service employees' empathy. We started to map the methods investigated in this thesis. Then, we expanded the mapping to other known empathic methods. Second, we discuss the implementation of an empathic approach in the industry according to three perspectives: the user researcher, the client, and the method expert. Last, we discuss the relevance of quantitatively measuring service employees' empathy. The two final parts of the discussion are the following publications:

Paper F	Drouet, L., Sleeswijk Visser, F., and Lallemand, C., 2023. Using Empathy-Centric Design in Industry: Reflections from the UX Researcher, the Client, and the Method Expert. In EmpathiCH workshop (EMPATHICH'23), April 23, 2023, Hamburg, Germany. ACM, New York, NY, USA, 9 pages. https://doi.org/10.1145/3588967.3589130
Paper G	Drouet, L., Bongard-Blanchy, K., Lallemand, C., and Koenig, V., 2022. The Measure of Empathy in Design: How Do We Trigger Empathy Among Designers and Beyond?. In EmpathiCH workshop (EMPATHICH'22), April 26, 2022, New Orleans, USA. ACM, New York, NY, USA, 6 pages. https://empathich.com/2022/papers/EmpathiCH2022_paper_2.pdf

This first section of the chapter have been submitted for conference publication after the submission of this thesis. **See the updated version once published** with the following reference:

Drouet, L., Sleeswijk Visser, F., Pagán, B., and Lallemand, C., Towards A Mapping Of Empathic Design Methods.

Towards a mapping of empathic methods

Empathic design literature provides an overall definition and frame for empathic methods. These are defined as user research methods helping designers to get an empathic understanding of users. For this purpose, they embed specific characteristics (Koskinen et al., 2003). These methods aim to look at what people do, ask people to participate, and try things themselves (Fulton Suri, 2003). However, the literature is way less clear about the specific empathic properties of each method, which facets of empathy they contribute to trigger and their effectiveness (Cash et al., 2023). What are the empathic properties of methods like the design probes, first-person methods, and others? What dimension of empathy do these methods develop?

In this section, we put our empathic design interventions into perspective. We define the empathic properties of the main empathic methods used within an empathic approach. We also look at what are the empathic objectives of these methods, to which stages of the empathy process in design (Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019) they relate, and which empathy dimensions they trigger – based on our empathy dimensions measured by the EMPA-D scale (Drouet et al., 2022, 2023). Finally, we also question which profile of service employees is the most appropriate to use them.

These reflections about the empathic method result in a first generalized mapping of the ways of using empathic methods. By providing an overview of the methods used in research to build empathy, a mapping of empathic research methods can support the definition of empathic objectives and the deployment of empathic interventions. This mapping focuses on the properties of each method, considered as mechanisms to trigger empathy. It relies on the categorization and definitions from prior work (Chang-Arana et al., 2022; Fulton Suri, 2003; Koskinen et al., 2003; Lee, 2014; Mattelmäki et al., 2014; Sanders and Stappers, 2008; Smeenk et al., 2019). For researchers, this work paves the way for further research in validating these empathic properties and the dimension of empathy they trigger. These guidelines will help design practitioners choose the methods relevant to their industrial context and needs.

1. Empathic methods

Literature in design mentions several research methods that primarily contribute to empathy building. We presented these key methods in the related work section of the thesis (see Chapter 1, 1.3.). For the sake of understandability, Table 1 repeats from Chapter 1 the definitions of the methods included in our mapping.

Table 1. Key empathic design methods documented in the literature

Empathic method	Definition	References examples
Design documentaries	*"Filmmakers who believe that reality can be captured through neutral observation have adopted a self-explanatory name for their genre: fly-on-the-wall documentaries. The intention of such films is to simply observe without intervention, and thus they permit no interviews, reenactments, film lights, narration, dissolves in the editing, etc."* Design documentaries show behaviors and attitudes without intervention with a neutral observation objective.	Raijmakers et al. (2006)
Cultural/Empathy probes	are kits of creative and suggestive activities used to explore people's lives and experiences in their real context. These kits encourage people to interpret, document, and express their ideas and experiences through the activities. They support the dialogue between designers and people. They aim to inspire designers when reading and looking at the material collected. Probes support the empathic understanding of users as if they were telling their stories directly. The activities include, e.g., filling postcards, taking pictures, drawing, or writing a love letter.	Gaver et al. (1999) Koskinen et al. (2003) Lallemand and Gronier (2018) Mattelmäki (2006) Mattelmäki and Batterbee (2002) Wright and McCarthy (2008)
Role-plays	designate the use of theater techniques to understand and include people's perspectives in a participative approach. The designer plays the user's role in immersing themselves in the experience and pretending to step in the user's shoes. Acting in a role invites one to explore the emotional states of others. It engages the actor to imagine what it is to be like the others.	Chang-Arana et al. (2022) Medler and Magerko (2010) Newell et al. (2006) Pagán (2022) Wright and McCarthy (2008)
Design games	mediate others' perspectives and support empathy. These are usually cards or boarding games but they can also be digital. Their qualities have the potential to impact society: think, for instance, about games that sensitize people to social changes or bullying. Playing a role helps designers to step out of their cognitive process and to experience those of others. Vaajakallio and Mattelmäki (2014) identified four uses of design games: for research to observe people's behavior, *for building design competence*, *for empowering users*, and *for engaging multiple stakeholders*.	Mattelmäki et al. (2014) Papoutsi and Drigas (2016) Vaajakallio and Mattelmäki (2014)
Autobiographical design/ First-person methods	are a form of "design research drawing on extensive, genuine usage by those creating or building the system." (Neustaedter and Sengers, 2012). This is usually the designers' personal experience when using technologies for which they are the targeted users.	Neustaedter and Sengers (2012) Wright and McCarthy (2008)
Simulators	are artifacts that help to simulate others' contexts and behaviors (e.g., elder interactions, dementia). Simulators engage the designers in people's experiences. The simulators can be physical or virtual spaces reproducing specific realities like those of dementia people, elders, or young people.	Chang-Arana et al. (2022) Kullman (2016) Smeenk et al. (2017)
Storytelling methods	are the use of scenarios to convey and communicate people's experience with a product or service. The stories provide rich descriptions of user experience. Narrative techniques facilitate the imagination of others' experiences. Storytelling methods include design tools such as personas, scenarios, and storyboards.	Battarbee in Koskinen et al. (2003) Lallemand and Gronier (2018) Wright and McCarthy (2008)
Participatory, co-design, and co-creative methods	are methods to collect data through collaborative activities with users and designers to generate collective ideas and solutions. Co-creation usually involves workshop sessions, including generative activities focused on making with visual and tactile material. Co-creation happens in an overall co-design process, including the users at different stages of the design process. These techniques are grounded in a participatory design approach, including political and social implications.	Akoglu and Dankl (2021) Sanders and Stappers (2008, 2012) Smeenk et al. (2016) Sustar and Mattelmäki (2017) Yuan and Dong (2014)

2. Models and theories mapping empathic methods

Design literature broadly defines empathic design methods (Fulton Suri, 2003; Koskinen et al., 2003; Lee, 2014). The focus depends on the researchers, for instance, the properties (e.g., Koskinen et al., 2003), the perspectives they support (e.g., Smeenk et al., 2016), or the objectives (e.g., Surma-aho and Hölttä-Otto, 2022). Literature misses a review of empathic design methods. The theories of empathy in design are recent (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019) and too few empirical studies challenge them. Most model mapping methods focus on particular aspects of empathy in design. For instance, Smeenk et al. (2016) focus on mapping methods for novice designers in the Empathic Formation Compass. The compass includes three perspectives-taking and four factors of empathy: *emotional interest*, *sensitivity*, *personal experience*, and *self-awareness*. Dong et al. (2017) establish a system of coordinates on empathy, including cognitive and affective empathy, the subject-oriented, and object-oriented aspects, and the technique and attitude. Sanders and Stappers (2008) define the landscape of design research depending on four axes: *expert mindset*, *participatory mindset*, *design-led*, and *research-led*. Hess and Fila (2016) conceptualize empathy in design through four axes: *self-oriented*, *other-oriented*, *affective experiences*, and *cognitive processes*, and four dimensions: *empathic distress*, *empathic concern*, *self-perspective taking*, and *other perspective taking*. More recently, Sandman et al. (2020) illustrate the different registers of empathy under a parachute symbol. They defined the following four axes; *me*, *others*, *in-depth*, and *distance*.

3. The procedure of mapping empathic methods

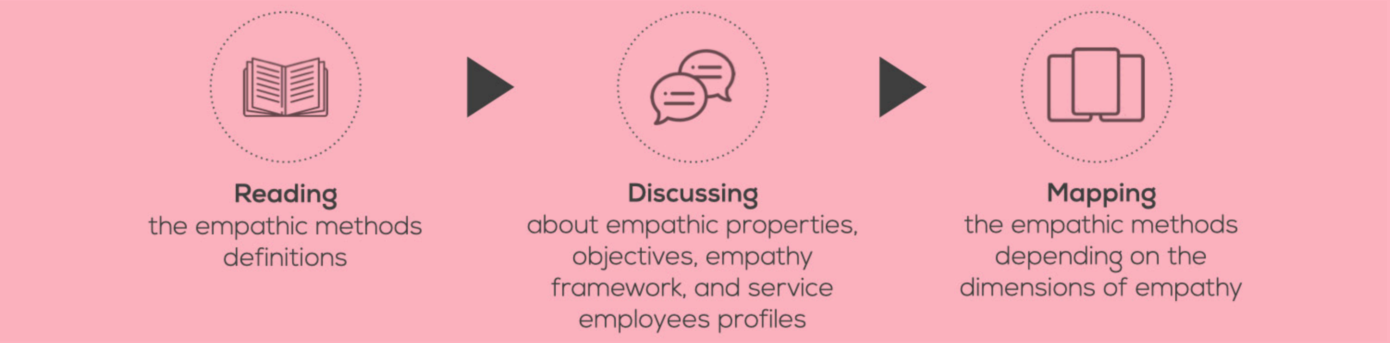
We conducted the mapping of empathic methods during two iterative workshops of 3 hours with N = 5 design researchers and experts in design, methods, and empathy (3 participants in the first workshop and 2 in the second workshop). The workshops included three stages (Figure 1). A similar protocol was conducted during both sessions. However, one group discussed in broad terms all the methods presented in this mapping, and the second group discussed in depth the three methods investigated in this thesis. In the second step, the first workshop also grouped the empathic properties in thematics. The second workshop used and improved the thematics iterated by the first workshop.

First, we asked the participants to read four definitions of the empathic methods (Fulton Suri, 2003; Koskinen et al., 2003; Lee, 2004; Mattelmäki et al., 2014). We invited the participants to take notes and highlight the key elements for them (Figure 2). We also shared with them the definitions of ten empathic methods (see following section 4.1. in Table 2).

Then, we asked the participants to pick one empathic method and discuss its empathic properties, empathic objectives, to which stage of the empathic process they relate, and with which profile of employees would it be possible to use them. The participants could add other empathic properties and objectives. We shared visuals of these methods to help them reflect on each method. Depending on the workshop, the discussion lasted 5 - 30 minutes per method.

Last, the participants ranked the methods between them according to the dimension of empathy they triggered more or less. These dimensions are those of the EMPA-D scale we developed and validated (Drouet et al., 2022, 2023). In this way, it is possible to measure quantitatively the effectiveness of the methods. The methods have been ranked between them on the same line – representing one dimension of empathy. We ranked them from the least triggering one dimension of empathy - represented by a minus, to the most triggering this same dimension - represented by a plus. The minus does not mean that the method negatively triggers this dimension.

Figure 1. Overview of the workshop sessions


Reading
the empathic methods definitions
Discussing
about empathic properties, objectives, empathy framework, and service employees profiles
Mapping
the empathic methods depending on the dimensions of empathy

4. Mapping elements

4.1. Empathic properties and objectives

In the first workshop, we merged, added, and classified 41 characteristics of empathic methods into empathic properties and objectives based on literature. In the second workshop, we refined the empathic properties and objectives to create 34 empathic properties, classified into 13 themes (Table 2) and five empathic objectives (Table 3).

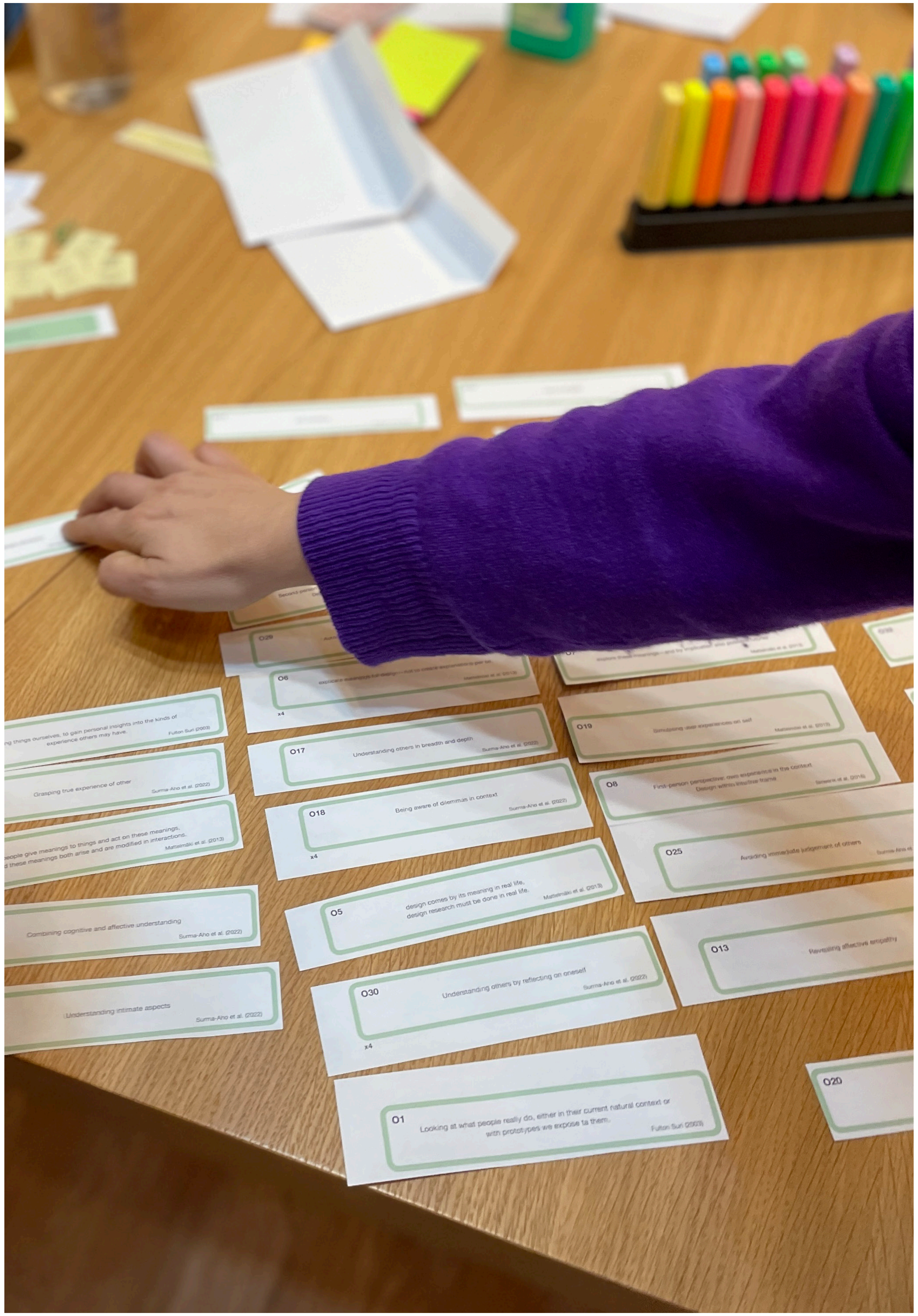
Table 2. List of the empathic properties and their references

Category	Empathic property	Meaning	Based on the references
Resources	Cheap	using cheap cost materials	Koskinen et al. (2003)
	Low tech	using low tech materials	
Experience	Playful and fun	using playful and fun activities	Koskinen et al. (2003)
	Creative	using creative materials	
	Imaginative	supporting the imagination of a future or user experience	
Modality	Visual	using visual materials used	Koskinen et al. (2003)
	Tactile	tactile materials used	
	Others (e.g., sounds)	stimulating other sense through materials like the sounds and hearing (to complete the visual and tactile characteristics defined by Koskinen et al. (2003))	
Orientation	User-centered	focusing on the user experience	Koskinen et al. (2003)
	Designer-centered	focusing on the designer experience (e.g., first-person methods)	Neustaedter and Sengers (2012)
	Society-centered	focusing on the society experience	Manzini (2015)
	Object-centered	focusing on the object experience	Giaccardi et al. (2016) Rozendaal et al. (2019)
	More than human	focusing on the nature experience	Yoo et al. (2023) Vella et al. (2021)
Temporality	Past-oriented	focusing on the past experience	Sanders and Stappers (2012)
	Present-oriented	focusing on the present experience	Sanders and Stappers (2012)
	Future-oriented	focusing on the future experience	Koskinen et al. (2003) Lee (2014) Mattelmäki et al. (2014)
Interpretative		making sense of others' reality	Koskinen et al. (2003)
Understanding level	In-depth	building an in-depth and intuitive understanding of users	Smeenk et al. (2016)
	Intimate	building an intimate and affective understanding with users	Dandavate et al. (1996) Mattelmäki (2006) Su et al. (2017)
	Embodied	supporting an embodied understanding	Marshall et al. (2013) Wilde et al. (2017)
Empathy type	Affective	supporting emotional response	Chang-Arana et al. (2022)
	Cognitive	supporting the understanding process	
Ways to empathize		looking at what user do/say	Fulton Suri (2003)
		asking user to participate	
		inviting to try things ourselves	
Perspective navigation	First-person	showing employees' perspectives	Smeenk et al. (2016)
	Second-person	showing users' perspectives	
	Third-person	showing overall people and society's perspectives	
Context	Reality	happening in real context	Koskinen et al. (2003)
	Simulative	simulating reality	Chang-Arana et al. (2022) Smeenk et al. (2018)
Mindset context	Participatory	involving users	Sanders and Stappers (2008) Smeenk et al. (2019)
	Expert mindset	focusing on employees' understanding	
Design objective	Design-led	designing solutions	Sanders and Stappers (2008) Smeenk et al. (2019)
	Research-led	supporting user research	
	Sensitive-led	supporting sensitive understanding	Smeenk et al. (2019)

Table 3. List of the empathic objectives

Empathic objective	Meaning	Based on the references
Convincing empathy is necessary for impact	supporting empathy and convincing the employees about the empathy value for designing the user experience	*"Believing that empathy is necessary for impact"* (Surma-aho and Hölttä-Otto, 2022)
Informing decision making	sharing users' inputs to inform clearly on decision making	*"Designing solutions with value for others"* (Smeenk et al., 2016) *"Analysis of the research seeks to explicate meanings for design – not to create explanations per se"* (Mattelmäki et al., 2014) *"Using empathic understanding in design decisions"* (Smeenk et al., 2016)
Understanding tensions	revealing the tensions experienced by the users	*"Being aware of dilemmas in context"* (Surma-aho and Hölttä-Otto, 2022)
Understanding intimacy	triggering an intimate connection with the users or getting the feeling of intimacy	*"Understanding intimate aspects"* (Surma-aho and Hölttä-Otto, 2022)
Understanding attitudes	uncovering users' behaviors and attitudes	*"Adopted attitude"* (Chang-Arana et al., 2022)

Yes


O6
x4
O17
Understanding others in breadth and depth
Surma-Aho et al. (2022)
O18
Being aware of dilemmas in context
Surma-Aho et al. (2022)
x4
O5
design comes by its meaning in real life,
design research must be done in real life.
Mattelmäki et al. (2013)
O30
Understanding others by reflecting on oneself
Surma-Aho et al. (2022)
x4
O1
Looking at what people really do, either in their current natural context or
with prototypes we expose to them.
Fulton Suri (2003)
O19
O8
O25
Avoiding immediate judgement of others
O13
Revealing affective empathy
O20
experience others may have.
Fulton Suri (2003)
Grasping true experience of other
Surma-Aho et al. (2022)
Mattelmäki et al. (2013)
Combining cognitive and affective understanding
Surma-Aho et al. (2022)
Understanding intimate aspects
Surma-Aho et al. (2022)

4.2. Empathy framework

We used Kouprie and Sleeswijk Visser (2009)'s and Smeenk et al. (2018)'s empathy frameworks to map the empathic design methods.

Kouprie and Sleeswijk Visser (2009)'s framework includes four iterative stages in building empathy: the discovery (i.e., willingness to understand the users), the immersion (i.e., the action to take users' perspectives and navigate in their world), the connection (i.e., when users' world resonates emotionally with designers' one) and the detachment (i.e., the phase to design for the users with their perspective).

Other frameworks like Hess and Fila (2016) and Smeenk et al. (2018) describe similar phases. Smeenk et al. (2018)'s model highlights five factors of empathy into four dimensions: *affective experiences*, *cognitive processes*, *self-oriented*, and *other-oriented*. The five factors are *emotional interest*, *sensitivity*, *personal experience*, *self-awareness*, and *mixed-perspectives taking* (*first-*, *second-*, and *third-perspectives*).

4.3. Service employees and scalability mapping

In this thesis, we used empathic design methods to trigger service employees' empathy. We, therefore, added to this mapping a category regarding the service employees targeted by these methods. We learned from prior work that the empathic approach needs open-minded participants (Mattelmäki et al., 2014). Furthermore, implementing an empathic design approach inside an organization requires the support of user-centric approach ambassadors (also called allies) (Lallemand and Gronier, 2018; Stickdorn et al., 2018). Thus, we identified three types of service employees: the close-minded (i.e., the employees who do not believe in users' expertise value), the open-minded (i.e., the employees who are open to believe in users' expertise value but are not yet convinced or in the process of being convinced), and the allies (i.e., the employees who are convinced of the value of the empathic approach).

Figure 2. Illustration of the two workshops

In this mapping, we also considered the "scalability" of the methods to get an overview of the application of the methods to individuals, groups, or an entire organization.

Last, we mapped the effect of the methods on these three levels. For instance, an empathic method can be applied to the organizational level and have an effect on the individual level.

4.4. Empathy dimensions of the EMPA-D scale

To compare the empathy dimension the empathic methods trigger, we based the ranking of the empathic methods on the three EMPA-D scale dimensions (Drouet et al., 2022, 2023): *emotional interest and perspective-taking*, *personal experience*, and *self-awareness* (Table 4).

Table 4. The EMPA-D empathy dimensions (Drouet et al., 2022, 2023)

Dimension	Definition
Emotional interest and perspective-taking	The employees' willingness to learn from users, including their interest and curiosity towards users The employees' active, evidence-based, perspective-taking.
Personal experience	The employees' ability to use their personal experience with the service (or one of their acquaintances) to understand users' experience.
Self-awareness	The employees' ability to distinguish between their experience and the users' experience (self/other distinction).

5. Initial mapping

We applied our initial mapping to the three empathic methods we investigated. In this section, we share the empathic properties of each method. Throughout our exchanges, we noticed that some properties were secondary or merely consequences of the main properties. Other empathic objectives were also added to the existing list. The following empathic properties, presented here, focus on the methods' main empathic properties and objectives. We mapped these three methods during the second workshop. We based the choices on our own experience with these methods.

5.1. The physical journey map

The physical journey map method as used in our work (Chapter 4, Paper C), aims to understand users' attitudes (Figure 3). The method is a way to explore users' worlds (i.e., navigation in the journey map) and ideate on solutions (i.e., at the end of the navigation when employees can imagine solutions for improving the service). The method stimulates an expert mindset instead of a participatory one, as the user's voice is told through the installation and not directly shared by the users.

Based on the literature about the empathic methods' characteristics, the playful and fun properties likely trigger empathy. The imaginative and creative aspects help to visualize the users' world. The method is also based on visual, tactile, and audio materials. It stimulates user experiences by synthesizing user insight from user research and making sense of their reality. It illustrates the current user experience and invites the employees to imagine the future user experience. It leads to design solutions. The method is user-centered by telling users' stories and designer-centered by asking the employees to experience the user journey. The method builds cognitive empathy based on the second- and third-perspectives by looking at what the users say and trying indirectly the service experience.

The physical journey map is an interesting method for the service employees to discover and immerse themselves in users' worlds. The last part of the activity, asking the employees to reflect on how they might improve the user experience, allows them to detach themselves from the users' world and ideate solutions from the users' perspectives.

This method is adequate to be used with close-minded employees. The synthesis of user insight might facilitate the empathic understanding of this specific target. The method shares a complete overview of user experience for open-minded employees. The employees' allies of the user-centric approach might be willing to further their empathic understanding with a deeper immersion in the users' world. The method works well with individuals and groups but impacts empathy on the individuals' level. Its scalability at the organizational level seems more complex because of the physical aspect of the method.

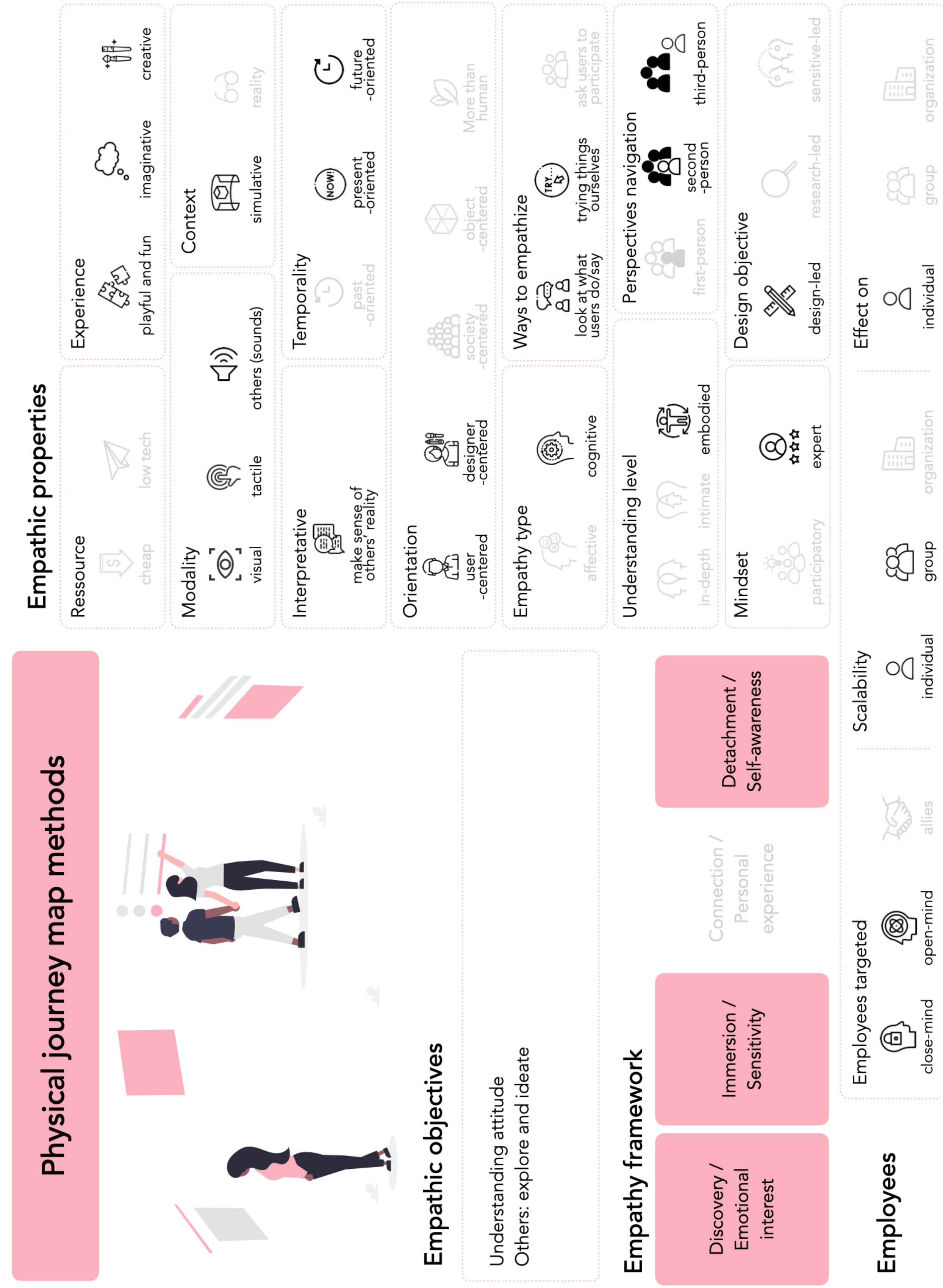

Physical journey map methods
Empathic properties
Ressource
cheap
low tech
Experience
playful and fun
imaginative
creative
Modality
visual
tactile
others (sounds)
Context
simulative
reality
Interpretative
make sense of others' reality
Temporality
past -oriented
present -oriented
future -oriented
Orientation
user -centered
designer -centered
society -centered
object -centered
More than human
Empathy type
affective
cognitive
Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate
Understanding level
in-depth
intimate
embodied
Perspectives navigation
first-person
second -person
third-person
Mindset
participatory
expert
Design objective
design-led
research-led
sensitive-led
Effect on
individual
group
organization
Empathic objectives
Understanding attitude
Others: explore and ideate
Empathy framework
Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness
Employees
Employees targeted
close-mind
open-mind
allies
Scalability
individual
group
organization

Figure 3. Mapping of the physical journey map methods

5.2. The love and breakup declarations

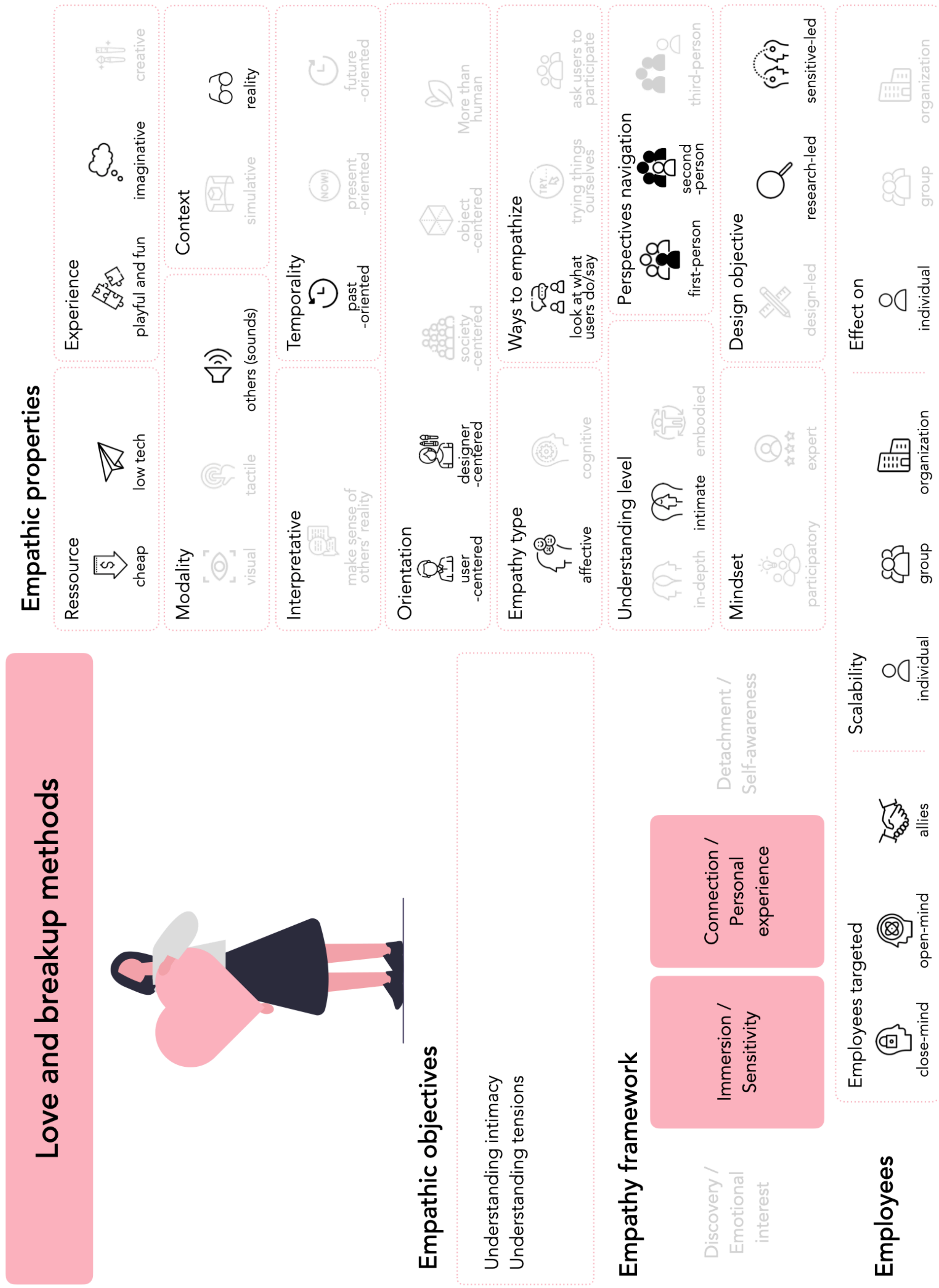
The love and breakup method aims to get the feeling of intimacy with users and understand the tensions faced by the users along their experience with the service (Figure 4). The method also reveals the tensions between users' and employees' perspectives. It leads to research and sensitivity.

The method uses playful, fun, cheap, and low-tech aspects that facilitate empathy building. In the case of love and breakup declarations shared orally, the voices and the users' tones trigger empathy. The employees can imagine the users' experiences by listening to the love and breakup stories. The method is based on the users' real stories and past experiences. Mainly focused on users, the method used as we did in this thesis is also designer-centered (i.e., asking the employees to share their emotional resonance). The method elicits affective empathy and supports an intimate understanding of users by looking at what users say about the service. The employees navigate between the second-person perspective when listening to the love and breakup declarations, and their first-person perspective when reflecting on the emotions they experience while listening to the declarations. However, the method is not interpretative. It is based on raw data not synthesized and thus does not make sense of others' reality. The method also does not focus on a participatory or expert mindset.

The love and breakup method helps the employees to get immersed in users' everyday lives. Asking the employees to reflect on their emotional resonance with users' emotions felt during their experience can also allow them to connect with the users.

The method can be used with close-, open-minded, and allies service employees. The focus on users' emotions and the metaphor of the love relationship can be better adopted by allies who already accept creative and empathic approaches. The provocativeness of the breakup declaration format can discourage close-minded employees from getting an empathic understanding of the users. The possibility to broadcast the declarations to employees during a specific listening session or online facilitates its scalability at the organizational level. However, without group discussion, the method impacts only individuals' empathy.

Figure 4. Mapping of the love and breakup methods


Love and breakup methods
Empathic objectives
Understanding intimacy
Understanding tensions
Empathy framework
Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness
Employees
Employees targeted
close-mind
open-mind
allies
Scalability
individual
group
organization
Empathic properties
Ressource
cheap
low tech
Experience
playful and fun
imaginative
creative
Modality
visual
tactile
others (sounds)
Context
simulative
reality
Interpretative
make sense of others' reality
Temporality
past -oriented
present -oriented
future -oriented
Orientation
user -centered
designer -centered
society -centered
object -centered
More than human
Empathy type
affective
cognitive
Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate
Understanding level
in-depth
intimate
embodied
Perspectives navigation
first-person
second -person
third-person
Mindset
participatory
expert
Design objective
design-led
research-led
sensitive-led
Effect on
individual
group
organization

5.3. The co-creation workshops

Although the co-creation workshop method does not aim to build empathy at first, the direct contact between users and employees participates in this (Figure 5). Co-creation sessions develop an overall understanding of users' intimacy, tensions with the service, and attitudes. The results from co-creation activities inform decision-making to improve the service. The co-creation is a participatory approach leading to research and design.

The usual activities of co-creation workshops are playful and fun, based on low-tech material, and creative in a manner that triggers imagination to understand users' experiences and ideate on solutions. It builds cognitive and affective empathy by looking at what users do and say during the workshop. It also asks the employees to participate in ideating solutions for the service. The co-creation activities focus on reality context and make sense of users' reality. Depending on the activities, the discussions can focus on past, present, and future user experiences. These discussions reveal users' and designers' in-depth and intimate experiences and reflect more general societal questions. Such sessions facilitate taking first- and second-person perspectives.

The co-creation workshops can be applied in the discovery and immersion phases to understand users' perspectives better. It is not appropriate to connect with employees' own experiences. Co-creation workshops are particularly interesting in the detachment phase of the empathy framework to ideate solutions for improving the service.

Organizing co-creation workshops with employees requires time for coordinating each participant's schedule and for the activities' preparation. For these reasons, organizing them at the organizational level is complicated. Small groups are more effective than bigger ones. Such activities could be conducted with close-minded participants; however, their reluctance could demotivate open-minded and allies employees to participate actively in the activities and exchanges with the users.

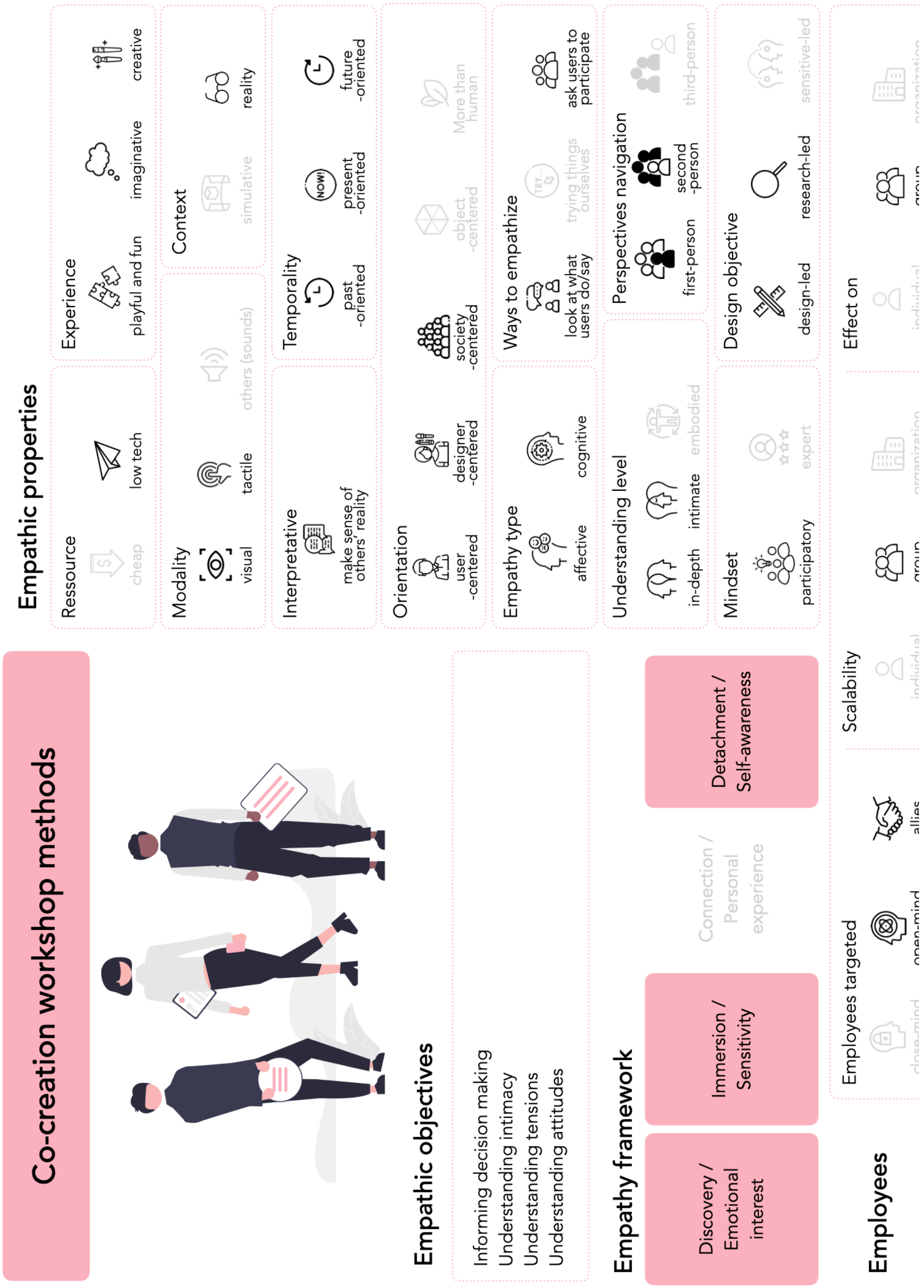
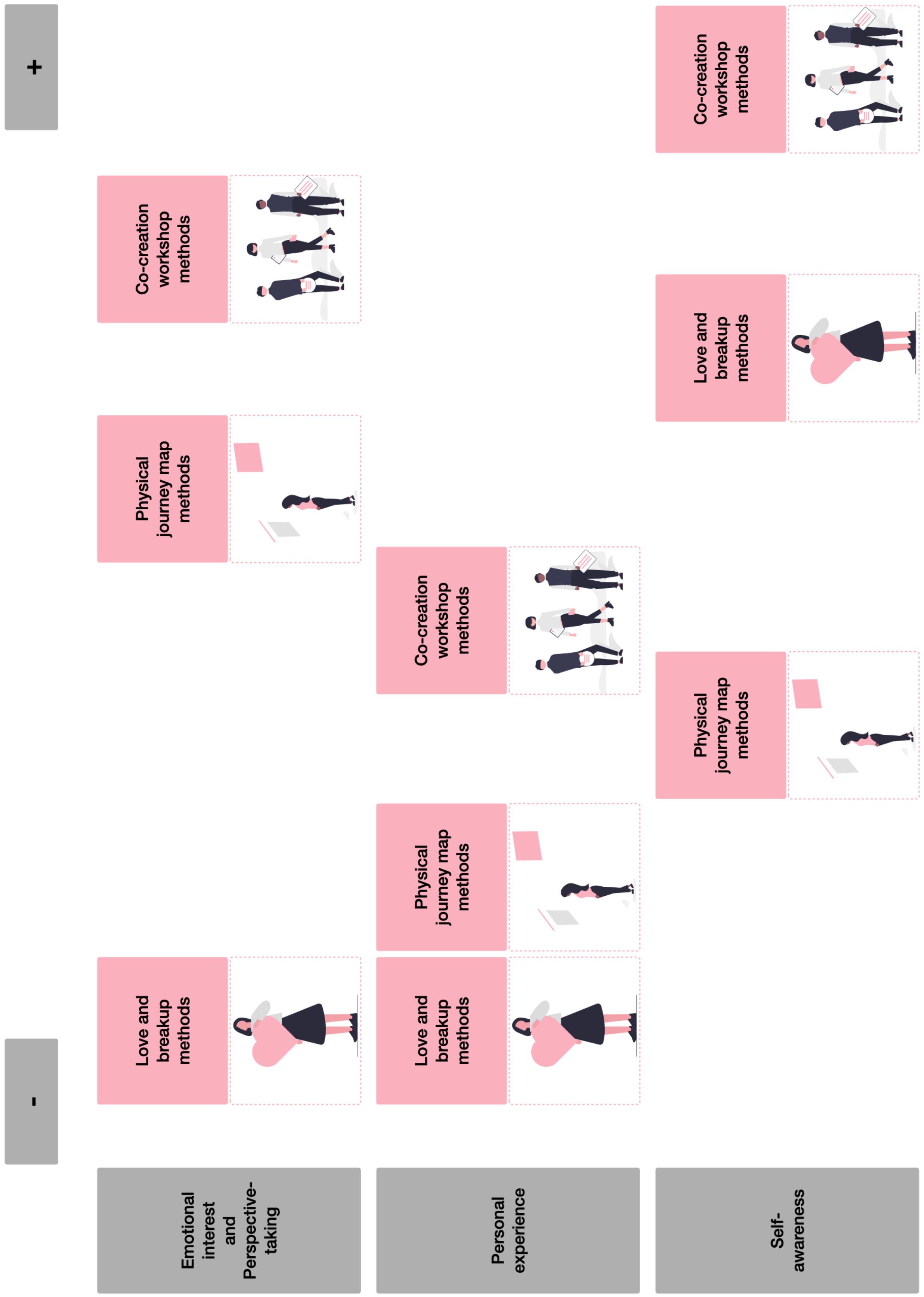


Figure 5. Mapping of the co-creation workshop methods

Co-creation workshop methods
Empathic objectives
Informing decision making
Understanding intimacy
Understanding tensions
Understanding attitudes
Empathy framework
Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness
Employees
Employees targeted
close-mind
open-mind
allies
Scalability
individual
group
organization
Effect on
individual
group
organization
Empathic properties
Ressource
cheap
low tech
Experience
playful and fun
imaginative
creative
Modality
visual
tactile
others (sounds)
Context
simulative
reality
Interpretative
make sense of others' reality
Temporality
past -oriented
present -oriented
future -oriented
Orientation
user -centered
designer -centered
society -centered
object -centered
More than human
Empathy type
affective
cognitive
Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate
Understanding level
in-depth
intimate
embodied
Perspectives navigation
first-person
second -person
third-person
Mindset
participatory
expert
Design objective
design-led
research-led
sensitive-led



+
-
Co-creation workshop methods
Physical journey map methods
Love and breakup methods
Co-creation workshop methods
Physical journey map methods
Love and breakup methods
Co-creation workshop methods
Love and breakup methods
Physical journey map methods
Emotional interest and Perspective-taking
Personal experience
Self-awareness

Figure 6. Ranking of the three empathic methods on the three EMPA-D scale's empathy dimensions (Drouet et al., 2022, 2023)

5.4. Ranking of the three methods on empathy dimensions of EMPA-D

Among the three methods, the love and breakup methods would trigger the least emotional interest and perspective-taking while the co-creation workshop methods the most (Figure 6). This aligns with the observations from our empirical studies. The physical journey map facilitates taking users' perspectives by navigating in the synthesis of their world. However, this synthesis reduced the possibility of fully understanding the users' reality, while through the discussions elicited in the co-creation workshops, they faced others' reality in live.

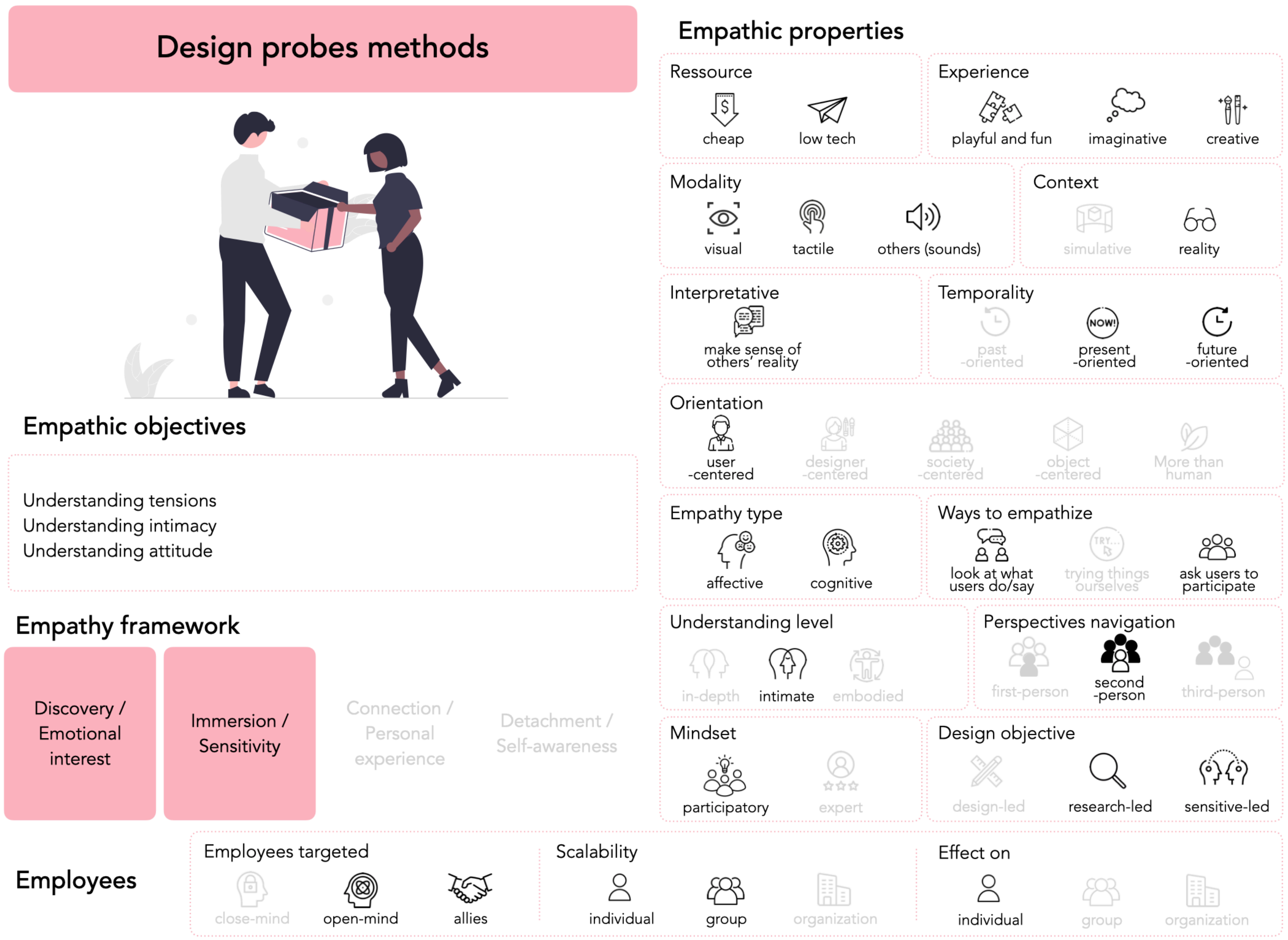
Co-creation workshop method could elicit better personal experiences during the discussions with the users, while the love and breakup methods and the physical journey map methods focus on users' experiences. In the first case, the employees simply listen to users' stories and do not use their personal experiences to understand the users. In the second case, the employees can interact with users' insights. They could recognize themselves in some users' patterns; however, this is not the objective of the method. At the same time, the discussions with the users can invite employees to compare their point of view with users.

The direct exchange between employees and users triggered by co-creation workshop methods seems to better develop the empathy dimension of self-awareness than methods like the love and breakup declarations and the physical journey map. The discussions between the participants reveal the differences between the perspectives resulting in self-awareness.

6. Mapping of other empathic methods

Following the two workshops, the first author and another expert in empathy applied the mapping to seven other empathic method families: design probes, design documentaries, role-plays, first-person methods, wearable simulators, and game designs. We name these methods as "families" to cover the variety of techniques they include. There are many ways of using each of these methods. Thus, they could be mapped differently according to how they are used. We aimed to investigate the potential limitations and improvements of the mapping approach. For this expanded mapping, each researcher mapped the methods individually in the first place. Then, they discussed their choices together to refine the mapping. Figure 7 illustrates the final mapping.

Figure 7. Mapping of the other empathic methods



Design probes methods

Empathic objectives

Understanding tensions
Understanding intimacy
Understanding attitude

Empathy framework

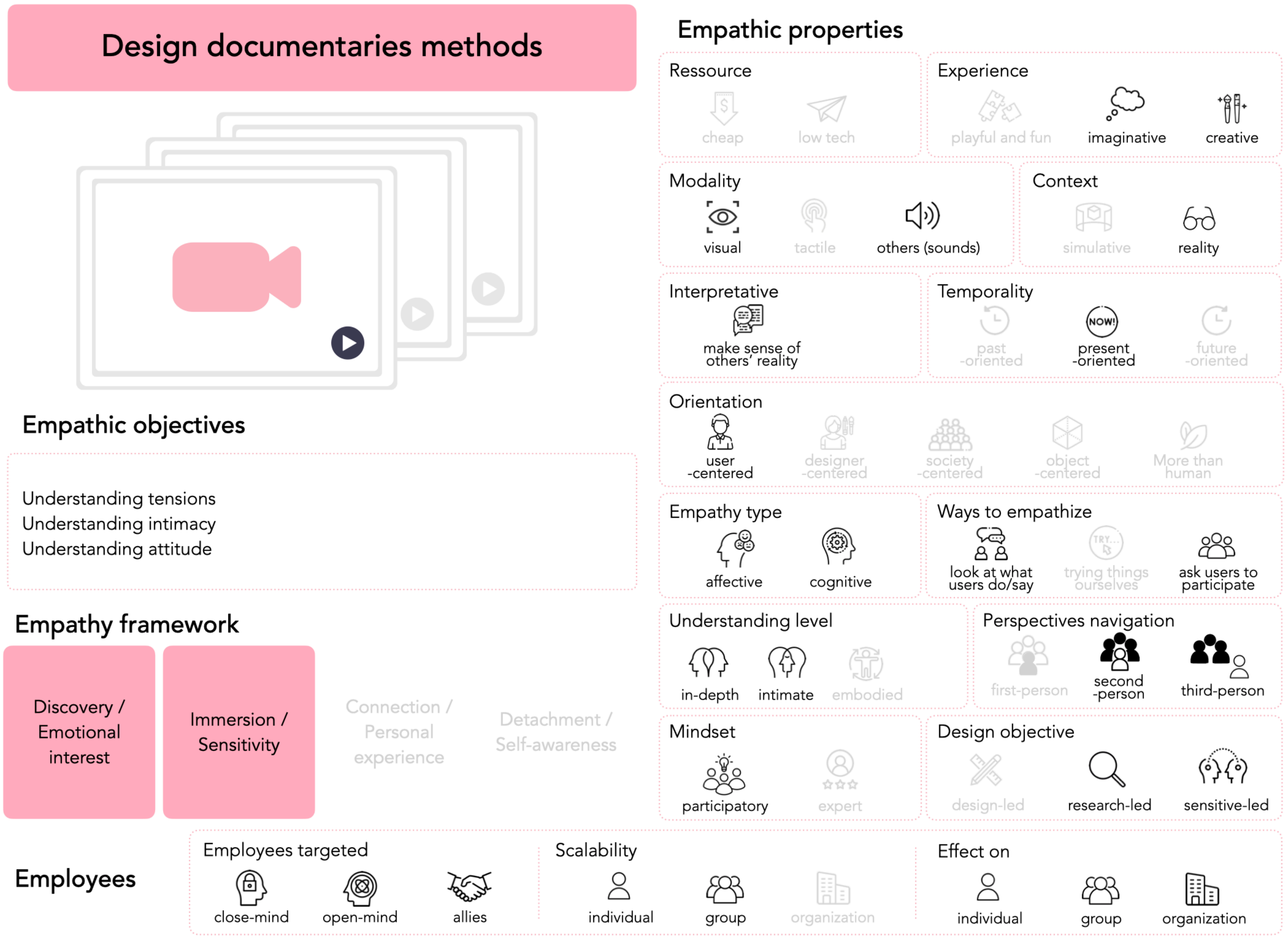
Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness

Employees

Employees targeted: close-mind, open-mind, allies
Scalability: individual, group, organization
Effect on: individual, group, organization

Empathic properties

Ressource: cheap, low tech
Experience: playful and fun, imaginative, creative
Modality: visual, tactile, others (sounds)
Context: simulative, reality
Interpretative: make sense of others' reality
Temporality: past-oriented, present-oriented, future-oriented
Orientation: user-centered, designer-centered, society-centered, object-centered, More than human
Empathy type: affective, cognitive
Ways to empathize: look at what users do/say, trying things ourselves, ask users to participate
Understanding level: in-depth, intimate, embodied
Perspectives navigation: first-person, second-person, third-person
Mindset: participatory, expert
Design objective: design-led, research-led, sensitive-led



Design documentaries methods

Empathic objectives

Understanding tensions
Understanding intimacy
Understanding attitude

Empathy framework

Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness

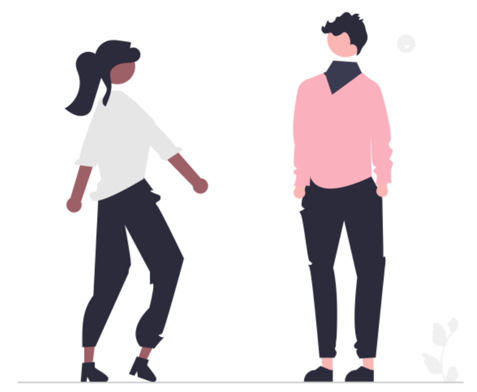
Employees

Employees targeted: close-mind, open-mind, allies
Scalability: individual, group, organization
Effect on: individual, group, organization

Empathic properties

Ressource: cheap, low tech
Experience: playful and fun, imaginative, creative
Modality: visual, tactile, others (sounds)
Context: simulative, reality
Interpretative: make sense of others' reality
Temporality: past-oriented, present-oriented, future-oriented
Orientation: user-centered, designer-centered, society-centered, object-centered, More than human
Empathy type: affective, cognitive
Ways to empathize: look at what users do/say, trying things ourselves, ask users to participate
Understanding level: in-depth, intimate, embodied
Perspectives navigation: first-person, second-person, third-person
Mindset: participatory, expert
Design objective: design-led, research-led, sensitive-led

Role-play methods



Empathic objectives

Understanding tensions
Understanding attitudes
Others: Understanding behaviors

Empathy framework

Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness

Employees

Employees targeted: close-mind, open-mind, allies
Scalability: individual, group, organization
Effect on: individual, group, organization

Empathic properties

Ressource: cheap, low tech
Experience: playful and fun, imaginative, creative
Modality: visual, tactile, others (sounds)
Context: simulative, reality
Interpretative: make sense of others' reality
Temporality: past -oriented, present -oriented, future -oriented
Orientation: user -centered, designer -centered, society -centered, object -centered, More than human
Empathy type: affective, cognitive
Ways to empathize: look at what users do/say, trying things ourselves, ask users to participate
Understanding level: in-depth, intimate, embodied
Perspectives navigation: first-person, second -person, third-person
Mindset: participatory, expert
Design objective: design-led, research-led, sensitive-led

Game design methods

Empathic objectives

Understanding intimacy
Understanding tensions
Understanding attitudes

Empathy framework

Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness

Employees

Employees targeted: close-mind, open-mind, allies
Scalability: individual, group, organization
Effect on: individual, group, organization

Empathic properties

Ressource: cheap, low tech
Experience: playful and fun, imaginative, creative
Modality: visual, tactile, others (sounds)
Context: simulative, reality
Interpretative: make sense of others' reality
Temporality: past -oriented, present -oriented, future -oriented
Orientation: user -centered, designer -centered, society -centered, object -centered, More than human
Empathy type: affective, cognitive
Ways to empathize: look at what users do/say, trying things ourselves, ask users to participate
Understanding level: in-depth, intimate, embodied
Perspectives navigation: first-person, second -person, third-person
Mindset: participatory, expert
Design objective: design-led, research-led, sensitive-led

Wearable simulators methods

Empathic objectives

Convincing the empathy is necessary for impact
Informing decision making

Understanding intimacy
Understanding tensions
Understanding attitudes

Empathy framework

Discovery / Emotional interest

Immersion / Sensitivity

Connection / Personal experience

Detachment / Self-awareness

Employees

Employees targeted
close-mind
open-mind
allies

Scalability
individual
group
organization

Effect on
individual
group
organization

Empathic properties

Ressource
cheap
low tech

Experience
playful and fun
imaginative
creative

Modality
visual
tactile
others (sounds)

Context
simulative
reality

Interpretative
make sense of others' reality

Temporality
past -oriented
present -oriented
future -oriented

Orientation
user -centered
designer -centered
society -centered
object -centered
More than human

Empathy type
affective
cognitive

Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate

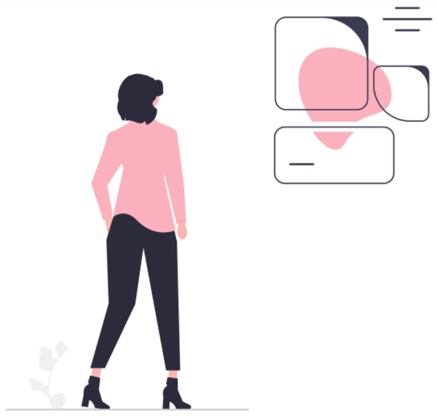
Understanding level
in-depth
intimate
embodied

Perspectives navigation
first-person
second -person
third-person

Mindset
participatory
expert

Design objective
design-led
research-led
sensitive-led

First-person methods



Empathic objectives

Understanding intimacy
Understanding tensions
Understanding attitudes

Empathy framework

Discovery / Emotional interest

Immersion / Sensitivity

Connection / Personal experience

Detachment / Self-awareness

Employees

Employees targeted
close-mind
open-mind
allies

Scalability
individual
group
organization

Effect on
individual
group
organization

Empathic properties

Ressource
cheap
low tech

Experience
playful and fun
imaginative
creative

Modality
visual
tactile
others (sounds)

Context
simulative
reality

Interpretative
make sense of others' reality

Temporality
past -oriented
present -oriented
future -oriented

Orientation
user -centered
designer -centered
society -centered
object -centered
More than human

Empathy type
affective
cognitive

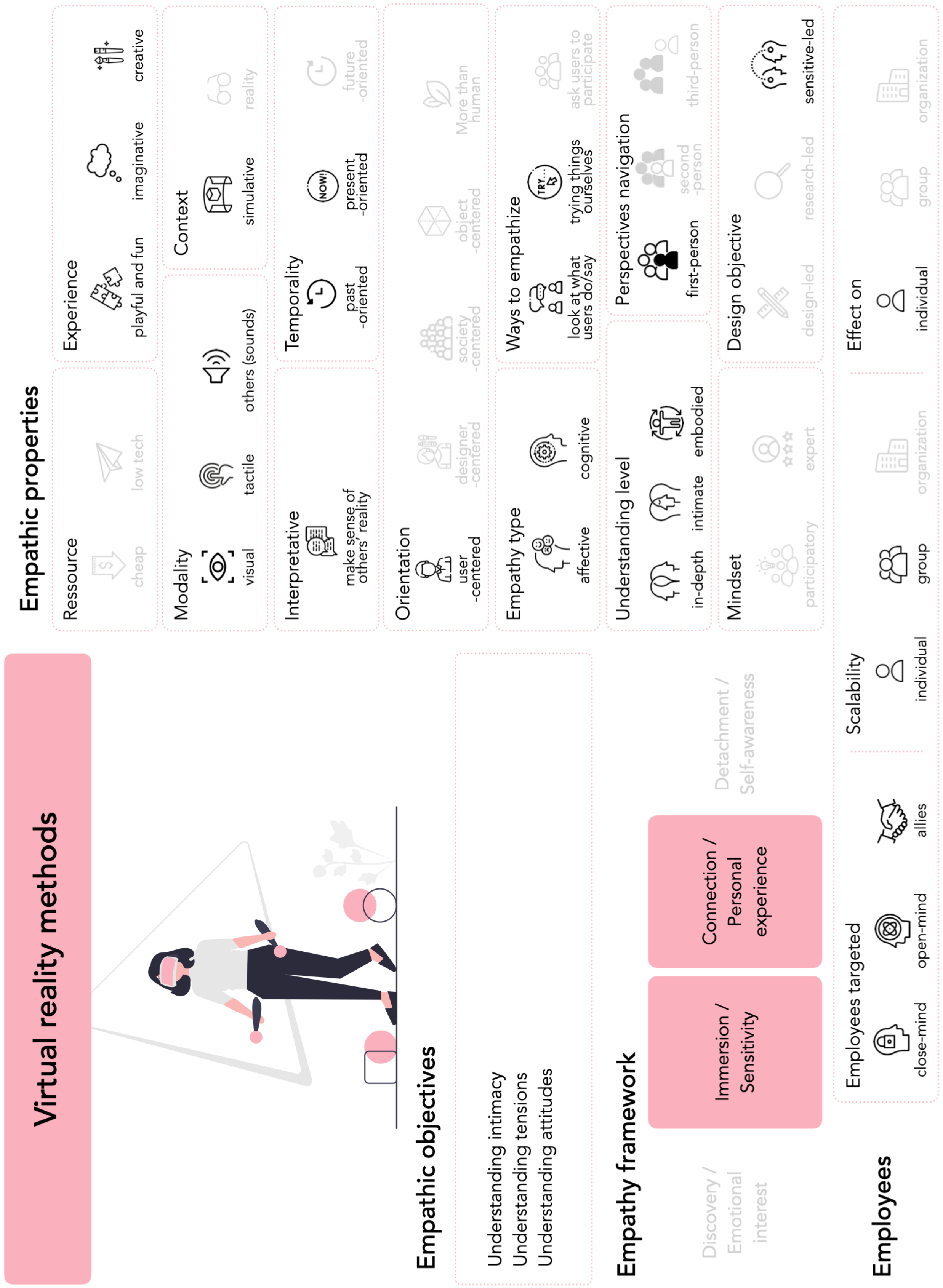
Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate

Understanding level
in-depth
intimate
embodied

Perspectives navigation
first-person
second -person
third-person

Mindset
participatory
expert

Design objective
design-led
research-led
sensitive-led


Virtual reality methods
Empathic objectives
Understanding intimacy
Understanding tensions
Understanding attitudes
Empathy framework
Discovery / Emotional interest
Immersion / Sensitivity
Connection / Personal experience
Detachment / Self-awareness
Employees
Employees targeted
close-mind
open-mind
allies
Scalability
individual
group
organization
Effect on
individual
group
organization
Empathic properties
Ressource
cheap
low tech
Experience
playful and fun
imaginative
creative
Modality
visual
tactile
others (sounds)
Context
simulative
reality
Interpretative
make sense of others' reality
Temporality
past -oriented
present -oriented
future -oriented
Orientation
user -centered
designer -centered
society -centered
object -centered
More than human
Empathy type
affective
cognitive
Ways to empathize
look at what users do/say
trying things ourselves
ask users to participate
Understanding level
in-depth
intimate
embodied
Perspectives navigation
first-person
second -person
third-person
Mindset
participatory
expert
Design objective
design-led
research-led
sensitive-led

7. Ranking the methods on the three EMPA-D scale's empathy dimensions

We reproduced the exercise of ranking the empathic design methods on the three EMPA-D scale's dimensions (Drouet et al., 2022, 2023), including the three previous empathic methods and the seven others. As for the mapping exercise, the first author and the other expert in empathy individually ranked the empathic methods on the following three axes: emotional interest and perspective-taking, personal experience, and self-awareness. They ranked the methods per line from the least to the most triggered dimension. The two researchers discussed their choices and suggested an iterated version in Figure 8. Noteworthy, the ranked methods were considered as "families" rather than applied instances of a method. It sometimes generated discussions between the two experts. For example, the first-person methods is part of the researcher's introspection method, which counts five subcategories, according to Xue and Desmet (2019). The use of design methods also varies according to how it is configured and the context in which it is applied. We split the ranking into three zones to better illustrate the proximity and differences between the methods (Figure 8).

The emotional interest and perspective-taking axis raised the most discussions. For the personal experience axis, the two experts had similar rankings in more than half of the cases. The two experts had an almost perfectly aligned ranking regarding the self-awareness axis. We detail the argumentation points of the experts and the content of their discussions in the following.

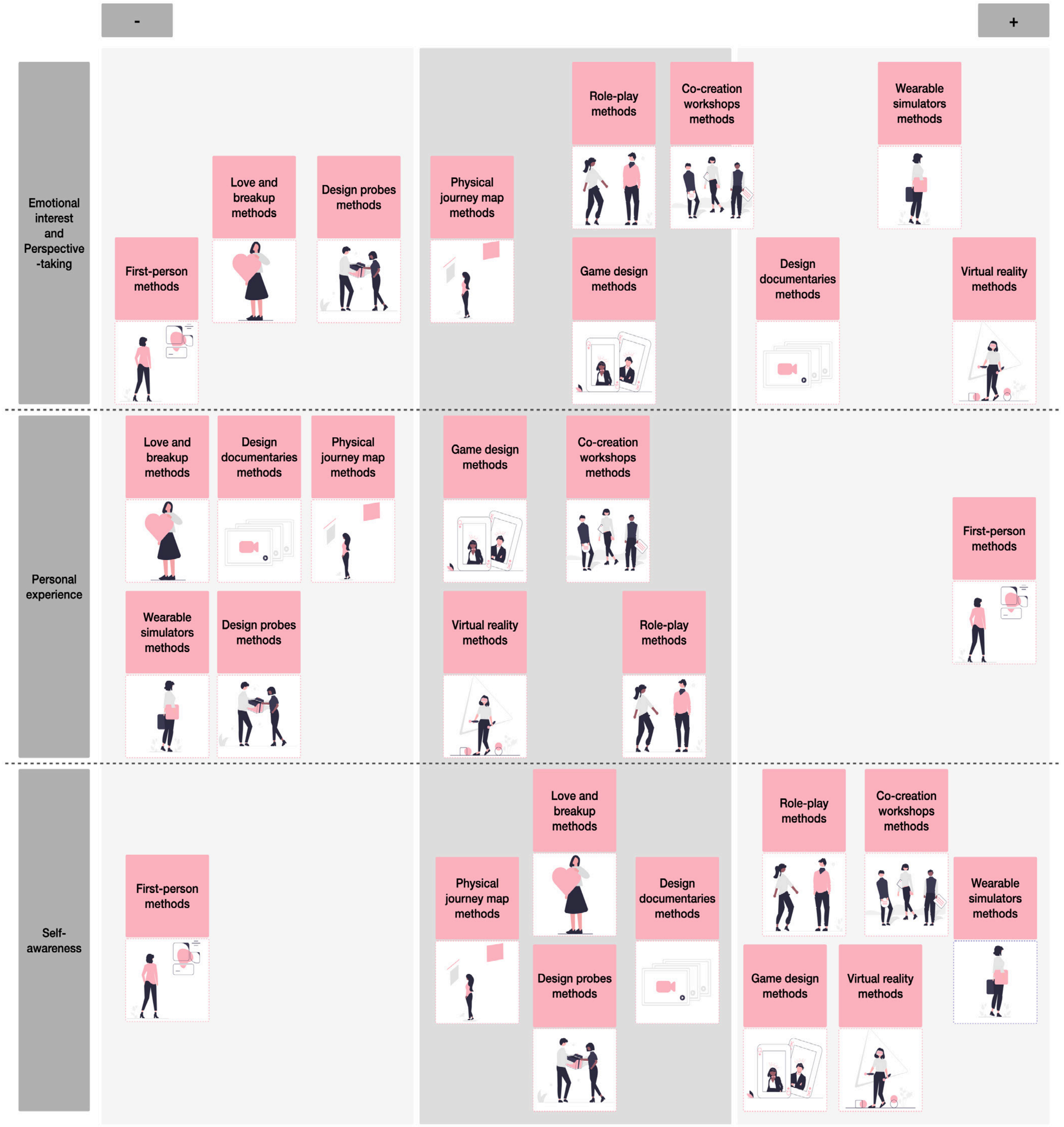
7.1. Emotional interest and perspective-taking axis (EIPT)

The emotional interest and perspective-taking dimension is the willingness to learn from users, including the interest and curiosity towards users. It is also the evidence-based active perspective-taking (Drouet et al., 2022, 2023).

For the first author, the design documentaries could be considered close to the love and breakup methods, with a low EIPT trigger. The design documentaries do not actively invite people to take the perspective of others. In comparison, role-play methods invite people to take others' perspectives actively "by stepping into their shoes."

The second expert however argued that role-play methods being based on fictive perspective-taking and acting out a specific set of situations limited in scope, are thus less able to trigger EIPT as compared to design documentaries (which share real-life stories).

Figure 8. The ranking of the ten empathic methods on the three EMPA-D scale's dimensions


-
+
Emotional interest and Perspective-taking
Role-play methods
Co-creation workshops methods
Wearable simulators methods
Love and breakup methods
Design probes methods
Physical journey map methods
First-person methods
Game design methods
Design documentaries methods
Virtual reality methods
Personal experience
Love and breakup methods
Design documentaries methods
Physical journey map methods
Game design methods
Co-creation workshops methods
First-person methods
Wearable simulators methods
Design probes methods
Virtual reality methods
Role-play methods
Self-awareness
Love and breakup methods
Role-play methods
Co-creation workshops methods
First-person methods
Physical journey map methods
Design documentaries methods
Wearable simulators methods
Design probes methods
Game design methods
Virtual reality methods

Additionally, design documentaries illustrate users' perspectives in a broader way, through multiple modalities and timespans. The audience is looking at users and hearing them in different contexts. The two authors agreed on the value of both arguments. To define the final ranking of the EIPT axis. They assumed (further research would be useful to verify this claim) that empathic methods using fictitious material would trigger less perspective-taking than those sharing users' real stories.

The ranking of the co-creation workshops was also debated. Both authors concurred on the fact that the method allows participants to ask questions to others and set direct exchanges. This reasoning would place the method in the third zone of the ranking. This also aligns with prior work (e.g., van Rijn et al., 2011). van Rijn et al. (2011) concluded that out of three sources of information, direct contact was the most effective to trigger designers' empathy towards users. It is unclear whether these conclusions would similarly apply to non-designer employees. Interestingly, the first author noticed in her empirical study (Paper E) that direct contact in co-creation workshops does not necessarily prevent employees from making many unfounded assumptions about the users. On the contrary, it sometimes seems to stimulate employees to adopt a defensive perspective and stick to their opinions to the detriment of constructive exchanges with end-users.

Methods such as design documentaries, wearable simulators, and virtual reality show observable users' or designers' reality. For the second expert, virtual reality triggers EIPT through immersion even more. Although wearable simulators seem more powerful than VR for simulating situations of disabilities, VR simulates reality.

Both experts believe that design probes trigger less EIPT than the other methods. They argue that the abstract and interpretative aspects of the users' data collected through design probes make users' perspectives less understandable for non-initiated service employees. The physical journey map synthesizing users' data facilitate the understanding of others' perspective.

The role-play and game design methods make the employees participate and actively take the users' perspectives. This is why they are ranked higher on the EIPT axis than methods like the design probes and physical journey map methods.

Last, the first-person methods are self-oriented. They only allow to take the users' perspective when the employees are also users (which is a prerequisite to the meaningful use of first-person methods in design research (Neustaedter and Sengers, 2012)). It triggers emotional interest in a particular topic; however, the employees use their own user's perspectives and are not required to project themselves in others' perspectives. As the navigation between perspectives is usually at the heart of empathic design (Smeenk et al., 2019), there might be opportunities to explore combining first-person methods with other techniques.

7.2. Personal experience axis (PE)

The personal experience dimension is the ability to use one's personal experience with the service (or one of their acquaintances) to understand users' experience (Drouet et al., 2022, 2023).

Both researchers agreed that the first-person methods triggered personal experience the most, as the methods focus on employees' self-experience. Co-creation is placed in the middle area of the ranking. The direct exchange with users elicits personal experiences or relative experiences. Physical journey maps, design probes, love and breakup, and design documentaries methods are placed in the first part of the ranking as they illustrate others' experiences.

The first author grouped the wearable simulators, role-play, game design, and virtual reality in the second part of the ranking considering these methods simulated PE. For the second expert, if the employees' need to use wearable simulators to understand users' experiences, that is probably because they do not have PE in this context. For the other methods, the second expert placed them at the same level as co-creation workshops, thinking that the role-play method could even trigger a bit more PE. When the employees are also users, they can detach themselves from their employees' roles and play their users' roles.

7.3. Self-awareness axis (SA)

The self-awareness dimension is the ability to distinguish between one's experience and the users' experience (i.e., self/other distinction, Drouet et al., 2022, 2023).

For the SA axis, both researchers' reasoning was aligned except for the co-creation workshop method, which is assumed to trigger a bit more SA than the role-play, virtual reality, and game design methods. As shown in Paper E, co-creation workshops can generate friction between each other's perspectives, making the employees aware of their difference. However, it is limited to one moment, in one space, and on one particular problem. Also, the facilitator plays an important role in giving space for each participant to express their differences.

For both experts, the wearable simulators will likely trigger the most SA. The fact of wearing a simulator outfit, for instance, a geriatric simulator (Moore and Conn, 1985) enables one to physically experience a variety of physical and visual challenges, like stooped posture, restricted motion, or glaucoma) demonstrates differences in an embodied and expectedly eye-opening way. On the contrary, the first-person method (self-oriented) was expected to trigger less SA as compared to the other methods ranked.

Physical journey maps, love and breakup methods, probes, and design documentaries are placed in the middle area of the ranking. They make employees aware of their differences with users by sharing users' expressions of their experience or observations of their experience.

8. Discussion

In this section, we mapped ten empathic design methods based on their empathic properties and objectives. We identified in which phases of the empathy frameworks these methods are the most appropriate to use. We also suggested with which service employees the methods can be best used and at which level they can be applied or have an effect. Last, we ranked these methods on the three EMPA-D scale dimensions (Drouet et al., 2022, 2023): emotional interest and perspective-taking, personal experience, and self-awareness.

8.1. The challenges of a single mapping of empathic methods

When designing this mapping, we encountered difficulties identifying the right empathic properties and objectives from the design literature. Little is published on this subject, and there are overall scarce empirical studies validating conceptualization and theories of empathy in design (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019) and empathic methods (Fulton Suri, 2003; Koskinen et al., 2003; Lee, 2004; Mattelmäki et al., 2014). Previous research did not encompass an exhaustive list of potential empathic properties and objectives. For instance, the empathic characteristics mentioned by Koskinen et al. (2003) were limited. Through the two-steps procedure we followed to build our mapping of empathic design methods, we felt the need to add other properties like orientation, temporality, and understanding levels. Except for Smeenk et al. (2019)'s Empathic Formation Compass, other empathy frameworks did not advise on useful methods to support designers in achieving their empathic goals at each phase. Furthermore, the literature falls short in providing guidelines about the audience with which to use the empathic methods (e.g., novices, close-minded, open-minded), the scalability of these methods in industry, and the reach of their effect on employees.

While ranking the methods, we aimed to use a tool reflecting the three dimensions of empathy assessed by the quantitative measure of empathy we developed: the EMPA-D scale (Drouet et al., 2022, 2023). Are some methods specifically suitable to support a specific facet of empathy? For instance, we hypothesize that some methods mostly contribute to developing emotional interest or support perspective-taking. Others could act on the personal experience or rather on the necessary self-awareness and detachment to recognize that the users' experience is different than the one of the service employees experimenting with the method. As the majority of the models (e.g., Dong et al., 2017; Hess and Fila, 2016; Sanders and Stappers, 2008; Smeenk et al., 2016; Smeenk et al., 2018) are represented by axis, similarly we intended to map the empathic methods on the EMPA-D scale dimensions axis. However, the EMPA-D dimensions can meet some overlaps, so we adopted a simple representation of three continuum.

8.2. A tool for discussing and understanding the space of empathic design methods

Our mapping aims to trigger discussion and a novel understanding of empathic design methods. We present here the first iterations of this work, which raise nuances regarding the empathic aspects and objectives of these methods.

We created our mapping on empathic properties and objectives based on the literature. However, we did not use all the properties extracted from prior work, which led to interesting discussions worth sharing with the community.

First, we did not classify any method studied at this stage as object-centered or more than human-oriented. With some adaptations, could we use similar methods to trigger empathy towards objects and nature?

Second, we did not achieve to rank the methods on the "objectives" defined in Table 3. The objectives seemed to apply to all methods or none, depending on one's interpretation of their definition. The objectives extracted from the literature seem not specific enough. More particularly, the objective "Convincing that empathy is necessary for impact" raised debate. Does each method, by default, aim to convince about the value of empathy? Or, do empathic methods, on the contrary, not include any explicit strategy to convince service employees? Being initially created to trigger designers' empathy, one can argue that this audience needs less to be convinced about the value of users' perspective and expertise. Yet, there is a need for methods to convince service employees about the value of empathy in service design (Postma et al., 2012; Walther et al., 2020).

Last, for some methods, such as game design, role-play, and VR methods, their ranking depends on their objectives and scope. Our investigated methods are likely to trigger empathy regarding a particular context and topic. Their scope is thus limited to this specific context. Consequently, the increase of the three dimensions of empathy is also limited to this context. For instance, the perspective-taking elicited by design documentaries is limited to the particular situations shown in these documentaries. Another example is that wearable simulators trigger perspective-taking limited to a specific physical disability.

8.3. A tool for supporting design practitioners in implementing an empathic approach in industry

Practitioners have little time to read design theories and process the findings to get concrete potential applications in their daily work (Lallemand et al., 2022). Thus, we envision mapping empathic methods as a tool to support practitioners' mission of implementing an empathic design approach within their organizations. The mapping aims to guide practitioners in choosing which methods to use to achieve specific empathic objectives. It also highlights the empathic properties of each method to understand their underlying empathy mechanisms. We indicated the service employees audience targeted by the methods, the scalability, and the effect level for practitioners to select the methods depending on their industry context. Last, ranking the methods per empathy dimension of the EMPA-D scale (Drouet et al., 2022, 2023) informs them on which method to use to support which dimension of empathy. By using the EMPA-D scale in parallel, they can assess the employees' empathy and adapt the methods they need according to the observed empathy ratings. For instance, if the employees' lack personal experience (measured through the EMPA-D subscale), the practitioners could deploy first-person methods as an intervention.

9. Limitations and future work

The present work is only a first exploratory step towards mapping empathic design methods. It involves several limitations that should be addressed in future work. Except for the first three methods, for which some participants of the mapping exercise relied on the empirical data collected (yet still from one study only), the methods have been mapped based on assumptions about how each "methods family" might impact empathy dimensions. To refine such a mapping, empirical studies on empathy building should be conducted with all these methods informing their empathic properties and objectives.

Regarding our ranking of the empathic methods on the EMPA-D scale dimensions (Drouet et al., 2022, 2023), quantitative measures of employees' empathy could be done before and after using the methods. The ranking could, therefore, be done on empirical data, with the awareness that each organizational context differs and that a specific method won't produce the same result in different contexts.

The mapping is also conducted at a high level of "families of methods." However, there is rarely such a thing as a "one-size-fits-all" method, and, as we emphasized earlier, the empathic qualities of a specific method also depend on how the method is configured. For instance, the extent to which role-playing or VR can trigger empathy will depend on the scope of the situation in which the employees are placed. This can be limited to a very small problem area or cover multiple contexts of the experience. The mapping thus serves as a guide to decision-making and method configuration for those who consider using empathic methods to trigger service employees' empathy.

As a first step, we completed our mapping exercise with six researchers working on empathy and design methods. Each of them had specific experiences with some of these empathic methods, which guided their evaluation. The mapping, therefore, includes these partial and subjective views on the methods and is accompanied by a short statement of positional. The first and second authors used and investigated the first three methods (physical journey map, love and breakup, and co-creation workshop methods) with the purpose of triggering service employees' empathy. The first author knows the seven other methods in theory but did not use them in practice. The second author is an expert in design methods with experience in designing new methods, adapting existing ones or validating them. In addition to the three aforementioned methods, they had hands-on experience with first-person approaches and role-play methods and an extensive knowledge about the whole set of methods. More nuances could be brought to the mapping if the exercise was done with more expert researchers discussing their choices in a focus group.

This work paves the way for further mapping of the empathic methods based on empirical studies and theories of empathy in design. This mapping is meant to be challenged by design researchers.

10. Conclusion

We mapped ten empathic methods according to their empathic properties and objectives. We defined the service employees targeted by these methods according to their UX and empathy maturity. We also identified the scalability and potential impact of the methods. We also ranked them according to the dimensions of empathy they are likely to trigger. We started the mapping exercise with the three methods we empirically tested with service employees and users (love and break-up declarations, physical journey map, and co-creation workshop methods). We then extended it with seven other methods mainly cited in the literature for their ability to build empathy: design probes, design documentaries, role-plays, first-person methods, wearable simulators, virtual reality, and game design methods. This work contributes to framing the empathic properties of methods. It can be a guideline for practitioners to select methods to spread users' perspectives and develop empathic approaches inside their organizations. This mapping also highlights the need for more knowledge of empathic design methods to understand their empathic properties. We call on the community to challenge it by conducting more studies to understand empathic methods in context.

Acknowledgments

The authors thank Froukje Sleeswijk Visser, Wo Meijer, Sophie Doublet, and Vincent Fourrier for their participation in this work.

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Using Empathy-Centric Design in Industry: Reflections from the UX Researcher, the Client, and the Method Expert

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EmpathiCH workshop (EMPATHICH'23), April 23, 2023, Hamburg, Germany. ACM, New York, NY, USA, 9 pages https://doi.org/10.1145/3588967.3589130

Keywords: empathic design, service design, empathy-centric design, empathic research methods, industry insights, introspection

Abstract

Empathic design provides tools and frameworks supporting designers to understand users' experiences with products or services. However, how does one hand over this empathic understanding of users to other internal stakeholders shaping the service experience? In this contribution, we reflect on a three-year implementation of an empathy-centric design approach in an industrial context with a low user experience maturity from three different professional viewpoints: ours as UX researchers, the one of a company manager, and an expert researcher on empathy in design. These narrative introspective accounts unveil some of the main benefits, opportunities, and challenges of implementing an empathy-centric design approach in the industry. We discuss and confront them prior to work. We contribute to the field of empathic design with rich insitu research insights and principles for a successful empathic approach.

1. Introduction

> *"If the people within the organization do not share the attitude or mindset that is needed for doing empathic design, then the effort is likely to strand."*
>
> (Postma et al., 2012)

Since the 1990s, empathic design methods (Fulton Suri, 2003; Koskinen et al., 2003) and frameworks (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2019) support designers to step into users' world and step out (Kouprie and Sleeswijk Visser, 2009). The empathic design approach aims to deeply understand users' experiences (Dandavate et al., 1996; Leonard and Rayport, 1997; Mattelmäki et al., 2014). Empathy is the art of taking users' perspective: "stepping into their shoes" (Krznaric, 2014), and enables designers to know what users think and feel (Fulton Suri, 2003), as well as what they say, do, and make (Sanders and Stappers, 2012). In the service industry, prior work has documented the positive influence of empathy on service quality, customer satisfaction, loyalty, and forgiveness (Bahadur et al., 2020; Bove, 2019; Marandi and Harris, 2010). Empathic research supports business and innovation objectives such as generating user insights for opportunities, learning and refining ideas and prototypes, and estimating potential solutions (Fulton Suri, 2003).

Design researchers have developed empathic methods for collecting creative and inspiring user insights that support the design of user-centered solutions. However, other stakeholders, like engineers or frontline workers, also shape the user experience of services but have limited skills in design or research. If empathy has a positive influence on the relationship between users and service employees (Wieseke et al., 2012), it seems essential to help these employees to approach users with an empathic mindset. At the organizational level, increasing empathic understanding might lead to more acceptance and integration of user insights in an innovation process. Service industry value is created in use. Consequently, it is easier for a customer-centric driven organization to integrate UX insights (Rutkowska et al., 2020; Verganti, 2009; Yu and Sangiorgi, 2018). According to Patnaik (2009), empathy needs to be *"widespread throughout the large organization."* The author defines principles for companies to develop their empathic approach: hiring their customers, or if not possible, adopting strategies to step into users' shoes. Meeting users face-to-face is key as it triggers emotional memories that will guide companies in the design of their solutions. A successful empathic approach in the industry involves multiple challenges, like switching from a rational approach to an empathic one, turning users into partners, or engaging stakeholders in user research (Postma et al., 2012). Deploying such an approach requires first convincing the company management and involved stakeholders about its relevance (Postma et al., 2012). The stakeholders are then inclined to open their minds and develop an interest in the users' experiences (first stage towards empathy in design (Kouprie and Sleeswijk Visser, 2009)). This creates opportunities to engage stakeholders in user research, in a way that they would envision users as long-term partners with expertise in the service (Wright et al., 2008). However, involving stakeholders in user research requires training their research skills (Postma et al., 2012). Non-experienced people usually focus on part of the findings only, taking into account individual users' problems instead of patterns, and struggle to translate insights into solutions. The ability to take others' perspectives and to switch between perspectives (self/other distinction (Chang-Arana et al., 2022)) throughout the design process is challenging for novices (Surma-aho et al., 2022). Beyond research skills, Manrique et al. (2018) identified six strategies to engage stakeholders in such an approach: managing their expectations, facilitating their understanding of the design process, making them participate, creating a high level of excitement (developing an *"enthusiastic mindset"*), establishing trust in design professionals, and translating users' insights.

In practice, design researchers rely on empathic methods and techniques to establish an empathic approach inside projects and get stakeholders engaged like empathy probes (Mattelmäki, 2006; Mattelmäki and Battarbee, 2002), generative techniques (Sanders and Stappers, 2012), ethnographic and mapping methods (Enninga et al., 2013; Sustar and Mattelmäki, 2017), and co-creation workshops (Akoglu and Dankl, 2021; Sustar and Mattelmäki, 2017). Being able to assess stakeholders' empathy and the effects of specific interventions can be an asset in supporting the success of the empathic approach. The specific challenges related to the measure of empathy in the field have been discussed by Drouet et al. (2022). While empathic design has been developed in academia, design practitioners still lack guidance on how to convey this to- and with- other internal stakeholders. Information on how to successfully implement an empathic approach to conveying user insights/inputs in the industry is limited (Hess et al., 2017; Postma et al., 2012). What should be avoided and what needs to be anticipated in stimulating empathic understanding through involving users or conveying user insights with stakeholders inside companies? More literature on applying empathic approaches inside companies would guide practitioners in designing user-centric services and technologies in closer collaboration with stakeholders. Documenting and reflecting on the hands-on experiences of user researchers and designers with empathic design in various industries would deepen the research understanding of empathy in design.

This paper aims to reflect on the deployment of empathic design interventions within a company with low UX maturity in the railway industry. These interventions focus on "stepping in" the users' world part of the empathic process. Building on work by (Kouprie and Sleeswijk Visser, 2009), this process originally aims to develop designers' empathy towards users through four stages; (1) *discovery*, (2) *immersion*, (3) *connection*, and (4) *detachment*. Our interventions focus on techniques to convey user input and insights to teams in the industry. They act as a way to raise service employees' interest (*discovery* stage) in users and develop an empathic understanding. We offer reflections on these interventions from three viewpoints; our perspective as UX researcher, the client represented by a company manager - and those of an expert in research in empathy. Observations are discussed from their experience, a key theme being the challenge of eliciting interest and a sense of purpose in participating in the empathic process interventions among the employees of the company.

The originality of our contribution lies in sharing a detailed rich description of the resistances that empathic design and user-centric design can encounter in the industry, as well as opportunities and success factors. This paper is conveying an empathy lens to evaluate three interventions in corporate reality. We contribute to the empathic design field by documenting the experience of using empathic design methods with service stakeholders rather than their typical focus on designers' empathy. The insights we share might inspire the research and design community on adapting and renewing empathic research design methods to help other stakeholders involved in user experience than designers to get an empathic knowledge of users. Noteworthy, this contribution does not report each study's findings, documented in previous work or ongoing publications. We first introduce the context of the company and the techniques used in the interventions. We then navigate between viewpoints from the three actors of our project. These introspective accounts unveil some of the main benefits, opportunities, and challenges of implementing an approach to empathetically convey user insights in the industry.

2. Applying an empathic approach in industry

2.1. The railway company context

The studied railway service is an established public company. Over the years, the shift from freight service to passenger transportation required adapting the service offer (e.g., trains frequency), expertise, processes, and company culture. The company recently redefined its service strategy to place the passenger at the center of innovation. With about 4 000 employees, the passenger side of the company mostly includes technicians and engineering professionals. Service quality is represented, but there are no designers and only a few creative profiles working on corporate communication and passenger information. We assessed the company's UX maturity at the start of the project (Nielsen Norman Group, 2021) as "limited" (phase 2), "*UX work is rare, done haphazardly, and lacking importance*" (Pernice et al., 2021). This aligns with the awareness phase of Chapman and Plewes (Chapman and Plewes, 2014): *"the organization may be considering UX design, but applying very little structure around UX activities. Often there is a significant amount of misunderstanding surrounding the real nature of UX design."* The company management viewed their maturity as rather "emergent" (Nielsen Norman Group, 2021), defined as *"a growing belief among the leadership team of the value of design [...] and investments are being made in professional hires"* (Chapman and Plewes, 2014). Despite an awareness of the need to increase UX competencies and to involve the passengers' opinions in their innovation process, the company's UX knowledge is still low. User research is not systematically implemented. There is no UX strategy, nor measures of the results of UX work. Our project paves the way towards a user-centered approach to the service.

2.2. Our Empathy-Centric Design approach

We deployed an empathic approach to convey user input focused on valorizing users' insights and developing empathy towards users inside the organization. Based on the empathic design literature (Fulton Suri, 2003; Kouprie and Sleeswijk Visser, 2009; Koskinen et al., 2003; Leonard and Rayport, 1997), we selected user research methods to collect passengers' experiences. A main requirement was their potential for empathically handovering our findings inside the organization (i.e., conveying empathy through the dissemination of user insights, Figure 1). We used three user research techniques, from the most processed/synthetic to the most direct: (1) a physical journey map (synthesis of user insights), (2) the love and breakup method (Hanington and Martin, 2012) (raw user data), and (3) co-creation workshops based on generative techniques (Sanders and Stappers, 2012) (direct contact with users). These methods embed empathic characteristics (Koskinen et al., 2003): user-centered, visual and tactile, cheap and low tech, playful and fun, interpretative, tested in reality, and creative components (Lee et al., 2014). We also selected the methods according to the opportunities brought by the project and user research needs from the company (e.g., exploring passengers' needs, co-creating information with passengers). To measure the success of our approach we developed the Empathy in Design Scale (EMPA-D) (Drouet et al, 2022), a self-reported measure of service stakeholders' empathy towards users. We administered this scale to the railway employees before and/or after our interventions. We additionally studied the employees' level of empathic ability through empathic accuracy techniques (Chang-Arana et al., 2020), and ad-hoc measures of their willingness to improve the service and their interest in passengers.

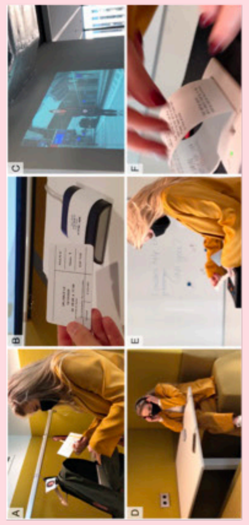
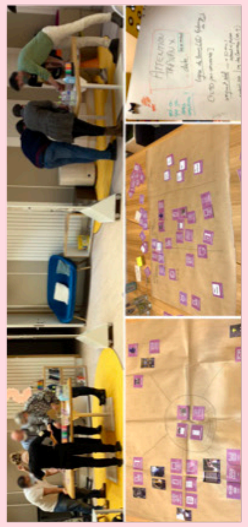
Name of the method	Physical Journey Map	Love and Breakup Method	Co-creation workshop
Illustrations of the design intervention			
User research data used	Synthesis of user insights	Raw user data	Direct contact with users
Objectives	Getting immersed in user insights	Listening to passengers' complaints and praises through a new lens	Involving passengers in the design decisions

Figure 1: A synthetic view of our empathic methods choices

2.2.1. Intervention 1: Interactive showcase of passengers' journeys

Based on existing passengers' feedback collected through satisfaction surveys, previous workshops with users, and customer complaints, we created a multimedia installation showcasing passengers' journeys (Lallemand et al., 2022). As a method, a physical journey map refers to an installation where curated user research data is staged through various mediums and sensory modalities to represent the journeys of the users of a service or a product (Lallemand et al., 2022). The experience was staged to follow the temporal journey of the train passengers (Figure 1). Scanning a ticket, visitors embark on the journey of three passengers, able to discover their identity, follow their actions, hear their thoughts, feel their emotions, and understand their pain points. At the end of the experience, the employees were invited to generate ideas and take action to improve the passenger experience. This physical journey map is a dedicated tool to help employees navigate through passengers' insights and immerse themselves in the passengers' experience. This immersion acts as a mean to convey empathy (Kouprie and Sleeswijk Visser, 2009). The prototype has been developed and showcased to the client. Yet, due to Covid-19, only a virtual version was tested with five employees. The physical prototype version has been tested with five other employees from another railway company (Paper C).

2.2.2. Intervention 2: Broadcasting passengers' love and breakup declarations

We shared passengers' feedback on their service experience with employees (N = 230), as part of a mandatory information session. We strove to trigger empathy towards the passengers by broadcasting six passengers' love and breakup declarations to the service (out of 53 collected). We hypothesized that passengers' emotions elicited by the declarations would resonate with employees and generate empathy. After each declaration, employees filled out a questionnaire about the passengers' emotions. One empathic accuracy exercise (Chang-Arana et al., 2022) consisted in recognizing the emotions expressed by the passengers. Measuring their emotional resonance, we asked employees to select emotions they felt while listening to the declaration. They then reported the main ideas they remembered, and rated their learning, interest, and perceived ability to improve the service. We measured the baseline level of employees' empathic ability using the EMPA-D scale (Drouet et al., 2022) before the session. After the intervention, we used a shorter single-item measure inspired by (Sleeswijk Visser and Kouprie, 2008); "On a scale from 1 to 7, how would you rate your level of empathy* for these passengers? (1 = No empathy, 7 = High empathy) *empathy = putting yourself in the other person's shoes." Finally, we shared a synthesis of user insights introducing the passengers' needs expressed in the declarations.

2.2.3. Intervention 3: Co-creation workshops with employees and passengers

We sought to trigger empathy through direct contact between 15 employees and 15 passengers during co-creation workshops. We used generative techniques (Sanders and Stappers, 2012) to facilitate a dialogue on the specific issue of passenger information during railway maintenance. The workshops entailed two experience mapping activities (mapping the current information devices used by passengers along their journey and how their experience with information could be improved) and the co-design of an information poster. These activities aimed to provoke discussions with the users and to convey empathic understanding through this direct contact. We measured employees' empathic ability before and after the workshop with the EMPA-D scale (Drouet et al., 2022). A few months later we presented the findings to the employees, focusing on users' habits, expectations of the service as well as potential design directions. We asked them to fill out an online questionnaire including EMPA-D and open questions related to what they learned about the passengers, their interest, and their ability to help improve the passenger experience.

To reflect on our journey of implementing an empathic approach in the industry, it is useful to make the assumptions underlying our work explicit. At the start of the project, we expected that: (a) creative and narrative methods would facilitate employees' understanding of passengers' experiences and trigger empathy, (b) the user research methods used by designers could be transferred to stakeholders with similar prerequisites and benefits, (c) a change in empathy could be measured as a result of our empathic design interventions and inform on their effectiveness. The company was at first solution-oriented and expected prototypes and new designs without being interested in user research as a process. The company did not directly see what to expect from the empathic approach.

In the next sections, we rely on our own experiences through three complementary perspectives to illustrate the benefits, opportunities, and challenges of implementing an empathy-centric design approach in the industry. We do not report the findings of each study but focus on the overarching experience of applying an empathic approach in a company.

3. Viewpoint of the UX researcher

In this section, we present an introspective account of our experience leading empathic design interventions in an industrial context. We documented these experiences using written notes and through frequent exchanges with the research team both during the intervention (reflection-in-action) and retrospectively after the intervention (reflection-on-action). This section aims to reflect on our personal experience as researchers, acting as mediators of empathic understanding of users. Designer's personal experiences refer to *"the collections of their individual experiences derived from their direct observation of past real-life events and activities, as well as their interaction with design artifacts and systems"* (Zhang and Wakkary, 2014). Zhang and Wakkary (2014) explains the relevance of such practices in our field and their contributions to technology design.

3.2.1. The credibility of empathic design

A striking moment in the project has been the reaction of a few employees to the passengers' declarations. We imagined that the playful, emotional format of declarations would trigger employees' empathy towards passengers, yet the breakup declarations generated some revolting comments among employees, e.g., "stupid", "seriously?!?" or blasts. The audience was calmer while listening to the love declarations. After the session, participants questioned the reliability of the content presented, "53 interviews is not a lot", "are the declarations stories or real customers' feedback?." Although these reactions were scarce, we felt disturbed to the point of questioning the credibility of our empathic approach. This was fortunately balanced by individual employees' positive messages after our design interventions (e.g., "this is the reality," "thanks for this experience.") An employee recognized us on the train station platform and shared that they had an interesting experience listening to passengers' declarations. Regarding the few negative reactions, the person explained that frontline staff are facing "crazy situations" (e.g., drunk people that frontline staff need to manage) with customers at times. The co-creation workshops did not lead to any comments questioning the technique. Only one employee refused to participate in one activity comparing employees' and passengers' points of view as they did not see the value of the exercise. This anecdote raises questions about the relevance of activities for stakeholders. They participated in our intervention with the expectation to learn something rather than for the sake of interacting with users. This resonates with Walther et al. (2020)'s work on training engineers' empathy: our empathic methods should take into account stakeholders' expectations and teach them that human interaction builds knowledge for their profession. It requires convincing them that direct contact with end users provides valuable knowledge for their innovations (van Rijn et al., 2011).

3.2.2. Stakeholders' engagement

Besides navigating stakeholders' busy schedules, avoiding the pressure to participate was a concern. The company's hierarchical structure imposed us to approach employees through their managers. Attending the declaration session was mandatory. Yet, being present does not guarantee being sensitive or adhering to the approach. The challenge thus lies in engaging the stakeholders in the intervention. 356 employees attended the sessions. Noteworthily, 66 did not give consent to participate in the research. It is hard to know whether this results from concerns about sharing data with researchers associated with their hierarchy, a refusal to engage in the research, or simply a lack of attention to the checkbox in the form. We eventually collected 151 fully completed questionnaires. The research design involved some redundancies and reduced the engagement of the stakeholders. We adapted the protocol after the first sessions, striving for a trade-off between academic soundness and engaging restitution of insights. This echoes (Manrique et al., 2018)'s strategy of creating a high level of excitement all along the approach. The topic of stakeholders' engagement also led us to wonder: to trigger stakeholders' empathy towards users, should researchers first strive to show empathy towards the stakeholders? Once the researcher is recognized as an ally, sharing users' insights becomes easier. The voluntariness of employees to attend such sessions seems like a prerequisite to establishing a trustworthy space where emotional interest and empathy can grow. Then, how do we trigger their interest and curiosity in the first place? In our case, empathic methods seemed to provoke debate among employees. Debate in itself might be fertile ground to change the mindset, leading eventually to empathy. An empathic approach would thus require building relationships with stakeholders first before focusing on the objective of increasing empathy towards users.

3.2.3. Data curation

The curation of which user data extracts to use was a point of reflection. We selected six extracts of passengers' declarations to broadcast, out of 53 full interviews. Similarly, the physical journey map was a showcase of selected information. Which criteria had to prevail? Stronger emotional data to trigger empathy? Frequent or generic issues which would resonate with a large part of employees? Unusual findings to trigger curiosity? Should the representativeness of the aspects raised by passengers matter? We ended up broadcasting a love declaration first, to avoid demotivating stakeholders or creating reluctance. While selecting specific user data to trigger empathy, we wondered to which extent we stayed faithful to the reality of the passenger experience.

3.2.4. Scalability of the empathic approach

Throughout our interventions, we often wondered how to reach a maximum number of employees. While disseminating user research findings from the declarations could be done at a large scale with low cost, co-creation workshops are harder to imagine at a large scale. The time investment felt frustrating compared to the ratio of employees put in direct contact with users. We however thought of this initiative as an experimental testbed, which could be replicated. The stakeholders participating could also possibly become ambassadors of the empathic approach within the company. We invited the client to observe the sessions. If the company envisioned the workshops as mostly solution-oriented, we saw them as a way to initiate awareness around the benefits of user contact beyond pragmatic aspects. More technological interventions such as the physical journey map opened new opportunities but also challenges. On the one hand, the client envisioned using the immersive installation during the training of employees, particularly newly hired ones. The installation would not require the presence of the user researchers. It could be accessed by anyone and raise curiosity thanks to its original format. On the other hand, to stay up to date and continuously feed empathic understanding, the techniques used need to provide up-to-date data (e.g., live stream data instead of archival data in the installation). We thought that the material used needed to be easily accessible and the approach flexible enough to get new stakeholders on board all along the process (e.g., due to the turnover of teams). We also reflected more globally on the implementation of our approach: which techniques to use? and in which order? targeted at which audience? or how to best combine them. In particular, are some techniques more adapted to the context of a low UX maturity than others? For which reasons? Part of our concerns for measuring the empathy level of stakeholders related to this idea of understanding the mechanism behind empathy-building and how specific techniques were instrumental to this endeavor.

3.2.5. Triggering empathy rather than frustrations

In reaction to the declarations, some employees shared judgmental comments about passengers instead of showing understanding, e.g., "Being nice [to passengers] doesn't always pay off", "Take scissors to chop headphones" (to force passengers to listen to audio announcements in trains and stations), "They [passengers] always bring up the same topics." Could empathic methods be counterproductive? Or can it be successful for the majority yet not effective for some? We collected similar answers after the co-creation workshops, e.g., "I have empathy for customers. Unfortunately, empathy is not enough for them." Interestingly the workshops triggered employees' comments related to their own need for customers' empathy, e.g., "I agree with customers but we also have constraints and it is important to accept them too," "the exchange was more humanized" (than exchanging with passengers at the station). During the workshop, some employees also realized that passengers did not understand the designed solutions. The processes of empathy seem to be enhanced when there is a mutual exchange: both parties step into each other's worlds. However, the employees still had the tendency to explain to passengers why the service worked in this way. In both interventions, employees concluded that the solution is to "educate" users of the railway jargon. This is due to the fact that service systems are usually designed from the system perspective: "the service action flow thus goes from the organization to a customer and not the other way round" (Sustar and Mattelmäki, 2017). Isn't the role of the UX researcher above all a mediator or negotiator? To avoid alienating employees with such approaches, UX researchers would need to welcome these comments with a particular open-mindedness and skillfully deconstruct them with facts, e.g., educating 16.6 million passengers per year does not seem realistic - clarifying messages on information displays in stations seems easier.

4. Viewpoint of the client

In this section, we report on the viewpoint of a manager of the company on our empathic interventions. We gathered their perspective through a questionnaire including sentence completions (Lallemand and Mercier, 2022) – "At the idea of using the love and breakup declarations method inside the organization, I expected...," and open questions – e.g., "What are the advantages, limitations, and challenges of using the love and breakup declaration method inside the organization?."

4.1. Strategic use of the collected insights.

The client has been positively surprised by the richness of the passengers' input provided by the declaration method and its relevance. The playful format helped the company to talk about the underlying problems. As explained by Rutkowska et al. (2019), the playful aspect is one of the nine qualities of insights (e.g., inspiring, memorable, experiential) to reach the actionability of design research. An employee later reused the passengers' insights during a strategic meeting and the synthesis of the declarations is used for strategic orientations. The main challenge of this intervention has been to distill insights on passengers' needs from the declaration to get clear and significant messages to share internally.

4.2. Credibility of the findings

Despite interviewing 53 passengers, findings needed to be combined with a quantitative study to validate the insights. The empathic methods deployed were not sufficient to eliminate entrenched beliefs. There are still employees being unreceptive and uninterested in passengers' experience. In particular, the physical journey map method raised questions about the Return On Investment of such an installation and its real impact on frontline employees. The client expressed concerns about employees' reactions, anticipating potential skeptical reactions.

4.3. Scalability of the empathic approach

The love and breakup declarations were memorable to the client, because of the impact they left on the company. During the session, employees laughed out loud in a good mood while listening to passengers. These laughs also demonstrated employees' understanding of issues in the service. The authenticity of passengers' declarations stayed memorable within the organization. According to the client, the co-creation workshops have been an interesting method to confront employees' and passengers' perspectives on the passenger experience. They revealed the gap between the employees' assumptions and the actual passenger experience. It increased employees' awareness of customer needs. Users are involved in the design process of solutions matching their needs. The memorability of the method was however limited to the employees who participated. For others, the presentation of the findings has been less memorable and powerful. Unfortunately, among employee participants or those who attended the presentation, few are still reluctant to users' insights. The challenge lies in knowing how to present findings without demotivating the staff. From the client's perspective, the declaration method seemed more impactful than the co-creation workshop which affected a smaller population within the organization. Does changing a company's mindset and approach require empathy techniques to spread users' insights easily across the entire organization? Both techniques seem relevant and complementary in an empathic approach. One aims to change the rational approach at the organizational level, the other focuses on changing the mindset of a specific team. It echoes the transformative power of techniques to convey user insights described by Rutkowska et al. (2020).

5. Viewpoint of the design expert

We interviewed an external expert with 15 years of experience in empathy in design to put our empathic approach into perspective in a broader design practice, as well as industrial and societal contexts. The expert is a University professor with an Industrial Design Engineering background, also working as an independent designer for the industry and the public sector. Not involved in the presented case study, the expert shared memorable moments around the use of deploying empathic processes within several UX/design projects. They unveiled challenges and good practices from their experiences. Reflecting first on our process, the expert pointed out that our design interventions only stepped into the users' world. However, the empathic approach includes also the act of stepping out of users' world to be able to design with users' perspective (Kouprie and Sleeswijk Visser, 2009). Among the design interventions used, the journey map as a technique seemed the most empathic. By synthesizing user research, journey maps facilitate the appropriation of users' feedback and expertise for novice stakeholders in research. The love and breakup declarations tell raw user stories, which makes the empathic understanding more tedious. Regarding co-creation, its main purpose is not to trigger empathic understanding, but to create a context in which stakeholders participate in the process with users and listen to users' stories, implicitly could develop an empathic understanding.

The expert shared their own experiences with similar projects to put our case study into perspective. A striking memorable moment happened during a three-year project in collaboration with an international company. The main goal was to help the company turn into a customer-centric organization over a period of ten years. Time and budget were allocated to enable user researchers to convey users' insights properly (e.g., a database of videos about users' home visits and organized workshops) and guide product teams in using users' insights to design solutions. While the project was well advanced and the stakeholders (designers, managers, and engineers) seemed well involved in the project, one of the designers made a comment about the users' lifestyle, which illustrated their prejudiced view on users, despite having seen and worked with various user insights. After all the work achieved to improve their understanding of users, how was it possible to stay so narrow-minded? If even design professionals struggle at times to stick to the mindset of empathic understanding, expecting it from stakeholders when first exposed to user declarations seems unrealistic. Favorable conditions should be set to prepare the organization and the individuals to embrace empathic understanding. This includes starting small, explaining the value of this approach, and helping the stakeholders consider users on an equal term.

In contrast, a rewarding achievement happened while working with another company that wanted users' insights for their innovation. The design and strategic teams were happy and involved in the project. The developers' team was invited to join, and voluntarily attended follow-up presentations and workshops about user insights. They became more and more enthusiastic because they could see direct implications and directions for their everyday work. One example is that after a workshop on journey maps of different segments, the developers voluntarily initiated a hackathon to develop prototypes based on these journeys. As compared to the railway company described, the expert notes that an organization with a higher UX maturity is likely to integrate empathic interventions better. Overall, this case demonstrates the necessity of emphasizing that such processes require an open mindset, and a willingness to change perspectives, from those involved.

6. Discussion

In this paper, we documented how an organization with low UX maturity reacted to different interventions in their innovation process to promote empathy towards their users. Similar to Postma et al. (2012) who reflected on the challenges of empathic design at a consumer product company, our work contributes to understanding how the empathic design approach fits within the reality of an industrial organization. We reflected by unraveling three different viewpoints on this case. What do these viewpoints teach us? This case study unveiled the main benefits, opportunities, and challenges of conveying user insights in the industry empathically. It conveys a rich description of the potential resistances that researchers and designers can encounter while using empathic methods with service stakeholders. It also provides insights into the suitability of several empathic methods for corporate reality.

First, this three-year intervention illustrated the inherent inertia of organizations. Conveying empathic understanding requires a careful staging of activities and communication (as done by Postma et al. (2012)), and does not produce immediate observable results at the company's scale. Empathy measurements made during or after each intervention hint at an effect on the employees involved in some dimensions of empathic understanding. Note that it is beyond the scope of this contribution to report on these findings, which are documented in work ongoing publication. Altogether, our three interventions led the company to a first step into the users' world (Kouprie and Sleeswijk Visser, 2009) for the employees participating in the design interventions. These interventions mainly triggered awareness of the value of users' insights but also illustrated challenges around the credibility of empathic design within the company. Similarly to Postma et al. (2012), some employees were hesitant to use and trust our data which led the company to run additional quantitative studies to validate our conclusions. Employees realized the gap between their vision of passenger experience and users' reality. However, not all of them connected with user insights emotionally, and many even struggled to hear and embrace the feedback provided.

At the organization level, the passengers' declarations were described as the most memorable empathic design intervention thanks to the long-lasting impression left (including critical comments) and the wide reach of employees. Comparatively, the co-creation workshops and the physical journey map involved fewer employees. The declarations created a form of empathic understanding, which can be attributed to their narrative qualities (Bal and Veltkamp, 2013). However, the declarations provoked comparatively more debate and the feeling of not reaching a comprehensive overview of the meaning of the findings. This aligns with (Manrique et al., 2018; Postma et al., 2012) showing that raw data is less intelligible for non-researchers. The employees struggle to transfer users' creative input into solutions or actionable inputs. Our physical journey map, as a design synthesis instrument, might mitigate this shortcoming. By facilitating personal connection with the users (Pagán, 2022) and triggering empathic responses, it might inspire new user-centered solutions (Mattelmäki et al., 2014). The direct contact between stakeholders and users during the co-creation workshop raised awareness and self-reflection on the gap between perspectives. Direct contact is known for increasing the quality of user-centered solutions (van Rijn et al., 2011), and hence the employee participating in the workshops later improved their solution based on the user inputs.

In their current state, our interventions paved the way for deepening the employee's emotional interest toward users and willingness to get immersed in their experience (discovery and immersion phases of Kouprie and Sleeswijk Visser (Kouprie and Sleeswijk Visser, 2009)). However, throughout the interventions, we noticed some tensions between the value as perceived by the user researcher and the one seen by the client. This echoes Manrique et al. (Manrique et al., 2018)'s recommendation to manage the client's expectations to engage them in user research. It also highlights a crucial step, which we missed, of introducing to stakeholders the goal of an empathic approach before deploying specific empathic techniques. Aligned with Postma et al. (2012), we believe that this could support a move from 'informing' stakeholders to 'engaging' them.

7. Limitations and future work

Besides the ones already discussed, our empathic approach involved several limitations. While we aimed at reaching as many employees as possible, we have at times lost sight of setting up the open-mindset key to developing an empathic approach (Sanders and Stappers, 2008). Starting with a smaller group of volunteer and open-minded stakeholders could have built a solid core team to deploy the empathic design interventions, which ended up more disparate and dispersed. When using empathic interventions with employees whose attendance is required, it is even more important to clarify the objective of such an approach to anticipate the resistances. Furthermore, as pointed out by the design expert, our design interventions focused mostly on activities stepping into the users' world, overlooking activities for stepping out (in reference to the connection and detachment phases of Kouprie and Sleeswijk Visser (2009)). We thus acknowledge that our findings do not reflect the entire empathy-centric design process with stakeholders. Regarding the generalization of our findings, it would have been interesting to run the same interventions in other companies' contexts to investigate patterns of effects and reduce the subjectivity of our findings. Although our contribution is not grounded in traditional rationalist HCI research, our reflections contribute to the field of empathic design by addressing the need for more designers and researchers' personal experiences research (Zhang and Wakkary, 2014). Mapping empathic design methods according to which empathy characteristics they embed and which effects they produce is an interesting avenue for future work. Such an analytical overview should be supported by empirical studies conducted with an experimental outlook. It would support designers in making informed decisions about which empathy-centric interventions to use in a specific context.

7.1. Principles for using Empathy-Centric Design in industry

Building on our research experience and prior work on empathic design, we summarize some take-away messages and implications for design, which we encourage the community to consolidate in future work. These principles are not to be understood as validated experimental findings, but as the result of an introspective and reflective analysis of a longitudinal field intervention.

7.1.1. Creating a favorable environment

The empathic approach requires a favorable and open-minded environment. Companies willing to adopt such an approach need to be introduced to why design thinking, co-creation activities, and user involvement can be relevant to their business and innovation processes. For instance, companies with a low UX maturity might attempt to collaborate with users without success if they organize product-oriented co- creation workshops instead of basing them on user experience. Such an approach may deliver product ideas but will not develop empathic understanding. To leverage an open-minded attitude from stakeholders, the challenge lies in opening them up and creating the appropriate mental space. This open mindset goes hand in hand with considering users on an equal term. As users are experts in their everyday service and product use, their knowledge needs to be considered valid and legitimate.

7.1.2. Starting small

Facilitating an empathic approach starts with small groups of users and stakeholders. Setting up a plan involving every stakeholder would run the risk to slow down the process (e.g., by continuously postponing the start of user research). Simple techniques aiming to step into users' shoes, such as role-playing, are excellent onboarding steps. At the start, (quantitative) research can be used to back up the first users' insights to increase the approach credibility perception of the stakeholders.

7.1.3. Sustaining the empathic approach

The key to sustaining an empathy-centric approach lies in emphasizing the value of empathic understanding for the company (e.g., business and innovation) and for the stakeholders (e.g., counting on users' expertise). The main strategy to convey the "why" is to share best practices, successful examples, and business stories. User research led to this solution that generated millions of revenues. Nonetheless, one should prevent stakeholders from believing that initiatives are limited to product-oriented thinking. The empathic understanding of users requires stepping out of the stakeholders' professional role to engage and connect with users' emotions. It is not expected for stakeholders to go as far as a user researcher would, but simply to experiment with the empathic approach and grasp its meaning. Empathy is not a simple check-off task but implies a continuous process of connecting with others varying with the contexts.

7.1.4. The empathic approach is not a substitute for user research

The integration of user insights is key to user-centered innovation. A crucial part of user research is guiding stakeholders in the sense-making of the users' input, and the fact of taking the perspectives of end-users of the products and services they provide. Empathic understanding is one aspect supporting a smooth user insights integration, yet it should not be seen as a holy grail within organizations. The empathic approach is solely a part of user research but does not replace other relevant techniques. Involving a variety of profiles is needed, including some that mainly focus on solving complex technical problems while others focus on humans. Both approaches feed on each other. The user researchers remain guarantors of ethical and critical research all along the process.

8. Conclusion

In this paper, we synthesized reflections about empathy-centric interventions conducted in an industrial context within the past three years. We presented and discussed three different viewpoints on this case study: our perspective as UX researcher, the client represented by a company manager, and those of an expert in research in empathy. Through this contribution, we deepened the understanding of empathic approaches' challenges and limitations when deployed in a company. We derived principles that can support designers willing to implement an empathy-centric design approach in a company. The insights we share might also inspire the community to adapt and renew empathic research design methods in order to help the service stakeholders, beyond designers, to get an empathic understanding of users.

Acknowledgments

We would like to thank Sophie Lacour, Tom Nickels, and the Luxembourgish Railway Company CFL for supporting this project. We are also grateful for the support received from various stakeholders within the company during the past 3 years. Thank you also to Sophie Doublet for her contribution to some analyses and reporting tasks, and to Kerstin Bongard-Blanchy and the HCI research group members for the continuous fruitful exchanges on this project.

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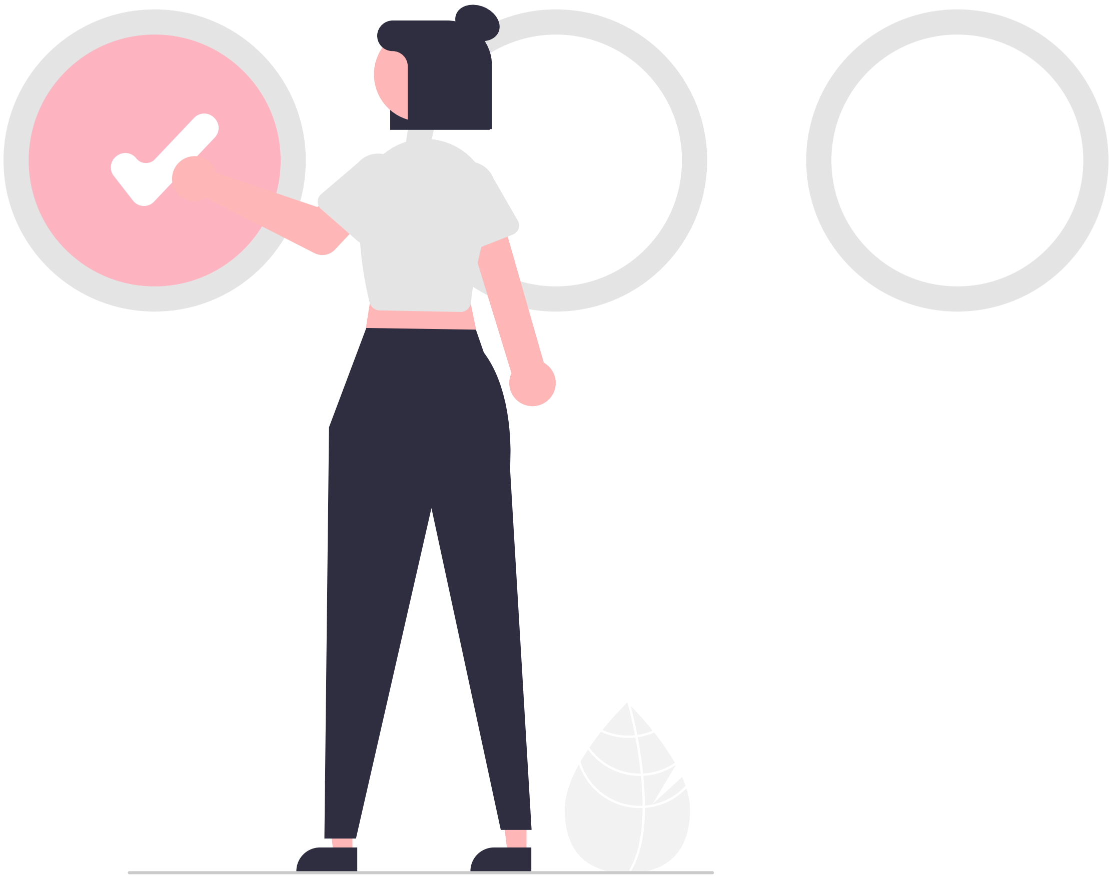

The Measure of Empathy in Design: How Do We Trigger Empathy Among Designers and Beyond?

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EmpathiCH workshop (EMPATHICH'22), April 26, 2022, New Orleans, USA. ACM, New York, NY, USA, 6 pages. https://empathich.com/2022/papers/EmpathiCH2022_paper_3.pdf

Keywords: empathy, empathic design, empathic methods, measure, service design

Abstract

Research in UX and design positions empathy as a key factor of a successful user-centered approach, supported by the emergence of empathic design methods. However, there is a dearth of empathy measurement tools to investigate the actual ability of design methods to trigger empathy among designers and beyond within organizations. For service stakeholders, a measurement tool would facilitate understanding the value of empathy for breaking silos in the organization and delivering high-quality services and products. The Empathy in Design Scale aims at measuring the impact of empathic design methods within an organization. In this paper, we share our preliminary work on triggering and measuring service stakeholders' empathy (e.g., service employees) in the context of a national railway service. We discuss the added value and limitations of a standardized measure of empathy and its implications to bring the field forward with new perspectives and opportunities.

1. Introduction

Design research identifies empathy as one of the key factors of the user-centered design approach (Dong et al., 2017; Wright and McCarthy, 2008). Building empathy towards the end-users allows designers to gain a more comprehensive understanding of the users' journey and overall experience (Knight, 2019; Liu et al., 2018). The expression "empathic design" emerged in the 1990s (Devecchi and Guerrini, 2017). This approach is described as having the potential to spark innovation (Leonard and Rayport, 1997). Empathic design relies on empathic methods that look at what people do, ask people to participate in the design process, and encourage designers to try things themselves (Fulton Suri, 2003). Many of these methods are now commonly applied in user research, like the generative methods (Sanders and Stappers, 2012). According to Lee (2014) and Leonard and Rayport (1997), these methods help designers better empathize towards users. They aim to inspire them and support the ideation of solutions (Kouprie and Sleeswijk Visser, 2009). Moreover, they can be used to trigger other service stakeholders' empathy (Lallemand et al., 2022).

While design literature claims the importance of empathy and develops empathic methods to be used in the design process, few studies only (e.g., Sleeswijk Visser and Kouprie (2008); van Rijn et al. (2011)) include an empirical measure of empathy to validate the effectiveness of these methods (Drouet et al., 2022). How can we know what we do not (really) measure? Why does the field lack specific measurement tools to examine whether empathy was effectively triggered and to which extent? In industry, the investment in user research and in-depth exploration of users' needs is not taken for granted and professionals often need to prove the added value of empathic approaches. Organizations hence valorize Key Performance Indicators (KPI) and Return On Investment (ROI) (Bias and Mayhew, 2005; Moran, 2020) to guide decisions. The undisputed value of qualitative user research methods seems insufficient to overcome these difficulties, especially in organizations with lower user experience (UX) maturity. How can we convince such organizations that empathic methods will support them in designing user-centered oriented solutions in the long run?

A key part of UX maturity relies on the involvement of all relevant stakeholders within an organization in user-centered processes. As pointed out by Kalbach (2017), such a process should not be limited to frontline personnel only. Every employee in a company must empathize with the end-users of their products or services. Empathic methods have the potential to support the involvement of everyone by creating personal connections and helping people within the organization to understand the impact of their daily work on the customer experience. Yet here again, which empathic methods are best suited to diffuse a user-centered culture to an entire organization? How can we scale up the use of these methods to allow a level of co-ownership within a company? How can we empirically measure the impact of interventions using empathic methods in order to showcase the value of empathic design methods to organizations?

To address the questions and consolidate previous research work on developing empathic approaches within industrial contexts (Mattelmäki and Battarbee, 2002; Patnaik, 2009; Postma et al., 2012; Sanders, 2009; Sleeswijk Visser and Stappers, 2007), we focus on assessing whether empathic methods actually generate empathy in stakeholders like service employees. Through an industrial partnership, we are deploying several empathy methods in a railway company (see section 3), which aims at increasing its UX maturity by raising awareness for user experience among its employees. These methods are interventions designed to generate empathy. In order to assess the impact of these interventions, we are developing an Empathy in Design Scale (EMPA-D) to serve as a standardized quantitative empathy measurement tool (Drouet et al., 2022). The scale items are based on four dimensions of empathy in design (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2018). We consider empathy measurement in a design process as (a) a relevant and useful metric to establish a baseline of the UX maturity and user-centered practices in an organization, (b) a way for designers to empirically measure the impact of their interventions at the scale of an organization in a cost-efficient manner, (c) a mean to showcase the value of empathic design methods to organizations, grounded in empirical data, and to potentially lead to a higher commitment for the user-centered approach. Based on these indicators, the organization can devise targeted interventions to increase all employees' empathy with the users.

In this contribution, we introduce our approach using empathic design methods to develop employees' curiosity and empathy towards users as part of the design process. We discuss the opportunities and rationale behind assessing empathy more broadly among various stakeholders within an organization, beyond the usual boundaries of the design team.

2. The current state of empathy in design

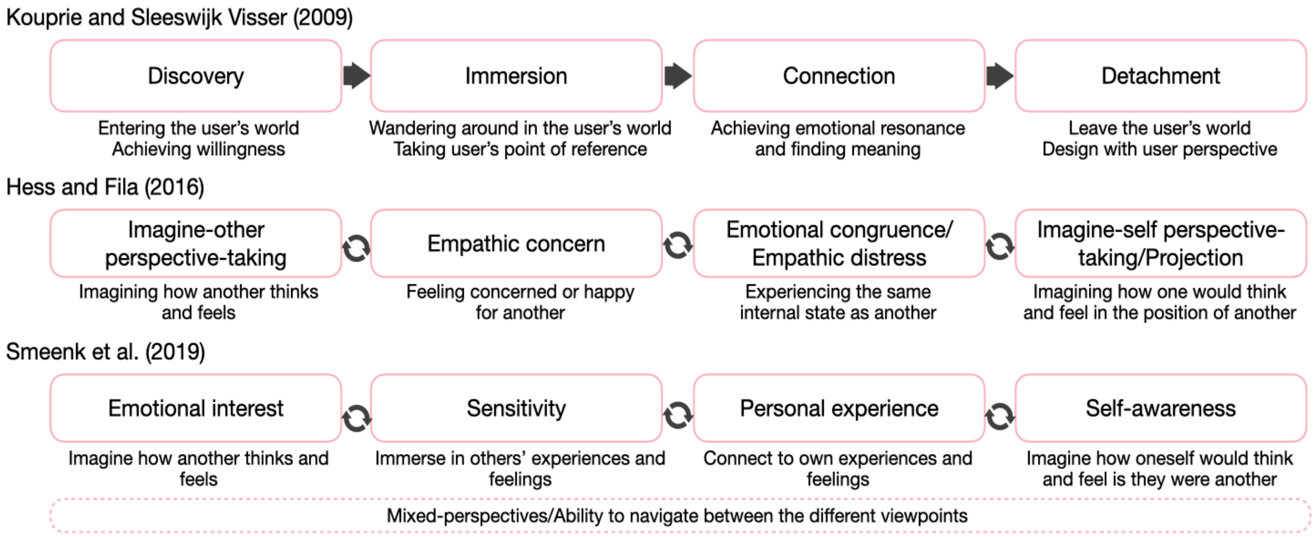
Design research bases its understanding of empathy on philosophy, psychology, and neuroscience. It defines empathy through various concepts (Dong et al., 2017; Drouet et al., 2022): cognitive (i.e., "to understand another's feelings") vs. affective (i.e., "the experience of emotion, elicited by an emotional stimulus" (Cuff et al., 2016)), empathy vs. similar emotions (e.g., sympathy, compassion, tenderness or pity (Becker, 1931; Gibbons, 2019)), trait of personality (i.e., some people being more empathic than others (Cuff et al., 2016)) vs. state (i.e., empathy is a state of mind that people can control and modify (Hodges and Biswas-Diener., 2007)). For Kouprie and Sleeswijk Visser (2009), empathy starts with the willingness and motivation to understand the users.

The role of empathy in the design process has been acknowledged by HCI and experience design literature (Dong et al., 2017; Koskinen et al., 2003; Surma-aho and Hölttä-Otto, 2022; Wright and McCarthy, 2008) as well as among practitioners (Dalton and Kahute, 2016; Icons8, 2019; Kumar, 2017). Empathy supports the engagement towards the users to better understand their experiences and perspectives (Dalton and Kahute, 2016; Devecchi and Guerrini, 2017). The notion of empathic design emerged in the 1990s with Leonard and Rayport (1997) arguing that empathic design sparks innovation. It employs methods and techniques allowing designers to immerse themselves in the user experience, enhance their understanding of their users' experience, and get inspired for designing suitable concepts instead of simple intuitions (Drouet et al., 2022; McGinley and Dong, 2011; Tellez and Gonzalez-Tobon, 2019). Fulton Suri (2003) classifies empathic methods according to three different goals: looking at what people do, asking people to participate, and trying things ourselves. These are aligned with Sanders and Stappers (2012)'s design principles to get an empathic understanding of what people say, do, or make. Koskinen et al. (2003) define the characteristics of empathic methods: *visual and tactile, deliberately cheap and low tech, interpretive, playful and fun, tested in reality, and targeted at the fuzzy front end*. Lee (2014) adds that empathic methods should include creative components. In reality, multiple design methods may qualify as empathic methods, as for instance:

- making the users' voice accessible to the design teams and other stakeholders through tools that synthesize the users' experience (e.g., personas or journey maps (Lallemand et al., 2022)),
- enabling immersion in the users' world (e.g., design probes (Gaver et al., 1999; Mattelmäki and Battarbee, 2002)),
- using multimedia supports to share raw data (e.g., convivial toolbox (Sanders and Stappers, 2012) or video-documentary (McGinley and Dong, 2011)), and
- prototyping or roleplaying to experience the users' point of view (Makki, 2020).

Surma-aho and Hölttä-Otto (2022) define five categories of approaches to empathy in design: *empathic understanding* (i.e., understanding of others' experiences), *empathic design research* (i.e., methods used to understand others' experiences), *empathic design action* (i.e., user-centered conception and generative methods), *empathic orientation* (i.e., designers' "*conscious preference for a human-centered evidence*"), *empathic mental processes* (i.e., processes by which designers are empathic towards users). Three frameworks (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2018) are generally cited (Figure 1) to represent the empathic process in design.

Figure 1: Synthesis of the main frameworks of empathy in design and their overlaps (Drouet et al., 2022)


Kouprie and Sleeswijk Visser (2009)
Discovery
Entering the user's world
Achieving willingness
Immersion
Wandering around in the user's world
Taking user's point of reference
Connection
Achieving emotional resonance
and finding meaning
Detachment
Leave the user's world
Design with user perspective
Hess and Fila (2016)
Imagine-other perspective-taking
Imagining how another thinks and feels
Empathic concern
Feeling concerned or happy for another
Emotional congruence/ Empathic distress
Experiencing the same internal state as another
Imagine-self perspective-taking/Projection
Imagining how one would think and feel in the position of another
Smeenk et al. (2019)
Emotional interest
Imagine how another thinks and feels
Sensitivity
Immerse in others' experiences and feelings
Personal experience
Connect to own experiences and feelings
Self-awareness
Imagine how oneself would think and feel is they were another
Mixed-perspectives/Ability to navigate between the different viewpoints

These theories and frameworks of empathy in design offer new perspectives for measuring empathy. However, to the best of our knowledge, there are no design-specific tools to date (Drouet et al., 2022). The design field mainly uses psychology scales to measure empathy, such as the Empathy Quotient (Baron-Cohen and Wheelwright, 2004) (e.g., used by Sleeswijk Visser and Kouprie (2008)). In service design, the service quality tool SERVQUAL (Parasuraman et al., 1988) is commonly used and includes a few items labeled as empathy. There is a small number of studies measuring designers' empathy during the design process, for instance Chang-Arana et al. (2020)'s investigation of empathy accuracy in an early-phase design and ideation task. Given the lack of a specific empathy measurement tool in design (Chang-Arana et al., 2020), the authors resort to common design methods adapted to assess empathy as in Chang-Arana et al. (2020), Sleeswijk Visser and Kouprie (2008), and van Rijn et al. (2011). Despite the relevance of these approaches, they might not meet industrial needs. Furthermore, existing work majorly focuses on the empathy of the designers towards users rather than addressing empathy-building in a larger frame involving other stakeholders in an organization. Empathy measurement tools should be further developed and consolidated to bring the field forward with new perspectives and opportunities (Surma-aho and Hölttä-Otto, 2022).

3. Our approach to empathy development and measures in design

According to Roto et al. (2020), designing a service implies *"a holistic approach used to orchestrate the whole service journey considering customers, service providers, and other relevant stakeholders."* Involving employees in a design process can make them ambassadors of a user-centered culture (Lallemand and Gronier, 2018). Holistic empathy-building research has been done in this direction by Mattelmäki and Battarbee (2002), Patnaik (2009), Postma et al. (2012), Sanders (2009), and Sleeswijk Visser and Stappers (2007). Yet how can we judge the effectiveness of a design intervention relying on empathy? What are the tools at our disposal to establish a baseline before the intervention and a measure of the outcomes of the intervention? To judge the effectiveness of an empathy design intervention, we argue that the following points need to be addressed: (a) establishing a baseline to start from in a given service design context, (b) measuring the impact of deployed design methods on the level of stakeholders' empathy after the intervention and a few months later. Additional measures related to empathy can complement the process. Our research is part of an industrial research project on passenger experience with a railway company. In this context, we have the opportunity to investigate the previous points in an industrial field.

We aim to trigger service stakeholders' empathy towards users through empathic design methods to facilitate the adoption of a user-centric approach inside service companies supporting design decision-making and to support the designers' teams. Table 1 presents the methods we are currently deploying within the organization.

To prove the effectiveness of the methods deployed at a large scale, we are developing a standardized scale of empathy in design. Our preliminary 18-items Empathy in Design Scale (under development (Drouet et al., 2022)) includes four dimensions, based on key frameworks of empathy in design (Hess and Fila, 2016; Kouprie and Sleeswijk Visser, 2009; Smeenk et al., 2018): *Emotional interest/Discovery* (EI), *Sensitivity/Immersion* (S), *Personal experience/Connection* (PE), *Self-awareness/Detachment* (SA). The Empathy in Design Scale will be used for measuring railway service stakeholders' empathy before and after empathic interventions. In addition to the scale, we will use a common qualitative analysis approach to assess and double check the true empathy increase. The participants' discussions generated during the design interventions will be analyzed to detect language elements that reveal the employees' empathy towards the passengers.

Table 1. Description of our approach and ongoing studies

Staging passengers' journey maps under the form of a physical installation (Lallemand et al., 2022)
By synthesizing and making accessible users' raw data, journey maps support building empathy within an organization (Kaplan, 2016). We introduce physical journey maps as physical installations staging user research data and insights through various mediums and sensory modalities to represent the journeys of the users of a service or a product (Lallemand et al., 2022). We designed XPressia, a physical and interactive journey map, staging the experience of railway passengers. Through this immersive installation, employees interact with various data showcasing passengers' experiences in order to develop their sensitivity towards passengers. A call-to-action invites employees to ideate solutions to improve the service and supports the awareness and co-ownership of their role in the passenger experience.
Co-designing the future of a railway service
Collaboration and direct contact with the users can generate an empathic understanding of users' experiences (Sanders and Stappers, 2012). We asked railway employees and passengers to ideate on the future experience of passenger information and co-design an information poster. While designing the service with users, employees received direct user experience inputs pertaining to the part of the service experience designed. It facilitated how employees could envision users' understanding and experiences.
Love and breakup declarations to the service
Usually part of a design probe kit (Gaver et al., 1999), the love and breakup letter technique stages a fictional relationship between users and a product to better understand their attachment to technologies or services (Gerber, 2011). It further allows triggering emotional user expression and collecting engaging data. We first asked passengers to make declarations of love or breakup to their railway company. The audio recordings of the declarations will next be anonymized and shared with some employees, who will be invited to interpret what needs the passengers express and to define how their work might impact these passengers' need fulfillment. This empathic method should trigger employees' sensitivity towards users and their self-awareness.

4. Discussion

4.1. Triggering empathy towards users beyond the design team

A key part of UX maturity relies on the involvement of all relevant stakeholders within an organization in user-centered processes. Such a process should not be limited to frontline personnel only but rather every employee in a company must empathize with the end-users of their products or services (Kalbach, 2017), and more specifically those taking decisions. Empathic methods have the potential to support the involvement of everyone by creating personal connections and helping people within the organization to understand the impact of their daily work on the customer experience (Kaplan, 2016).

Psychology theories on empathy debate the possibility for people to become more empathic. In this controversy, some researchers conceptualize empathy as a trait of personality (i.e., some people are more or less empathic and this trait does not change across time (Cuff et al., 2016)), while others consider empathy to be a capacity, (i.e., it is considered as a state which can evolve over time (Cuff et al., 2016)). Although people show more or less empathic traits, research has shown it is a skill that can be trained (Dong et al., 2017). In the empathy meaning logic of a personality trait, using empathic methods to increase empathy levels in individuals does not make sense. For the purpose of a user-centered design process, we thus try to trigger empathy from the empathy state perspective. In organizations with a low UX maturity, existing design resources (e.g., small team size, sometimes even a team of one (Buley, 2013)) are often insufficient to create and sustain an effective user-centric approach. Designers need to identify "allies" (also called ambassadors) among the stakeholders (Lallemand and Gronier, 2018) with a user-centered mindset such as those who are showing an initial interest in user experience. These allies hold precious value as they have the potential to participate in democratizing the user-centric approach and advancing the empathy level of the entire organization. Empathic methods could contribute to the progressive spread of the user-centric culture and consequently increase the number of allies.

However, the need to be empathic towards users varies according to the job missions and the needs for achieving a user-centered service. The intended empathy level would depend on a given stakeholders' position (e.g., job missions) and experience in the company (e.g., seniority, direct or indirect contact with customers, being themselves users of the service). Being too empathic can be counterproductive as Tellez and Gonzalez-Tobon (2019) argued. Being too empathic can make designers forget their design concerns: the *empathy trap* (Stern and Divecha, 2015). Designers are more or less immersed in the world of users according to the stage of the empathic design framework (Kouprie and Sleeswijk Visser, 2009). Beyond the designers' team, this operating mode should be the same for the stakeholders who may also be exposed to the same empathy trap. Wishing to make stakeholders more empathic would imply that they all need to be fully empathic towards users. Yet some reluctant stakeholders might believe this is not a priority in their job: some job positions or missions can be perceived as unrelated to users or as not having any decision power over the service experience. It is essential to share the vision that everyone is part of the process that makes and impacts the end-user experience and that setting an empathic mindset can help employees give meaning to the service they deliver.

4.2. Measuring empathy in design

4.2.1. Relevance and opportunities of a quantitative measure of empathy in design

"If you cannot measure it, you cannot improve it." This often-quoted Lord Kelvin's dictum supports, in the HCI field, the argument for the relevance of quantitative measurement in user experience (Law, 2011). Quantitative UX measures help designers to *"know to what extent targeted qualities of a system have been realized and to predict (or project) what values the system can potentially deliver based on its current state"* (Law, 2011). Existing approaches to evaluate empathy in design (Chang-Arana et al., 2020; Sleeswijk Visser and Kouprie, 2008; van Rijn et al., 2011) focus on the design team specifically yet would not meet industrial needs to scale up the measure at an organizational level. Developing an empathy scale will allow a quantitative and standardized measurement of empathy, fulfilling the cost-efficiency requirement. It will enable designers to (a) assess the empathy levels of different stakeholders of service design and to decide on targeted interventions following which they can (b) measure the effectiveness of empathic design intervention (Drouet et al., 2022).

Quantifying the increase in empathy (and expected higher quality of service) due to empathic design methods can underpin the value of an empathic approach in the industry. Although quantifying empathy might seem antagonistic to the value of qualitative data in design culture, the corporate reality is business-oriented (Kouprie and Sleeswijk Visser, 2009). It valorizes Key Performance Indicators (KPI) and Return On Investment (ROI) to guide decision-making. Some practitioners and researchers studied how to apply this business logic to user research (Bias and Mayhew, 2005; Moran, 2020). The lack of standardized and factual empathy measures makes it difficult for decision-taking stakeholders to accept and roll-out empathic design interventions. Proving the value of empathic methods in companies with a low UX maturity (Pernice et al., 2021) would therefore be a precious help for practitioners.

A relatively easy-to-deploy measure of stakeholders' empathy level, such as with the empathy in design scale, would also help designers identify UX ambassadors within their organization, which in turn would facilitate the creation of a successful design process. Designers would thus benefit from a reliable and valid empathy measurement tool, specific to the design context, to support their empathy-building strategy.

4.2.2. Limitations and risks of measuring empathy in design

Developing a self-reported tool to measure empathy entails numerous challenges. Besides the construction of the scale which is essential to safeguard its psychometrics properties, these measures are prone to bias (Lietz et al., 2011), particularly the social desirability bias. Social desirability can occur when the test result might be perceived as a measure of performance. In industry, our tool aims at supporting employees (at large, not only frontline personnel) in building empathy towards users of a service or product. It might thus be deemed desirable for an employee to showcase an empathic attitude and "to cheat the test" (Hemmerdinger et al., 2007) by presenting themselves in a positive light. For example, in our use case, the railway company strategy places the user in its center and distributes internal messages to share this vision with employees. To decrease the risk of biased answers, an anonymized administration of the scale is key along with a clear vision and communication about the tool's objective: supporting people's self-growth rather than assessing personnel performance (Drouet et al., 2022).

We see two ethical risks in creating a scale for measuring empathy in companies. First, the empathy measurement tool could be diverted from its primary use to become a tool for assessing the staff. Forcing employees to be empathic would contradict the logic of promoting empathy to deliver a better user-centered service. As mentioned earlier, the need to be empathic towards users also varies according to the job missions and the needs for achieving a user-centered service. Some dimensions of empathy might be useful to all (e.g., emotional interest) while others could be reinforced specifically for frontline personnel. Second, empathy could be perceived by companies as the holy grail of user experience and, rather than improving the service through a user-centric approach, empathy scores might turn into an end in itself with a marketing objective. On this subject, some authors criticize the adverse side of empathy when designing in a capitalistic logic (Holt, 2011) while others point out that empathy in design became more an ideology than a helpful principle (Heylighen and Dong, 2019).

While a tool like an empathy scale allows to measure people's empathy level before and after an empathic intervention, it does not provide insights into why certain interventions are more or less effective. A lack of effectiveness in empathic interventions could for instance be linked to the method itself or to a lack of motivation among the (Kouprie and Sleeswijk Visser, 2009). Similarly, the successful development of a user-centric culture does not only pertain to the use of design interventions using empathic methods. Measuring empathy quantitatively cannot be the only way to support an empathic approach. Indeed, qualitative data provides a richer dataset than quantitative measures (Forlizzi and Battarbee, 2004) and can provide rich insights into the benefits of a specific method on specific dimensions of empathy. The empathy in design scale however fills a gap in the design field and could help designers to prove the value of empathic design interventions and to democratize empathic design methods to industry for facilitating the design of more user-centric services and products.

5. Conclusion

In this paper, we introduced our preliminary work: (a) on triggering service stakeholders' empathy through empathic design methods and (b) measuring the effectiveness of these empathic methods through an empathy in design scale (Drouet et al., 2022). We discussed the pros and cons of measuring empathy in design methods from the academia and industry perspectives. This contribution creates opportunities for new ways of considering empathy in user-centered design and opens new possibilities for the field to leverage empathy beyond the design team.

Acknowledgments

The authors would like to thank their industrial partner the Luxembourgish Railway - CFL for supporting this research.

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Chapter 6.
Conclusion

Limitations

The present thesis entails several limitations. Each publication includes a dedicated section where we share the limitations related to each study. In this section we reflect on the more generic and transversal limitations of this work.

1. Research approach

First, we grounded our work on theories and frameworks developed to understand designers' empathy rather than service service employees' empathy. The existing empathy frameworks in design describe only the process for designers to build empathy toward users. To the best of our knowledge, our work is the first one applying them to other employees.

A second limitation relates to the research methodologies we used in our studies. We intended to investigate and contrast multiple methods to get an overview of the mechanisms of empathy in service design. In this regard, we made the choice to explore the problematic of empathic design methods broadly rather than digging into one method in-depth (for instance by exploring how different configurations of activities, sample and facilitation style would lead to more empathy building in co-creation sessions). In this broad exploration, deploying more than 3 methods to contrast could also have been desirable and constitute a stronger basis for our mapping of empathic methods, but this was not realistic due to time constraints. The involvement of experts with extensive prior experience in other methods did address this limitation to some extent.

One of our first objectives was to explore the efficiency (and underlying prerequisite) of empathic design methods when used with non designers. However, the diversity in the methodologies we deployed (as our knowledge evolved and due to the various contributions of each study) made comparing our results between the studies more complex. Furthermore, building empathy is a long term process that would require more time and engagement with empathic interventions. While we measured empathy before and right after our empathic design interventions, we are aware that changing attitudes and behaviors cannot happen after a single intervention. At best, in our case, they trigger reflections and awareness of others' experiences. Although we have tried to involve some of the same employees in our two last empathic design interventions, we were not able to follow these individuals longitudinally.

Other limitations of our work involve our measurement tool, the EMPA-D scale. We developed this instrument based on the current state of empathy theories in design, which are not yet well supported by empirical research. Theories in scale development state that concepts and frameworks on which the items are based should be well defined and reliable to build a valid and reliable measurement instrument. EMPA-D will eventually contribute to challenge and refine theories of empathy building in design. It is thus a work-in-progress and an iterative process.

This research also faces geographical, cultural, and organizational limitations. We investigated empathy in service design in the specific context of a national railway company, in a European country which additionally has recently adopted a one-of-a-kind measure of making public transportation free for all. At this stage, we cannot claim generalizable conclusions in another geographical, cultural or organizational context. We also did not consider the cultural ,diversity of Luxembourg inhabitants. If employees of the company are majorly Luxembourgish for historical reasons, the passengers represent a much more diverse population.

2. Research scope

We shared limitations on building service employees' empathy in service design in the two publications included in this chapter. We complement our reflections regarding these limitations.

This work opens many questions about triggering service employees' empathy: Which kind of employees should be involved, all or part (e.g., frontline employees are usually at the center of attention)? With which objectives? Is empathy building meant to have employees support designers in shaping a user-centric service or simply in applying good practices in their respective mission? Do we intend for employees to develop some design skills or simply to become aware of users' experiences? We explored some of these questions. However, our work does not fully address them. Our scope has been limited to understanding service employees' perceptions of users in service design and their reactions when we try to trigger empathy.

While not being a limitation of the present work per se, it is worthwhile to note that empathy is also a controversial topic in design. Building empathy can be perceived as primordial for some and irrelevant for others or for being the wrong concept to support human-centered design. For instance, Katta Spiel, in their keynote at the EmpathiCH'23 workshop (Drouet et al., 2023)[1] explained that when willing to empathize and understand others' reality, we are by default biased by our vision of the world. Consequently, it is better to develop the ability to accept not always understanding others and their expertise and experiences instead of trying to "get into their shoes."

Furthermore, our work is based on the design and service design research field but does not touch upon the established service research literature (based mainly on marketing sciences), which includes insights into employees, frontline staff, for instance. Another limitation of our research in service design is that we only focus on triggering empathy on the service organization side when service research also highlights the mutual empathy effect. Developing service employees' empathy, specifically frontline staff, can trigger in return users' empathy. In the first study investigating passenger experience (Paper A) and the study on co-creation workshops (Paper E), we evoke the users' empathy towards the company and staff. It would have been interesting to further the understanding of this empathy dynamic between employees and users.

3. Conducting research in an industrial context

Conducting our studies in an industry context offered opportunities in terms of ecological validity, yet implied other limitations to our research. First, as mentioned in the limitations of Paper F, recruiting our employee sample involved some biased hierarchical decision making. The employees whose mission is to improve the service are implicitly required to participate in studies investigating the service user experience. We could therefore only mitigate but not control the voluntariness of employees to be involved in such initiatives. The onboarding in empathic approach was also somewhat missing, resulting in some employees not having yet fully the open mindset often recommended in design literature for such an empathic approach.

The industry context also involves colliding interests and bringing obstacles to research, e.g., by preventing the use of rigorous experimental approaches. For instance, setting up a control group was difficult. Similarly, we could not organize different workshop contents for different employee groups of the same company. Another challenge we faced was related to the cumbersome and sometimes intimidating ethical procedures in academic research. For instance, consent forms can appear as a heavy procedure for participants non-used to research. This can sometimes lead to challenges in credibility and influence reluctant participants' behaviors, biasing our results. In consequence, the format of this procedure needs to be simplified.

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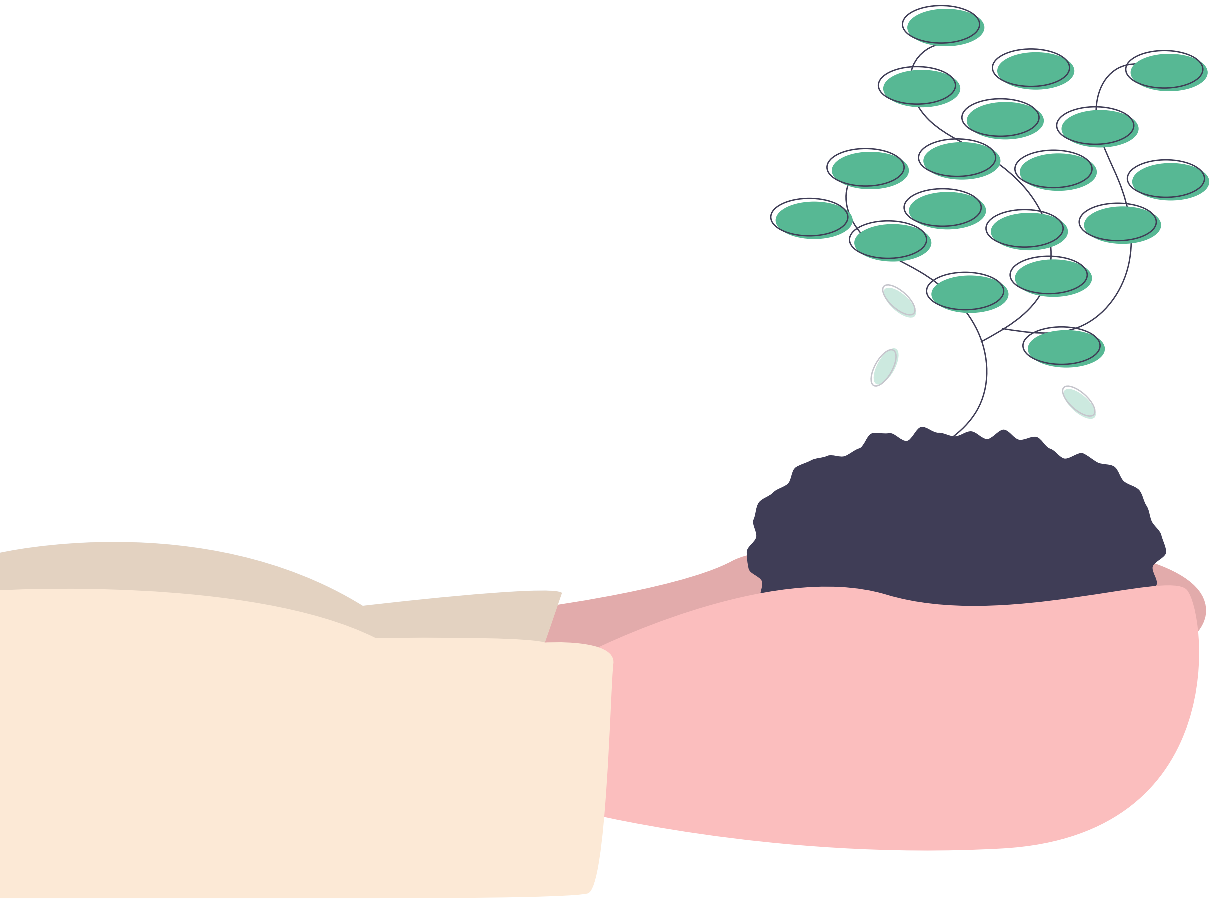
[1] Drouet, L., Meijer, W., O'Kane, A.A., Singh, A., Wambsganss, T., Mauri, A., Verma, H., The EmpathiCH Workshop: Unraveling Empathy-Centric Design. In Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems (CHI EA '23), April 23–28, 2023, Hamburg, Germany. ACM, New York, NY, USA, 9 pages. https://doi.org/10.1145/3544549.3573796



Future work

To better understand empathy in the service design context, research should investigate further the role and impact of empathy from the service employees' side. As empathic design methods were initially targeted at designers, the scarce empirical or methodological studies published to evaluate their use and impact usually involve samples of designers or design students (or related disciplines, including engineering). Some exceptions exist in the medical domain, e.g., involving nurses and doctors, but would deserve to be expanded to other application areas.

Investigating mutual empathy between service employees and users is also an interesting direction to understand empathy dynamics in this context better. Service research (marketing oriented) is beneficial to service design research. Further studies should consider building stronger bridges between the two fields and make service design research more accessible to other research communities than designers.

Another interesting avenue for future work related to the way empirical work is conducted and documented. To move forward, the empathic design community would require more longitudinal empirical studies based on the same sample. Documenting and extracting insights from real-world case studies, as done by Postma et al. (2012)[2] or in Papers D and E, is of high value, especially if the measures of empathy - and contextual elements - used could be comparable to some extent.

On this note, further research is also needed to measure empathy in service design. Existing self-reported measure instruments from psychology should be tested in various design contexts to assess their suitability, or provide insights in how they could be adapted for use in design. Beyond self-reported tools, the design field needs to develop and consolidate alternative assessment techniques of empathy, for instance qualitative observation metrics or behavioral indicators to be used in the field.

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[2] Postma, CE., Zwartkruis-Pelgrim, E., Daemen, E. and Du, J. (2012) Challenges of Doing Empathic Design: Experiences from Industry: 12.

In this work, we observed that the applicability of design theories is challenging. We recommend more applied research in service design and more documentation about researchers' personal experiences when conducting studies in industry. It would support research to anchor their work in a realistic context and increase the credibility of their research among practitioners.

Last, our field of study, the railway sector, is still in the early stages of centering the design of products and services around the passenger experience. Design, user experience, and service design are still a rare expertise in this industry in Europe. Further empirical research in user experience and service design is needed to understand the human factors of railway experiences better. Also, the sector, which mainly uses quantitative methods originating from marketing, still lacks original and creative research methods to listen to their users and engage them in implementing users' feedback. The democratization of innovative methods would support user-experience maturity in this sector and build stronger empathy between railway organizations and their passengers.

Conclusion

While empathy has been shown to be essential for creating user-centered experiences and delivering high-quality, customer-satisfying services, few studies have explored the methods triggering this empathy amongst service employees (beyond designers). In this doctoral dissertation, we studied empathy in the service design context. We conducted empirical studies to address the following research question: How do empathic design methods influence service stakeholders' empathy toward users?

We first explored the service context of our field of study - the national Luxembourgish railway company - and investigated their passenger experience with N = 53 users. We revealed 21 factors and eight needs influencing the passenger experience that were shared internally with service employees to sensitize them to users' experiences and, in fine, support their empathy to deliver a user-centric service.

We investigated three empathic design methods to trigger service employees' empathy towards users. As a first empathic design intervention, we explored the concept of physicalizing a journey map, one of the most known service design tools. After ideating with ten designers, we prototyped XPressia, a physical journey map of passenger experience, and tested it with five professionals working in the railway sector.

We used the audio-playback of love and breakup declarations to N = 230 service employees as a second empathic design intervention. We assessed the employees' ability to recognize users' emotions (empathic accuracy technique) and how they resonate with their emotions. We also assessed their interest in users, willingness to improve the service, and empathy. As a third intervention, we organized co-creation workshops with service employees and users to discuss and design passenger information. We qualitatively evaluated their ways of empathizing with users and measured their empathy quantitatively. We looked for and reflected on techniques for assessing employees' empathy for each of these methods.

In parallel, we developed and validated the EMPA-D scale measuring service employees' empathy towards users. Based on the main frameworks of empathy in design, the scale measures three empathy dimensions: emotional interest and perspective-taking, personal experience, and self-awareness with 11 items.

In the final part of the dissertation, we created a mapping of empathic methods. We aimed to document and synthesize the knowledge about empathic methods in reporting their empathic characteristics and objectives. This mapping expands our work and underlying insights to other methods likely to support service employees' empathy. Last, we discuss and reflect on the empathic approach and the empathy measurement instrument we developed.

The empathic design methods we used awakened service employees' interest in users, supported their reflection mindset, and triggered debates about the user's perspectives. We have encountered difficulties demonstrating a significant increase in empathy after using these methods in the short term. However, we observed empathic attitudes and documented obstacles to empathy.

This work contributes empirically to investigating service employees' empathy in the context of service design. It contributes methodologically to exploring the application of empathic design methods with non-designer stakeholders (like service employees) and developing a measurement instrument of empathy in service design. Through the investigation of our field of study, this thesis also contributes to the knowledge of passenger experience in the railway sector.

This dissertation paves the way for further research on methods and techniques to engage non-designer stakeholders of service user experience towards users. These stakeholders, such as frontline or back-office employees, play a strategic role in developing a user-centric approach inside service organizations and UX maturity. They support designers' and researchers' work and are precious allies for change. This thesis also contributes to the application of empathy frameworks in design. The EMPA-D scale is one of the first initiatives to measure empathy in a service design context. Its validation challenges existing frameworks in design for their application to other stakeholders. It invites the research community to deep theories of empathy in design, develops predictive models, and furthers the understanding of empathy mechanisms in design.

Thesis appendices

Find the thesis appendices online at this following QR code. It includes the protocols and study materials of our first author journal papers, as well as for the empathic methods mapping. There are also the original publications.

SCAN HERE

Link: https://drive.google.com/drive/folders/1BqiVGKvmldLFLpSfm1RcRTWSZ1JsEF-Y?usp=drive_link

Empathy is key in user-centered design. It drives designers to take users' perspectives to understand their experiences. Moreover, empathy is vital for service companies as it ensures quality, fosters customer loyalty and forgiveness, and ultimately improves customer satisfaction. Empathy supports the service employees' awareness of their role in users' experience (even those without design background). At the organizational level, empathy is the ground for breaking silos between teams and increasing overall user experience maturity. However, the methods and processes for triggering service employees' empathy are still under-researched. Design research needs more studies on empathic methods to train service employees' empathy. The field also needs more research on measuring empathy in a design context to deepen knowledge of empathy mechanisms. This knowledge will help designers shape their empathic design approach and observe the empathy tendencies evolution of the other service employees after participating in empathic design interventions.

Our research investigates the use of empathic design methods to promote the understanding of customer experiences inside an organization and deliver high-quality experience services. How do empathic design methods influence service employees' empathy towards users? We studied three empathic methods to trigger employees' empathy inside the Luxembourgish railway service company (CFL): the physical journey map, the love and breakup method, and the co-creation method. In parallel, we developed and validated a self-reported measurement instrument, the Empathy in Design scale (EMPA-D), measuring three dimensions of service employees' empathy: emotional interest and perspective-taking, personal experience, and self-awareness.

Researching methods triggering and measuring service employees' empathy is primordial for supporting the design of services through user-centric approaches. This thesis brings reflections and guidelines to consolidate empathic methods and research on empathy in design.

Keywords: *service design, empathy, empathic design, design methods, empathy scale development, service industry insights, railway*

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