

Perceived risks and benefits of automation in heavy rail: A multi-stakeholder perspective

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INTRODUCTION

- Existing studies on highly automated railway operations (GoA3+) concentrate mainly on technical aspects
- Some research explores passengers' perspectives on GoA3+, but studies incorporating the viewpoints of other stakeholders remain scarce
- Understanding the factors shaping acceptance across all interest groups is key for a successful migration
- Study aim: Identify perceived key risks and benefits across multiple stakeholder perspectives to develop strategies to increase acceptance



METHOD & RESULTS

PASSENGERS



- Online survey ($N = 942$) i.a. on demand for onboard staff presence on trains and other acceptance factors
- Passengers with **reduced mobility** express the highest demand for staff on automated trains. Participants with **experience** with automated transport express the lowest demand for onboard staff under GoA3+
- Acceptance depends on the service and operational conditions (**punctuality, reliability, and safety**) of GoA3+
- Perceived risks that negatively effect acceptance are **system breakdowns, cyberattacks, and conflicts or violence** among passengers

INFRASTRUCTURE COMPANIES



- Three 1.5-h interviews with management personnel from a German railway infrastructure company
- Greater operational **stability** due to reduced staff-related delays (e.g. late braking, waiting for staff before departure) could be a positive outcome of GoA3+
- Concerns about effective **communication** between entities (e.g. train operators, signallers, emergency management), when rapid problem solving is needed
- Call for **regulations** and **standards** on a European level

RAILWAY UNDERTAKINGS



- Two 1.5-h interviews with management personnel from one German and one Swiss railway undertaking
- The **shortage of operational staff** is believed to be potentially solvable by the introduction of GoA3+
- GoA3+ is seen as a feasible way to increase **capacity** on existing infrastructure
- A major impediment to acceptance is the lack of **evidence** and **traceability** of ATO benefits, such as increases in sustainability, punctuality, and cost reduction
- New **regulations and standards** to guide the migration to GoA3+ are required

OPERATIONAL STAFF



- Three 2.5-h on-site workshops with train operators (TO) ($N = 6$) and train attendants (TA) ($N = 2$)
- More family-friendly **working conditions**, (e.g. better-structured working hours, less shift work, working at a fixed location) were perceived as attractive by some TO
- Some TO feared **job loss**, loss of **motivational aspects of work** and a decrease in **job satisfaction**
- TO expressed safety concerns about the lack of **sensory feedback** from the train and the environment during remote train operations
- TA raised concerns about their own and passengers' safety due to a possible increase in **violent behavior** among passengers
- Higher **compensation** for work under GoA3+ would be an incentive for both TO and TA

CONCLUSION

- A successful migration to GoA3+ requires acceptance from all stakeholders
- Our work is a first step to identify perceived risks and benefits of GoA3+ beyond passenger perspectives
- Safety-related issues from automation failure, cyberattacks, and passenger violence are key concerns
- The possibility to overcome staff shortages and increase capacity and reliability is seen as a major benefit
- Higher income and better working conditions, while preserving motivational aspects would make work under GoA3+ attractive
- Infrastructure companies and railway undertakings need clear regulations, norms and standards to support their transition to GoA3+

NEXT STEPS

- Measures addressing perceived benefits and risks are under development
- A study investigating measures for good job design for train operators under GoA3+ is currently running

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