”We’re Doing This Together”: An in-Depth Analysis of the Teamwork between Train Traffic Controllers and Train Drivers

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Abstract: Operational train traffic is executed by train drivers and traffic controllers operating as a tightly coupled team. Although separated in time and space, their work is intertwined to the degree that the realisation of the train traffic depends on successful coordination and collaboration between them. Prior rail research is mostly focused on either one of these two roles, which leaves the collaboration between them understudied. The controller-driver dyad is at the core of operational train traffic and their relationship is of major interest in creating and maintaining a safe and efficient train traffic system. With the use of observations and interviews, this study investigates and analyses the controller-driver dynamic, how they view each other and their collaboration. The findings highlight team spirit and trust within the relationship, and at the same time reveal an underlying relational distance that affects the relationship and their prerequisites for achieving a successful collaboration. Lack of insights into each other’s work and different priorities generate challenges, just as the implementation of new technology and its effects on information distribution. Findings are discussed in the context of obtaining a holistic perspective of operational train traffic, and the fundamental activities that lie at its core.

1 INTRODUCTION

For many years, the railway domain received little attention, especially compared to aviation and road traffic. With increased demands related to a rising number of passengers and more trains running in the same envelope of time, aspects such as efficiency and safety became a topic of interest. However, the non-technical aspects of the work behind functioning train traffic is still an understudied area (Andreasson et al., 2019a). This paper has its focal point on the work conducted by train traffic controllers and train drivers—the two most essential roles for the execution of train traffic. Although separated in time and space, the traffic controller and the train driver work in a close dynamic and contribute with their own discrete functions that are necessary for the successful execution of train traffic. Given the tightly coupled dynamic between these two roles, their relationship and communication structures are at the core of their work and therefore important to understand and to take into account when working towards the train traffic system of the future (Andreasson et al., 2019b). However, few studies have attended to these aspects of operational train traffic. Accordingly, this study aims to develop a deeper understanding of the train traffic controller-driver dyad by identifying how these two roles view each other and their relationship. The obtained findings are discussed in the context of achieving a holistic understanding of train operations as they are executed in their natural setting, and to highlight this relationship as one important non-technical dimension at the heart of the socio-technical system of train traffic.

2 BACKGROUND

Train traffic control is a complex organisation of work conducted in a technology-intensive environment and with fast and safe decision-making as a core activity. Each controller is responsible for a predefined geographical area and all the trains running on the segment of rail within that area. They are responsible both for monitoring and manually

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executing actions that control train paths, points, and signals, as well as rescheduling the traffic when delays and disruptions occur. The first of these tasks is constantly ongoing and supported by the traffic plan that describes the estimated location for each train and at which time. The controller is then responsible for manually adjusting points and signals in such a way that the traffic plan can be realised. The second task is done as a problem-solving activity when the traffic plan can no longer be followed, in which case the controller have to make fast decisions to maintain the overall traffic flow and to minimise the effects of the disruption. The two main tasks have different characteristics and together they often bring sudden shifts in cognitive workload.

The train drivers also work in an unpredictable and highly dynamic environment that requires them to not just operate the train according to the signs and signals, but to also pay attention to the information presented by various technologies inside the cab. These technologies normally present current speed, maximum allowed speed, and continuous instructions on how to uphold an energy-efficient way of driving. Furthermore, drivers are expected to always be attentive to events outside the train, anticipate and react to surrounding factors that might affect the train (e.g., weather conditions, passenger behaviour at platforms, and possible obstacles on the rail).

The railway domain presents complex, dynamic work processes that pose many research challenges. So far, research concentrated on inquiries related to understanding the work practices from a holistic point of view has been scarce. The need for naturalistic fieldwork to provide insights into how social and collaborative variables, and the complexity of the dynamic environment, affect behaviour and performance have been called for (e.g., Andreasson et al., 2019a; Wilson & Norris, 2005). To study the collaborative aspects of work is further motivated by Naweed (2020) with the statement: “… a train is not propelled by a single person but by a team”. This is especially interesting since controllers and drivers normally receive their training separately and are thus never exposed to situations during training in which they can practice their collaborative skills.

Some attempts have been made to map out the everyday work in the organisation of train traffic but the research is highly dependent on the national context. If we turn to the Swedish context, operational train traffic has first and foremost focused on traffic control and for a long time, the main focus was to design and develop decision support systems with increased usability (e.g., Andersson et al., 1998; Sandblad et al., 1997). This work resulted in a new decision support system as well as a new strategy for the task of traffic control. The new strategy emphasised a proactive style of work and to plan the traffic ahead of time, which would impose less cognitive load on the controller (Kauppi et al., 2003). Related to this, the train drivers started to receive attention and the idea of a shared real-time traffic plan was initiated to remedy the fact that the drivers worked in what Jansson et al. (2005) described as an "information vacuum". The idea was to support successful collaboration by enabling accurate information at all times. In this research, the collaborative aspects of operational train traffic were put forward and Tschirner et al. (2013) described how the efficiency of operational traffic depends on the quality of the controller-driver collaboration. More recently, Andreasson et al. (2019b) identified processes of coordination and synchronisation between controllers and drivers essential for the safety and efficiency of the joint work performance.

The interest in non-technical aspects of work in the train traffic domain has increased also outside of Sweden, for example with the study by Rosenhand et al. (2011) in which it was revealed that drivers and conductors exhibit characteristics of high performing teams. This includes to catch and correct each other’s errors and to actively support each other’s activities by filling in knowledge gaps and identifying risks.

Naweed (2020) describes how train traffic controllers and drivers are part of a joint cognitive system with an intimate and dyadic coupling. He studies how traffic controllers see themselves in relation to the train drivers and conclude that the controllers’ view on the relationship impact how they perform their work, which in turn affects the drivers. Naweed focus on so-called SPADs (signal passed at danger), which means that a train goes past a red signal. SPADs are a serious safety breach and should be handled with a carefully developed routine. However, Naweed (2020) concludes that the controllers’ view on the relationship with train drivers results in different ways to handle SPADs. These findings emphasise that the relationship between controller and driver is not just the backbone of operational train traffic but also something that ultimately could affect the safety. Baysari et al. (2008) reach a related conclusion in their analysis of 40 rail incidents when they find that a majority of the incidents were associated with social, cultural, and organisational processes affecting behaviour and performance. To gain a deeper understanding of these subtle aspects of work is therefore critical for enabling safe and efficient train traffic.

Looking at the literature, it is clear that insights into the relationship between traffic controllers and train drivers and their prerequisites for successfully working together are relevant for maintaining safety in train traffic. Still, this relationship is to a large degree an understudied area. The purpose of this study is to embark on this topic and to provide insights into the relationship between controller and driver as interdependent parts of the socio-technical system of train traffic.

3 METHOD

This study was conducted in the domain of Swedish train traffic with observations and interviews as main data collection techniques. Approximately 130 hours of observational data of the work by 19 traffic controllers and 13 train drivers were collected during a period of 2,5 years. All participants had 2-30 years of experience and the observations took place in their natural work environment, i.e., in the control rooms for traffic control and in train cabs. All observations were complemented with informal contextual interview questions to add clarifications to what was observed. Field notes were carefully taken and these were later transcribed and put to analysis.

Additionally, three in-depth, pair-wise interviews with one controller and one driver per interview session was conducted to put further emphasis on the relationship between these roles. Each interview session was 1,5-2 hours long and the questions concerned their work, with emphasis on interaction, communication, coordination, and information-sharing activities. Out of respect for the somewhat sensitive topic, direct questions about how the participants view the relationship with one another was not posed. However, the participants sometimes articulated this on their initiative.

During interviews, data were captured using audio recording equipment, which was later transcribed and, together with field notes from the observations, analysed based on the systematic process of thematic analysis. This process entails to systematically and repeatedly work through the entire data set to actively search for meanings and patterns that can shed light on the posed research question.

4 FINDINGS

In the thematic analysis, three themes with additional sub-themes were identified (Figure 1). All quotes have been translated from Swedish and participants are referred to as TC (traffic controller) or TD (train driver) followed by an identification number.

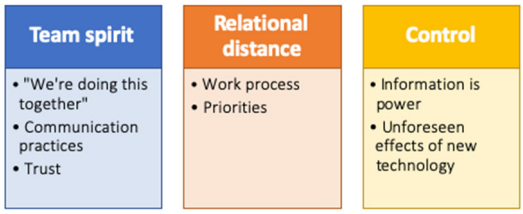

Figure 1: Overview of the three identified themes and their sub-themes.

4.1 Team Spirit

This identified theme concerns the way the controllers and drivers view their interpersonal relationship, their separate roles, and responsibilities. They consider themselves to be colleagues and members of the same team. They collaborate by providing each other with relevant information but at the same time value silence as a sign of everything running according to plan.

"We're Doing This Together". This is not just the title of the present paper but one of the main messages derived from the data analysis. The quote is from TD1 who articulated that: "We're doing this together. During my workday, the people I talk to are the crew onboard the train and the traffic controller. Those are my closest colleagues". When talking to traffic controllers and train drivers, it is often mentioned that they are not able to do their job without support from each other. "It's teamwork. After all, I can't get the traffic running unless the driver does his job" [TC3]. Even the simplest example of a controller who sets the signals to "go" requires a driver to act on the information conveyed by the signal and to operate the train. This process of work demonstrates how intertwined the work of controllers and drivers are, and highlights also how essential the collaboration between these two roles are to realise a functioning traffic flow.

Another example of a situation that displays how the controller and driver work towards a shared goal was observed at the traffic control centre in which TC18 received a call from a driver. During the conversation, the controller expressed: "Good! Good suggestion. Thank you." Once the call had ended he explained: "The driver knew that train 637 was late, which means that he no longer needs to go through so many switching points. I didn't think of that, so it was really good that he called". This is an example of a situation in which the controller and driver act as a

back-up for each other and provide reminders or ideas to the other that may be relevant for solving or improving the efficiency of a certain traffic situation.

Communication Practices. As in all collaboration, communication is fundamental. At the control centres, the telephones are constantly ringing and information is delivered from drivers to controllers. Traffic control is highly information-dependent and the traffic controllers are sometimes forced to make assumptions regarding, for example, a train’s equipment and properties. The assumptions usually prove to be correct but in the case of equipment being out of order or situations in which the train’s properties differ from the usual, the controllers depend on the driver to call and deliver that information. TD1 gives an example about limited braking capacity: ”If my top speed is affected for some reasons, for example, if I had to turn off a brake, I always call and let the controller know. With a lowered braking capacity you need to lower the speed so that you have time to reach a full stop when you’re supposed to”. Small pieces of information like this are important for the controllers to take into account since they, no matter how small, can have large effects on the overall traffic plan. While some drivers are proactive and report on situations that they believe are of importance to the controller, this is not always the case. TC9 describes: ”Sometimes you notice that a train [displayed in the digital system for traffic control] are getting more and more behind the timetable and you call the driver just to be told that he has reduced speed capacity today. By the time you detect the issue… well, that can really create chaos in the planning". Some drivers are more actively involved in delivering information to the controllers than others. This may be the result of drivers not knowing what pieces of information that the controllers have access to and what they instead rely on the drivers to communicate. This is especially challenged by the fact that it sometimes varies what type of information the controllers have access to.

Much of the information exchange in the controller-driver dyad starts with input from the "real world" outside of the control room. The information does, however, flow both ways in this dyad and the drivers regularly receive information from the controllers, mainly concerning changes to the traffic plan. It is noticeable that the controllers have access to more communication channels than the drivers do. For instance, the controllers can transmit information via points and signals, while the drivers have to rely on the telephone. During a ride-along in the train cab, TD4 observed a stop signal and switching points guided us onto a sidetrack used to enable two trains to meet and pass each other. The researcher asked whether he knew what was happening and the driver responded: ”I don’t need to know, I have all the information I need right here”, and pointed to the stop signal. It is clear that the points and signals controlled by the traffic controllers play an important part in the communication practice employed by the controller-driver dyad as they convey concrete information for the drivers to act upon.

Trust. At the same time as communication is of importance, there is great trust in the relationship between controller and driver and they trust each other to do what needs to be done. This is displayed by a lack of all communication not considered necessary. “On the best day, we do not communicate. No communication means that everything is working as it is supposed to." [TC5]. The silence carries a meaning of the traffic running smoothly and without larger discrepancies. “As long as everything works, we do not have contact. I do what I'm supposed to do and I know that he is doing what he is supposed to do. And then we continue like that until something deviates from what is normal” [TD12].

4.2 Relational Distance

Teamwork is a necessity for enabling safe and efficient railway traffic. However, to maintain a well-functioning relationship in the controller-driver dyad is challenged by underlying factors and organisational structures, which creates a relational distance between them. That distance is the subject of this theme along with the differences between the two work roles, their separate work processes, and priorities.

Work Process. Although a joint overarching goal, the traffic controllers and train drivers enact different work processes due to their separate responsibilities. They are located at different geographical places and while the drivers work in real-time, the controllers’ work includes to control points and signals for future train paths. While responsible for planning and controlling traffic situations ahead of time, the controllers shift focus to present time when something unforeseen happens. For example in the case of an accident, the driver reports to the controller and awaits further instructions. While the driver is waiting, the controller uses the information from the driver to re-plan the timetable for the train involved in the accident as well as for other trains that might be affected. TC1 explains: “There is some waiting time, especially for the driver. We [the controllers] are working at high speed while the train just stands there. And if it is a major accident, it can take hours”.

This statement highlights the separate but highly related work processes that controllers and drivers are actively involved in. It also shows how their work processes, especially in regards to situations out of the ordinary, often are executed alternately, resulting in peeks of workload that shifts back and forth between the two roles.

One important difference between the work of traffic control and train driving is their separate work environments. Train drivers are occasionally exposed to situations with violent passengers, accidents etc., while the controllers are distanced from those situations and perform their work in a control room from which they can see neither trains nor passengers. This can sometimes create a mismatch between the two roles in regards to what they need for their respective tasks. In a conversation between a traffic controller and a train driver it was revealed that in the case of an accident, the driver reckoned that he should provide information about his location and that this could be done by describing what he saw from inside the cab, looking out through the window. The traffic controllers on the other hand are rarely familiar with the fist-hand view from the rails but need a different type of information to determine the train's exact location. They need the driver to remember what number was displayed on the last kilometre sign the train passed, which means that the driver is asked to remember a number no longer in sight. This can be challenging for someone who was just in an accident. Although understandable, it is troublesome that the controllers sometimes need information that can be difficult for the drivers to retrieve from memory.

To further add to the complexity of different work processes, the controllers and drivers of Swedish railway are employed by different organisations, which does not favour their possibilities to collaborate successfully. It also creates a reality in which these two roles, colleagues as they consider themselves to be, rarely (if ever) have visited each other at work and thus have limited insights into each other's' work processes. "I visited the control centre once during the train driver education. It was good, but back then I had no idea what the reality looked like… and I wasn't experienced enough to ask the right questions. Also, that was 30 years ago now... a lot has changed" [TD7]. The situation is similar for the controllers that rarely get the opportunity to ride along in the cab and when the opportunity presents itself, it is usually during their training and when they are new to traffic control.

The controller-driver dyad has an underlying distance in their relationship that derives from them not knowing enough details or depth regarding the challenges and different situations affecting the other role. However, they all agree that a mutual understanding and knowledge-base is something to strive for to facilitate the collaborative aspects of their work.

Priorities. During data analysis, it became clear that controllers and drivers have separate priorities and that these sometimes result in disagreements between them in regards to how a certain situation best should be handled. The main difference seems to be that the drivers focus solely on their train with the goal to bring that train to each stop in accordance with the timetable while providing the passengers a comfortable ride. The traffic controllers on the other hand prioritise the overall traffic flow, and all trains are treated as equally important. This can sometimes entail to purposely delay one train to improve the overall traffic flow from a more holistic perspective. Their different priorities sometimes create grounds for conflict in the controller-driver dyad. TD6 explains: "Our roles are different from each other. I have my train. That's it. But the controllers see the whole picture. Maybe not all drivers understand that controllers sometimes have to make a decision that seems to be very negative for me to resolve a traffic situation somewhere else".

The controller-driver dyad does not always agree on what should be the main priority; however, it is important to acknowledge that both roles are facing challenging situations and do their very best given their unique prerequisites. This mutual respect for each other's challenges is described by TD2: "It is important that we think of us as a team working together, and that we understand each other's difficult situations. I sometimes feel stressed when I'm falling behind the timetable. But if I think about the situation for the controllers… with many trains to consider. Although I only have one train to care about, I might have 500 passengers on that train. So, without a doubt, our two situations are both challenging but in very different ways". The dissimilar challenges faced by controllers and drivers can pose a hinder for enabling a successful collaboration. In the end, much comes down to the feeling of being in control of one's situation. More on this in the next section.

4.3 Control

This theme concerns the feeling of being in control, which is constantly sought by both traffic controllers and train drivers. These two roles are part of separate work situations, which brings different possibilities when it comes to control. These differences sometimes affect the controller-driver dynamic and

how the workers decide to execute their individual tasks

Information is Power. While the train driver is the only one with real-time information about his/her train and its journey, the controllers have access to comprehensive information about the whole train traffic situation in Sweden. This involves status on the trains that are currently running as well as the plan for all trains that will departure within the next 24 hours. This means that viewed from a holistic perspective, the controllers have an advantage when it comes to making strategic decisions for how the traffic should be executed. This sometimes puts the drivers in a situation where they feel left out and without control over their work situation. TD7 expresses that ”I have to stand where he [the controller] puts me”. This statement displays how information, or the lack thereof, can result in feelings of being out of control or even feelings of being a pawn in the traffic controllers’ game.

The controllers are constantly required to make changes and adjustments to the traffic plan and rarely have time to discuss the decisions with all concerned drivers beforehand. Rather, they have to make the decisions and act fast when executing and implementing them into the traffic plan, and only have time to inform concerned parties afterwards. This can occasionally cause conflicts in the controller-driver dyad. TC4 says that ”Sometimes you get calls from angry drivers questioning your actions: “Why do I have a stop signal here…?”. We try to call everyone and explain what is happening and why, but we don't always have the time". Due to the separate work situations of controllers and driver, they come across different types of information. Whether the information is derived from the physical surroundings that a driver oversees or from the digital traffic information displayed to the controller, the intertwined nature of the work by the controller-driver dyad makes it essential for them to frequently engage in information-sharing activities. For example, when an accident happens, all information lies with the train driver. However, as soon as the driver hands over the relevant pieces of information to the controller, the driver cannot do anything but await further instructions from the controller, which is then the one with all the information (and control).

Time is often a factor that works against this dyad, especially in the occurrence of something out of the ordinary, which tends to result in a long row of tasks that need to be done more or less simultaneously. This is especially true for the controllers that often need to call multiple drivers, one after the other, to inform about a situation and how it will be handled. In this process, the controllers can sometimes underestimate how valuable their information is to the drivers. TD2 explains the importance of updated traffic information: “You constantly have to adapt the way you drive. If I receive information about a stop signal later on, I can lower my speed and avoid having to make a full stop when I arrive at that signal. Then the passengers won’t notice anything.” This example highlights the power of information and the importance of updated information flowing back and forth between the individuals in the controller-driver dyad.

Unforeseen Effects of New Technology. The controllers have long worked in a technology dense environment and recently, the drivers have also gained access to multiple information technologies. Increased use of IT within a socio-technical system brings changes to the information structure and aspects such as who is reached by what information, when, and how. One example of equipment implemented in the cabs, often referred to as driver advisory systems (DAS), provide drivers with information about the train’s planned route, its current location, and upcoming stops. Sometimes it also presents similar pieces of information concerning other trains located in the nearby surroundings. Sweden’s largest railway undertaking has developed a driver advisory system that, in addition to the previously mentioned functionalities, also support the driver with recommendations for how to operate the train in a way that optimises energy consumption. TD2 explains how the DAS has affected his work: “In terms of information, it is like a new world. We don't need to call and ask the controller as much as we used to.” Although the DAS is used by drivers only, the addition of information available to them affects how they do their work—as shown by the description of fewer phone calls to the controllers. Hence, changes to the drivers’ work practice have in turn brought changes to the whole controller-driver dynamic.

Although the DAS brings more information than ever before to the drivers, it can only display current traffic situation, which means that it cannot display changes made by the controllers before these changes are realised into actual running traffic. This is problematic in cases when drivers use the real-time information they are presented with to adapt their driving behaviours, while unaware of planned changes that may make their information obsolete. In fact, uncommunicated deviations from the original traffic plan are put forward by participants as a source of conflict in the controller-driver dyad. One example of a situation like this is when a driver adapts his

speed to facilitate a train meeting at another meeting place than what was originally planned for. Due to mostly single-track lines, the planning of such a meeting without imposing unnecessarily long waiting time for the train that is first to arrive at the place of the meeting is a complex task for the controllers. For this reason, uncommunicated changes to the location or time of a train meeting can quickly make the traffic plan in need of major re-planning. "We have noticed that the tablet is used to take own initiatives as a driver. That can create huge problems… To make decisions when you don't have the full picture…" [TC1]. This is an example of a driver that makes use of the information at hand to optimise his situation without considering, or being aware of, the fact that all trains are part of a much larger puzzle and that even small changes can bring large effects on the overall traffic flow.

The drivers have long been working in an "information vacuum", as it was described by Jansson et al. (2005), and when this now starts to change it is easy to see why they want to use their increased access to information to gain more control of their work. However, from the controllers' perspective, they find it difficult to understand what has changed and why. In one of the observation sessions, TC15 ended a phone call with a driver and turned to her colleague, bursting out with amazement: "He knew that the train he was supposed to meet is cancelled. How can he possibly know that?" The controllers have never been formally introduced to the drivers' new routines and information structures. The controllers describe how they, based on conversations with the drivers during normal work activities, have concluded that the drivers must have gained access to more information. However, they are unaware of what kind of information. This makes it difficult for the controllers to know what information they need to share with the drivers and what pieces of information the drivers already have access to. "I can see the whole traffic situation in my systems, but I don't know what the drivers are seeing" [TC3]. It was clear during this study that the controllers are curious about the DAS as they, during the pair-wise interviews, posed questions about the system and asked the drivers to demonstrate it (which they gladly did). This spontaneous questioning suggests that the controllers want to be informed about the current information situation for the drivers. Considering that controllers and drivers are highly dependent on each other to perform their separate work responsibilities, they may not only *want* insights about each other's work situation, but they may *need* it to be able to feel in control of their tasks and to do their jobs.

5 DISCUSSION

This study is the initial step to deepening the understanding of the controller-driver dyad of Swedish operational train traffic. The analysis shows that they view themselves as colleagues, working as a team towards a shared goal. There is also a good portion of trust at the core of their relationship, which is mirrored in how they communicate with each other and especially regarding what they choose to communicate. However, the controller-driver dynamic is severely challenged by limited insight into each other's work situations. They are also facing what seems to be unforeseen effects caused by the implementation of new technology, which has not only brought changes to the information structure within the socio-technical system of operational train traffic but also changed the overall way of work. In conclusion, the functional dynamics of the relationship between controller and driver can either contribute to successful outcomes or create barriers and destabilising factors, which in turn can impact the functionality of the whole socio-technical system.

Though to a large degree informal and undocumented, the work practices for communication and collaboration discussed in this paper are central for the safe and efficient performance of operational train traffic. This points to the importance of analysing the social and behavioural aspects of work to understand what work practices are at play and how these can be supported and maintained through organisational changes and development. Changes to work processes, such as introducing new technology, can either enhance effective teamwork or disrupt the naturally emerging informal work processes crucial to coordinate work and ensuring safe operations (Roth et al., 2020). In the present study, the DAS is a good example of IT that supports the driver to operate the train, but that is poorly adapted to support the informal work practices for communication and collaboration between driver and controller. Implementing a new piece of technology brings changes to the overall process of work in the socio-technical system and should thus not be viewed solely as system development but rather as organisational development. The Federal Railroad Administration (FRA) points to the importance of not just developing technology that supports the main tasks but also the activities associated with aspects of teamwork—such as communication and coordination (Roth et al, 2020), which is in line with the results of the present study.

To conclude: team spirit is persevering in the train traffic controller-driver dyad despite a lack of

prerequisites to sufficiently foster a successful collaboration. The key to the successful outcomes that we normally see is the skilled traffic controllers and train drivers and their informally developed work practices of collaboration and knowledge-sharing. It is essential to understand how their skills and experiences can be integrated with new technical and organisational systems.

Further, we see that a systems perspective on the work practices benefits the understanding of informal, but critical, processes of teamwork. Insights into these social and behavioural aspects of work should be utilised to avoid situations where changes to work structures inadvertently disrupt critical teamwork processes. Future work should therefore make efforts to facilitate communication and coordination among the workers so that common ground can be directly fostered and, in the long run, contribute to safety and efficiency of work. This is a challenge and something that needs to be addressed by both railway companies as well as the research community. The former need to adopt a systems perspective to realise the intertwined nature of the overall task and to see how changes in one part of the system will affect other parts as well. A systems perspective provides a holistic understanding of work, which supports the task of enabling and maintaining a successful collaboration in which both roles are allowed to contribute with their expertise. As for the research community, a theoretical lens such as, for example, activity theory (e.g., Engeström, 2000) could contribute to a deepened analysis of the work and support operational traffic as it moves into the future. Another relevant agenda is to facilitate successful coordination and communication activities in the controller-driver dyad by arranging a learning arena for them to share experiences and knowledge. Joint workshops or, if possible, simulation-based environments could prove valuable in learning these non-technical skills. By supporting the team aspects of the operational work and enabling increased insights into each other’s work situation, the possibilities for the controller-driver dyad to successfully work together as a team can be further strengthened.

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