# SUBJECTIVITY AND TECHNOLOGY IN WORK OF TECHNICIANS IN PERIODICAL TECHNICAL INSPECTION STATIONS

**Nikša Dubreta[1, *] and Iva Mikulić[2]**

[1]University of Zagreb, Faculty of Mechanical Engineering & Naval Architecture
 Zagreb, Croatia

[2]Centre for Vehicles of Croatia
 Zagreb, Croatia

## ABSTRACT

The article deals with the subjectivity-technology theme and is based on qualitative study of technologically highly mediated technicians' work in two stations for periodical technical inspection of vehicles in Croatia. Specifically, it is studied how supervisors for periodical technical inspection of vehicles interpret the place and importance of their subjective judgements in contrast to technologically driven advancement of devices they use in everyday work activities. The main concepts guiding the analysis stems from the organizational research on work and technology according to which human beings act toward things on the basis of the meanings that things have for them. Other concepts included structural aspect of technicians' professional identity and work autonomy, organizational contingencies and social interactions as integral part of technical work.

Four descriptively based themes emerged through the procedure of summing up the findings. They suggest strong and enduring intertwining of human factor and technology in contingent organizational context. Findings suggest that subjective judgements are regarded as necessary human activity permanently related to simultaneous use of devices in the process of inspection where recognizing complex task related appearances, and spotting unusual events are integral part of work. Finally, interactional patterns suggested communications as the integral part of the job, often as the most difficult, stressful but simultaneously indispensable condition for work to be done correctly.

## KEY WORDS

subjective judgements, devices, technicians, communications

## CLASSIFICATION

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*Corresponding author, $\eta$:: niksa.dubreta@fsb.hr; +385 1 6168 382;
 Faculty of Mechanical Engineering & Naval Architecture, I. Lučića 1, HR – 10 000 Zagreb, Croatia

## INTRODUCTION

Contemporary and upcoming technologies significantly mediate the changes in the character of human work and in the activities of organizations in which this work takes place. In media and public discourse this subject is considered simultaneously in terms of great expectations and potential threats with regard to broader societal implications of ever faster technological development, most notably for the future of employment and new jobs, skills needed in the upcoming world of work and for a character of the new forms of organizations [1]. Regardless of whether technology is conceptualized in narrower or broader way, "work scholars have long debated the impact of technological development on work organization" in similar, mostly binary-type narratives approaching technology at work predominantely in positive or negative terms [2]. A corresponding conceptual binary tension is possible to identify in the longstanding discussions between the technological determinist and the social constructivist perspectives on technology, two approaches which differed mostly in assessment of possibility and the scope of technology to determine the pace and content of social change [1].

At an organizational level, the relationship between work and technology has been analysed and conceptualized almost constantly in a more nuanced way due to empirically based insights which highlighted the contingent nature of work-technology issue in particular organizations that have been studied. Generally, their findings and conclusions vary considerably depending on the specific issues they dealt with, the theoretical perspectives on which they are based, as well as on the applied research methods [3]. Research questions mainly focused on how existing and new technologies mediate work autonomy, discretion, skills and work experience, as well as social implications associated with the ways of introducing and applying them. In the relevant literature it is possible to discern several attempts to systematize the most significant researches, usually through pointing to several "generations" [4], paradigms [1] or theoretical approaches [3] that marked the research development in the field of work and technology at the organizational level. For the purposes of the present article, it is sufficient to remark that in the greater number of these systematizations common point suggests that the interpretivist approach which has focused on "local meanings" [5] with the avoidance of unnecessary generalizations prevailed since 1990s [4].

However, it is possible to claim that contingencies emerge earlier, already in maybe the most canonic studies unavoidable in corresponding literature. For example, Blauner in *Alienation and Freedom* pointed to technology as the main factor which determines workers' experience of work. However, Blauner confined this influence with regard to structural differentiations related to actual use of particular technology and with regard to particular organizational forms related to the internal division of labour [6]. A couple decades later, Zuboff studied a number of manufacturing and service organizations which were introducing information technologies. Although emergent computer technologies were observed as an unavoidable element of future workplaces, Zuboff left a room for divergent alternatives for work and power depending on the ways in which such technologies were considered and used in particular organizations. In the computerized organizational context Zuboff found out a kind of intertwining of technology as an essential feature of work and "the matters of choice" – or ways in which managers would decide to use it [7]. Zuboff implied that "information technology contains a duality that allows companies to automate or informate" [1], i.e., to reproduce old hierarchical divisions between workers and managers or to enhance the new culture of discussion, collaboration, meaning of work and to undermine existing organizational hierarchies.

More recently, Liker, Haddad and Karlin [3] summarized a number of factors related to the contingent nature of work-technology relationship at an organizational level. The authors referred to factors such as types of technology, intraorganizational social contexts, scopes of participation in the selection of technology, and structural consequences of technological change (who wins and who loses). While indicating the importance of theoretical approaches in the assessment of these contingent factors, the authors synthesized some major perspectives, including interpretivist approach which we found the most referent for our study because it "leads largely to descriptive and analytic research that provides a rich picture of the process of technological change" [3; p.586].

Most of interpretivist approaches to work-technology issue in organizations are focused on the study of human meaning as a guiding point for understanding of corresponding everyday actions. Therefore, organizational events and objects like devices and other technological artefacts which have arisen in their customary use are not comprehended as entities with intrinsic meanings and cannot be separated "from the meanings people assign them in the course of everyday social interaction" [5; 1404]. More or less explicitly, these approaches rely on broader sociological tradition of symbolic interactionism and its relativisation of the conventional image of reality as purely external and independent of our actions. Correspondingly, different aspects of human behaviour could not be determined according to an abstract and in advance defined person's "nature". Quite to the contrary, human self-identification and social action represent the outcome of continuous mutual defining and communication in the process of social interaction [8].

These theoretical backgrounds are also recognizable in other research on work-technology issues in organizations. On these grounds Prasad documented multiple symbols associated with computerization in the health medical organization she studied for extended period, suggesting at the same time that "computerization, or any technology can simultaneously hold different meaning for individuals or groups in organizations" [5; p.1422]. Barley, in his study of introduction of CT scanner technologies in two hospitals found varying degrees of empowering effect these technologies had on technicians' work, allowing them to interpret the data much more autonomously and to make judgements previously left to professionals [9]. Technicians are in focus in other Barley's researches in which he proposed contextually derived model of technicians' work. Since it was found that the technicians' work consists of bridging the material and the world of representations through the use of sophisticated instruments, techniques and bodies of knowledge, Barley has proposed new and necessary rethinking of organizational restructuring with regard to notions of horizontal organising and professionalism [10-12].

Darr and Scarselletta also proposed the concept of technicians' identity based on Goffman's suggestions that everyday interaction should be analysed with regard to broader structures which are more or less usually hidden behind actual everyday events. Analytically, this would lead to the integration of interactional dynamics of technical work with patterned, i.e., "framed" and structured organizational characteristics [13]. In organizational settings, technicians mediate between the transformation of the material realm into symbolic representations and their structured interactions with professionals and clients. Still, Darr and Scarselletta are cautious about broader generalizations on the nature of technicians' work and identity since the differences tend to appear with regard to a variety of technical occupations, knowledge bases built around different technologies and the scope of autonomy in everyday work. Summarising the findings from several ethnographic studies, Darr and Scarselletta point to the role of technology as the main factor in the process of technicians' identity formation which tend to change when interaction with clients is introduced. Although contextually developed and technologically driven technicians' knowledge base allowed for self notions of competency and good work, communications with clients indicated that this "identity formation takes on a subtler shading" [13; p.72].

Communications with clients and coworkers has also been a conceptual component in Trevelyan's attempt to reconstruct engineering conduct from practice. Drawing on the findings from different organizational settings and a semistructured interviews Trevelyan pointed to a common practice among engineers to frame their identity predominantly "in terms of the solitary technical: problem-solving and design" [14; p.176] with a tendency to "hide the social dimension of their work behind a technical facade, and, in doing so, [to] marginalize important aspects of their work" [14; p.173]. On the contrary, Trevelyan's analysis reveals that engineering practice is essentially based on distributed expertise which is derived from the shared meanings constructed in everyday interactions among engineers themselves. This finding allows Trevelyan to conceptually establish human performance and social interactions as integral part of any engineering conduct and to grasp them as elements which "lie at the core and constrain engineering outcomes just as material properties constrain the feasible height of buildings" [14; p.190].

The present study also aims at the micro level of the technology-people-organization subject theme. Specifically, we consider how periodical technical inspection supervisors – PTI supervisors hereinafter – (mostly technicians) at two selected periodical technical inspection stations (PTIs) interpret the place and importance of their subjective judgements in contrast to technologically driven advancement of devices they use in everyday work activities. Since the equipment which has been used by the supervisors at studied PTIs turned out to be constantly upgraded with the main current changes established in digitalisation of some existing devices (like the introduction of RFID cards for reading and recording of needed data), we rely on Tornatzky & Fleischer's definition of technology as "knowledge-derived tools, artefacts, and devices by which people extend and interact with their environment" [15; p.11]. In this regard, human characteristics seem to be important in recognizing complex task related appearances, spotting unusual and unexpected events, adjusting the decision-making process to different situations and in ability to make subjective judgments and decisions [16].

Additionally, the article presents several findings on issues which were not planned by initial research design and which emerged along the fieldwork and semistructured interviews with supervisors. These issues are considered in terms of the main themes PTI supervisors highlighted with regard to their experience of work. Given that the research has been qualitative with interpretivist features, we considered such a sort of open-ended flow of the study not only legitimate, but also instructive [17]. That means we entered into research with an approximate theoretical framework on technology-people-organization, but have had to relate unplanned findings to concepts we were looking for along the research itself.

## RESEARCH DESIGN AND PROCEDURES

The findings are collected through field notes and data from mutual conversations and interviews with PTI supervisors at two periodical technical inspection stations (hereinafter, PTI stations) in Croatia. One of the authors, while working for one year in one of the stations as a PTI inspector, initiated the idea of exploring subjective judgements in vehicle inspection. Options for the realization of idea began to be realized immediately after she moved to another position in the same company. Since the possibility of collecting notes from long-term fieldwork was discontinued, several mutual – recorded and later transcribed – conversations were held. In these conversations, a series of issues related to the most diverse vehicle inspection details were discussed, such as moments in which subjective assessments appear as possible or necessary; interacting details and ways of dealing in such situations; and information about the company and its organizational structure.

Several items important for continued research were indicated at this stage. First, it was clearly explicated that consideration should be given to the reflexive dimension of the

research since all our discussions included a certain interpretations which are related to the basic topic of the research [18]. Second, in the absence of the opportunity to undertake longer field participation, we agreed to conduct joint field observations through ten occasions in both stations over a two-month period. Third, it was found that for the continuation of research, it was necessary to conduct semi-structured interviews with the PTI supervisors in the two stations where the company provided us with access.

The inspector's involvement was completely voluntary, they were provided with anonymity and with real and fully elaborated opportunity to not answer or discuss issues they regard confidential or in any way unwanted and to leave interview at any time they find it disturbing. During the interviews, a part of the inspector indicated that the questions about cheating on the examinations would most likely be avoided, while the rest of them spoke about this subject generally, with the suggestions that ethically problematic situations happen "somewhere else". In our kindly effort to consider these topics in more detail, they also expressed the desire not to talk about it anymore. Therefore, we did not insist on this topic because this would be unethical on our side, regardless of our stance that the topic is important and multilayered for the research of work of the PTI supervisors. In the case of such a study, it would be necessary to shape the theme of ethics either as an integral part of wider research or as a separate research focus and to communicate it transparently to participants who would like to talk about it. Therefore, regardless of the fact that it was occasionally touched in some discussions, the topic of ethics did not represent the relevant material for later analysis of the obtained data. It is interesting that a number of our colleagues who commented that our decisions in that matter represent an important deficiency, claimed they "heard" something about cheating from "someone else" and never experienced it by themselves. It turns out that all of them – supervisors and our colleagues – consider that topic in relatively similar terms with prevailing expressions like "someone else" and "somewhere else" suggesting no-one directly involved, be it PTI inspector or scientist-client.

Ten PTI supervisors agreed to participate in the interviews. Analytically, a basic doubt, well known in qualitative researches and related to the character of credibility based on a relatively small sample, emerged. Generally, sample size estimates in qualitative research range from only few and less than ten to over fifty participants [17]. We found that in a number of qualitative studies we had opportunity to consult for a range of reasons, a similar sample size has been used sometimes purposively, but sometimes without clear evaluation [19-21]. In the present study, it was estimated that our participants represent relatively homogenous group with the same education, working the same job, and they were all male. In addition, possibilities of triangulation here included our aforementioned conversations and field observations. Nevertheless, we conducted interviews with the intention to consider whether an onset of saturation of one or more elements that could be formulated in some interpretative form will emerge and whether we can find the possibilities for describing the interactional elements that can be related to some of the concepts developed in other researches.

Interview protocol consisted of few broad, general questions related to single research focus on technology-subjectivity topics. These were followed by a number of more specific and detailed questions. However, during the interviews, other and initially unplanned topics were arising and when estimated as relevant were included in next interviews. For example, communications with clients (vehicle owners) were constantly indicated as potentially important element in actual social interactions related to work content. Every interview lasted about one hour. All interviews were recorded and transcribed.

Analysis followed standard qualitative analysis techniques [22, 23] and included triangulation with regard to our initial conversations and the notes from field observations. It started with repeated listening of recordings and reading the transcripts in order to indicate significant

statements, sentences, or quotes we regarded helpful for understanding and later construction of more concise meaning units or themes of description of participants' experience related to technology and other aspects of work [17].

## RESEARCH SITE

The research was conducted in two periodical technical inspection stations (PTIs) in Croatia. The first PTI station – PTIs 1 has four technological lines, the first two for light vehicle inspection and the other two for heavy vehicle inspection. It employs 17 employees, from which nine perform technical inspection of vehicles and are therefore called PTI supervisors. The second PTI station – PTIs 2 has two technological lines and is mostly inspecting light vehicles. The number of employees is 22, where 12 of them are PTI supervisors. Considering equipment and devices that are being used during an inspection in both PTIs, there is no great difference between them, apart from their layout on the testing line and different type of their manufacturer. In addition, PTIs 2 was relocated and renewed. The main difference between them is in the average age of inspected vehicles, which in PTIs 1 is 8,55 years and 12,59 years in PTIs 2. During the research the experimental testing, which uses modern RFID technology, was used in the process of vehicle inspection in PTIs 1 and it was not used in PTIs 2. However, when conducting the interviews, both PTI stations were using it. The purpose of that experimental testing was to reduce the probability of manipulation with data that are manually being collected during periodical technical inspection of vehicles and human factor regarding work ethics and subjectivity as well.

Technical inspection includes several steps and procedures. Preferably, the vehicle that is going to be inspected should be clean and tidy. The legal regulation prescribes devices, equipment and assemblies, possible defects on them and their categorization to be checked during technical inspection. It includes as follows: identification of the vehicle, steering, braking equipment, lamps, reflectors and signalisation, visibility, chassis and chassis attachments, axes, wheels, tyres and suspension, motor, nuisance, electrical equipment and installations, gear transmission, control and signalling devices, exhaust gas examination of motor vehicles, other devices and parts of vehicles, other equipment, supplementary tests for passenger-carrying vehicles categories M2, M3 and gas installation.

According to EU Directive on periodic roadworthiness tests for motor vehicles [24], deficiencies that are found during periodic inspection of vehicles can be classified as minor, major or dangerous. Minor deficiencies have no significant effect on the vehicle safety or impact on the environment. Major deficiencies may prejudice the safety of the vehicle or have an impact on the environment or put other road users at risk. Dangerous deficiencies represent a direct and immediate risk to road safety or have an impact on the environment and can therefore be prohibited for use on public roads.

It is difficult to compare PTI stations in Croatia because they differ in their size, number, length and width of testing lines, allocation of the various equipment and devices on them, employee number, etc. That variety is the main reason why there is no standardization of inspection procedure and therefore represents a big challenge regarding process improvement. Hence, it is difficult to represent testing procedure by using a flow chart. However, in order to show which activities are included in the testing procedure, the Figure 1 represents one example of PTI station and its layout regarding sequence of activities.

## FINDINGS

Altogether, 59 differently-defined codes emerged that are initially systematized in 11 formulations which indicated relatively rounded meaning sets related to subjectivity- technology
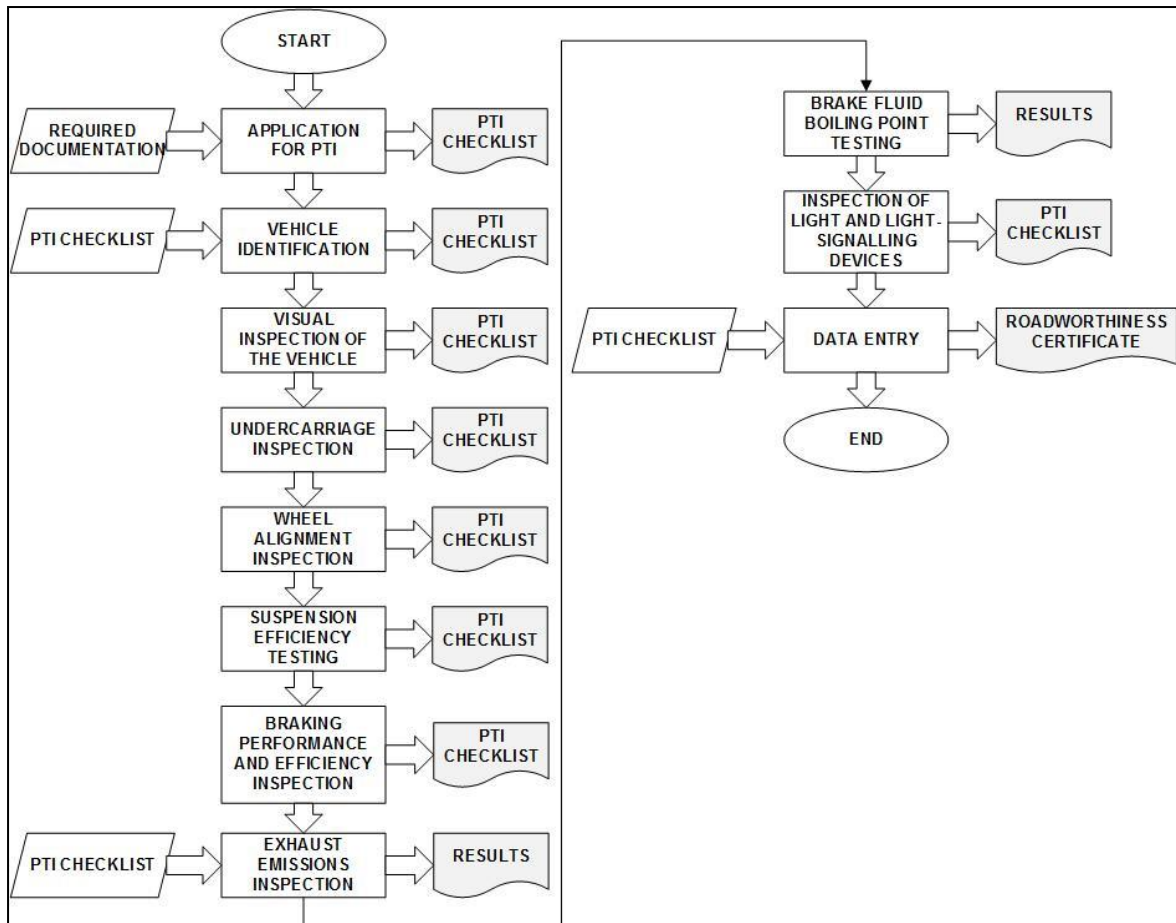
**Figure 1.** Example of PTI station and its layout regarding sequence of activities.

research question and to topics which were unfolded in the course of the research. These formulations were further classified into 4 distinctive themes, Table 1.

The first theme refers to patterns in assessing vehicles' roadworthiness, regardless of whether they are subjective or are based on devices, and to patterns that reflect not only explicit but also tacit knowledge based on supervisors' previous mechanical experience. The second theme refers to the supervisors' patterns of activity in unclear situations, which arise from uncertainty in their own judgments during the examination of certain parts of vehicles, or from questioning the initial perceptions, or are mediated by confusing aspects of getting or interpreting data from the device. The third theme refers to how difficult is to make a judgement and, again, includes references to the importance of subjectivity and to the role attributed to devices. The fourth theme points to the key interactional patterns in the inspector's work.

Two codes appeared in most of the themes, Table 1. Both are meaningfully integrated into the final themes and are an integral element in the ways in which supervisors interpret the role and importance of their subjective judgments and judgments that are based on the use of different devices. As regards their ubiquity, they are presented here separately, irrespective of the fact that they can be discerned in the later elaboration of each theme.

The first of these codes refers to *senses,* which have repeatedly proved to be an important and unavoidable element in making subjective judgments; a possible source of unreliability of subjective estimates; and the way of checking and possibly confirming data from the devices. PTI supervisors have indicated that in most of these situations they rely on eyesight, hearing, smell and touch. In some parts of technical inspection such as a visual inspection, the corrosion

**Table 1.** Themes and omnipresent codes.

| Final themes | Preliminary themes | Omnipresent codes |
|---|---|---|
| Assessing vehicles' roadworthiness | Subjective assessment as crucial. Devices as means for verification of subjective evaluations. Devices as the sole basis for evaluation. Mechanical experience. | Senses. "Is it valid or not". |
| Unclear situations | Subjective assessment as a source of uncertainty. Devices as a confusing factor. Mechanical experience. | Senses. "Is it valid or not". |
| Subjectivity and devices: difficulty of work | Subjectivity as the toughest part of the job. Devices facilitate and speed up the work. Devices are critical for assessment. | Senses. "Is it valid or not". |
| Interactional patterns | Communication with clients. Consulting with coworkers. | "Is it valid or not". |

assessment or the assessment of the condition of the undercarriage senses are experienced as crucial and often the only indicator for making judgements and this is most commonly expressed in statements such as "there is no way for us to record the undercarriage, but only me who can see it and my hand to feel it" and "let's say, when you look at the undercarriage or estimate the corrosion, there is no technology ... I mean, you have to look there and to touch, you see, to be sure that you didn't miss something". On the other hand, supervisors indicated that the senses are not always an unambiguous indicator for making an assessment of the roadworthiness of a part of a vehicle, but they may be misleading and sometimes are an integral part of the confusing situations in which further checks are needed. One of supervisors clearly expressed this perspective: "Sometimes at eco-test ... my opinion is that the car, let's say, really does not have a proper mixture /of emissions/ ... somehow. But, when we insert the probe in the rear end, the device says it is okay. It means it happens that the nose deceives. Then I trust the device".

The importance of senses is highly saturated and was many times indicated in every interview. Although they mediate not only in strictly subjective judgements, but also in those which are based on data retrieved from devices, senses are, however, interpreted mostly as an indicator and element which suggests further checks. Generally, a corresponding role of senses was found by Barley's ethnography of technicians' work where senses were considered in terms of sensory-motor skills and presented as an integral part of contextual knowledge and point specifically to tactile skills which Harper called "ways of the hand" [10]. In the present research, they seem to be in a great part unconsciously integrated into cognitive processes when making judgements.

The second, it could be said the omnipresent, code is formulated *In Vivo* [25] and, due to the complexities in English translation, can be called *Is it valid or not*. Being saturated in terms of a dominant way of thinking and expressing the character of supervisors' work, this code has reflected the fact that they ultimately have to make a judgement, to literally decide, whether the car will pass technical inspection or not. Although supervisors indicated that their judgements are facilitated by the new rulebooks which allowed for greater range of

gradations in estimates on the validity of a part of a car or for broadening options to pass something, their final decision seems to be summed up in this simple formulation: is it valid or not. This code extends through all themes and represents the statement that is continuously, almost as the buzzword, repeated by all of them reflecting most poignantly supervisors' experience of work. All the nuances, all subjective judgements and all attitudes towards using devices, etc., are pouring into this kind of final assessment – the statement which is a typical example of dichotomy and which, although seemingly too rigid, summarizes all their activities. It represents the most important frame of reference for their sense of responsibility and, finally, creates a greater number of complications in their relationships with clients. That way, PTI supervisors express what they see as the essence of their job – they make the final decision on the overall condition of the vehicle and are not in the position of a number of technicians in other kinds of job which, regardless of (often unacknowledged or discredited) level of their expertise, only prepare or systematize data and leave such kind of decision to others (for example to scientists or professionals at higher levels of organizational hierarchies). PTI supervisors make decisions independently and autonomously and, that way, directly affect different outcomes for clients. To have possibility to grade or to "assign homework" to be done by clients until next inspection changes nothing.

## ASSESSING VEHICLES' ROADWORTHINESS

According to the findings, assessing vehicles' roadworthiness points to three elementary patterns in inspector's work. The first pattern refers to parts of the inspection in which judgments are entirely subjectively based. The second pattern points to the reality of a continuous combination of subjective judgments and the use of available devices, i.e., their parallel and simultaneous referentiality. The third pattern indicates a situation in which the devices are seen as the only frame of reference to judge and in which subjective judgments as reported by supervisors are not a relevant basis for making decisions. Basically, all three patterns are significantly permeated by the supervisors' mechanical experience.

In the preparatory phase of the research, we have assumed that parts of the examinations where the supervisors relate mainly to subjective judgments include vehicle identification, vehicle visual inspection, vehicle undercarriage control, and light control with regloscope. However, the supervisors pointed mainly to the importance of subjective judgments in the visual inspection of the vehicle and the chassis control, identifying them as parts of the inspection in which subjective judgment is of crucial importance and cannot currently be replaced by the use of a device. Two supervisors expressed this as follows:

> "The ball, whether it's gone or not, I have to touch it with my hand. I have to take the tie rod end into my hand, see if it's valid or not. There is no such robot, there is no such machine that will come under the vehicle and here's the situation and now look what's wrong with it. Maybe it would be possible in some situations, but how complicated would this equipment be. You know, just how complicated the mounting and everything else would be. If it's possible to introduce it, I have no objections. To put something on the tie rod end, to have a machine check if there is something wrong with them, great. But as I say, I think that some of these things will not change. And of course, the optical inspection of the vehicle, I mean, it cannot, a machine, a device cannot do it."

> "For example, I would like to see how technology would estimate the corrosion down there. What is a structural one and what is only on the surface. I would like to see that, have someone to show me how that would look like."

Other parts of the inspection where the subjective assessment was the only framework for making decisions on validity related to the colour, the exterior and interior appearances of the vehicle and so on. In all of the above mentioned sequences, the reliability of subjectivity is based on knowledge, mechanical experience, and sense of responsibility. While knowledge and mechanical experience usually refer to prior vocational education and to a number of years of supervisory work, here, in most cases, they are related to supervisors' mechanical family background and presupervisor professional biographies. For the most part, they were coming from families where someone, most often their father, had a mechanic shop, so getting to know the work of repairing vehicles represented an integral and even prevalent element in growing up and everyday life through which affinity to mechanical work and a strong sense of mechanic self-confidence had developed. This was also evident in other participants' statements which allowed us to recognize the image according to which subjective judgments have the force of objectivity in situations where the human factor is currently irreplaceable.

Nevertheless, when it comes to the bases of the judgments made, in many parts of the vehicle examination the subjectivity is interwoven with the use of the devices. Most commonly, participants referred to sequences of inspection process where previous and sometimes a certain subjective impression of roadworthiness of the vehicle was checked by connecting to devices and, thus, confirmed or refuted. These situations indicate that subjective judgment is constantly at work, it is present from beginning to the end of the inspection process, but although often indicates a roadmap for estimates, it has to be checked where devices are available. In those cases devices represent not only prescribed, but also internalized decision-making point of reference. One of the participants called this process the "symbiosis" of technology and subjectivity by clarifying:

> "Specifically, if it is a braking system, it means that we are looking at the wear of the brake linings, for example, we are looking at the brake discs that can have this thickness. Let's say where it's not even prescribed how thick they have to be, but we're looking at whether it's burned, cracked or scorched on the surface by previous mistake. Then in a lot of cases when we get to the rollers later, we see exactly what we considered suspicious so to say. Here the device shows us the difference, helps us to make sure that, somehow, we estimated well."

Finally, participants also described situations where they almost completely rely on devices. This suggests that in some parts of the inspection there is no need for a (subjective) assessment because it is contained in the data from the device. While it does not seem to be a complete ignorance or neglect of one's own involvement in such part of the inspection, it can be said that this represents a kind of "practical wisdom", i.e., the belief that the devices serve to be used as reliable and competent aids in the work:

> "When you enter the wheels into the rollers, it's normal for the apparatus to do its part of the job. That's it. Or when you measure the brake fluid, you will put a probe inside and it does its job. You push the button, you don't completely set your mind at ease, but you don't worry about it anymore. You will get the result, you print it and that is it".

## UNCLEAR SITUATIONS

Unclear situations are interpreted by supervisors as an integral part of their work, as something that happens on a daily basis and is a result of a number of reasons, whether it is vehicle age, its current condition, hidden parts that need to be checked and inspected, details on certain parts that are difficult to assess, etc. Here as well exists the dichotomous

determinant in the background: supervisors cannot postpone or leave to someone else the decision on the validity or roadworthiness of a certain segment during vehicle inspection. Therefore, unclear situations imply increased attention and spending more time inspecting a certain part in order to make a responsible assessment of the problem at hand and not to make a mistake. They have to make the decision on their own and be certain that the decision is correct since its consequences are reflected in the way clients need to act from then on. Basically, supervisors associate main sources of uncertainty with self-questioning when it comes to their own subjective judgements, and with confusing data from the device.

In some situations, subjective judgements on a certain part of the inspection may vary between supervisors themselves and may be the subject of their disagreement. Nevertheless, in unclear situations, consultation between supervisors is the first step towards the judgement. For example, it is often complicated to assess the level of corrosion or to what extent the data from the vehicle registration certificate corresponds to the results of visual inspection, and that process includes seeking help from colleagues. Two supervisors expressed this as follows:

"Here's the deal, if it were, so to say, up to us to make the decision, I can then see that we are... Some people think in one way, other people in another... To some people one millimetre doesn't make a difference, they say that there has to be some tolerance, while others say that there shouldn't be any tolerance ... We don't always agree with a certain assessment."

"Take, for example, colour. One colleague will say that the car is grey, and another will say it's blue. I had a Seat Anthea, it said it was blue, but to me it was grey and I sold it, for me it was grey. But the vehicle registration certificate said it was blue. And some people said it was grey, while others said it was blue. You know, that's because of those things, through corrosion. Corrosion is what is most often questionable, you have to check it additionally, maybe by touching it so to say, and you take a screwdriver to try whether it really affected the structure of the material or it's only on the surface and so on."

On the other hand, unclear situations may be caused by confusing data from the device. In other words, data from the device does not correspond to the subjective assessment. This is where supervisors most often pointed out the need to view the subjective assessment as a means to reassess data from the device. So it's not only about checking the subjective assessment, in circumstances which allow for it, through available measurements and results from the device, but also vice versa, a continuous subjective involvement in the inspection process has the role to confirm or refute data from the device which should, at first sight, be objective and reliable. For example, one of the supervisors expressed this as follows:

"Those lift racks ... the runways on the lift racks are quite ... One time, my colleagues and I, we don't do that often, but if we suspect something regarding suspension, we put it over the pit to see. Lift racks are relatively new, but we got accustomed to the pit, let's say, over the years. It's good, those lift racks are good, but sometimes, sometimes it's not clear whether the tie rod end is loose or not. So then we go over the pit and we move the steering wheel by hand. Look, technical inspection is a serious thing. We have to be sure."

In any case, participants most often gave an example of a tester for shock absorbers and a device to conduct an eco-test, and in some cases, a roller brake tester. The tester for shock absorbers has been mentioned multiple times as a relatively unreliable device that causes confusing situations:

"The tester for shock absorbers is not a particularly reliable device... That device is not mandatory required at stations by the rulebook... The rulebook says that if

the shock absorber is not oily, if it's not ... If it's well fixed, if it's subjectively good, then we let it pass ... We don't always trust that device because we've seen many times, for example, that a new vehicle comes from Skoda, not one, but a number of such cars which have 15-20 kilometers, and the device says that the shock absorber is not good while the car is brand new ... It's not a coincidence, it happened in the case of approximately 50 vehicles ... Considering that the use of that device is not mandatory in the station, we can ignore it".

On the other hand, it is not possible to conduct an eco-test without using the device, but confusing situations have often been mentioned. Sometimes it happened that data on the number of revolutions or gas emission did not match with the colour of smoke seen by the supervisors or with the smell they sensed at that moment. It is always a question of data which supervisors consider to be unrealistic. Then, based on the subjective doubts, they repeat the checks until they get the results for reliable estimation: whether it is a case of an inadmissible irregularity. Sometimes, they combine the data from the device with their subjective perception in order to decide whether to let the vehicle proceed to the next phase of the inspection. In general, the whole process was described by the supervisors as self-evident and an integral part of their work, as well as another aspect of a human factor and technology at work being intertwined, which only seemingly doesn't leave a lot of room for uncertainty.

## SUBJECTIVITY AND DEVICES: DIFFICULTY OF WORK

In general, supervisors did not interpret the technical, i.e. non-relational [10] part of their job as difficult in the usual terms which are considered to be parameters for the difficulty of work. They do not think that the working hours are problematic, physical and mental efforts during vehicle inspection are not indicated as particularly problematic, the time needed to inspect a certain vehicle has been estimated to approximately half an hour, the number of vehicles inspected during each shift is only occasionally too big, and busyness, although foreseeable only to a certain point, is more linked to the car market cycles, city lifestyle or clients' annual leaves. The same can be said for the role of the turnover in the operation of the vehicle testing stations – although the supervisors' salaries are in correlation with the generated revenue of the station and may vary on a monthly basis, supervisors did not interpret that as an important aspect which would affect the difficulty of their work. Finally, the elements of functional flexibility that are most often manifested through work rotations and performing various tasks – from the beginning of the technical inspection until approval and technical documentation – have not been mentioned as problematic as long as work task integrity is preserved.

Essentially, the difficulty of non-relational part of their work is most often linked to the sense of professionalism and manifested through the perception of a good quality inspection. Sense of responsibility is indicated through understanding that subjective aspects of the inspection should be approached with concentration and awareness that the decisions made in that way cannot be attributed to the neutrality of the device, that they affect the inspection results and that the supervisors are the only ones responsible for such decisions. As one inspector claimed:

"So, in my opinion, that is the most difficult part of our work since we influence the results. It is up to us to assess whether the vehicle as such is roadworthy or not. Without us, without our word, without our signature, etc., I don't think that our work would mean a lot. If we only had devices, if everything was done using devices, we wouldn't have a lot to do, so to say. We connect a device, the device says roadworthy or not, and we have nothing to do. But, I think that we contribute greatly to the technical roadworthiness because... I suppose that not every system, every set can have a device for it. And we contribute a lot, let's say, to the technical inspection."

Also, the majority of other interview participants singled out subjective assessments as the hardest part of a non-relational, i.e. technical work. This is most often expressed by using the term "what we have to assess", whether it is a question of replacing the brake discs because they are worn out, a question of the level of corrosion, its position on the car, for example on pressure lines or on brake hoses, whether the corrosion is only on the surface or a structural one, or a question of the condition of the undercarriage. Clients sometimes quite vaguely suggest that there is something wrong with some parts of the vehicle, which was compared, by one of the many supervisors who mentioned the difficulty of the undercarriage inspection, to the visit to the doctor to whom you say that "something hurts" without specifying what exactly and where it hurts. Similarly, a client says something along the lines of "I hear some noise in the front left side", which means that a supervisor must carefully inspect a number of things, from the ball and the tie rod end to the shock absorber, without clear chances that he would indeed find the source of the problem. The situation is sensitive because it could mean that even after consultation with colleagues they didn't find anything wrong with the car and that they must let it pass despite warnings by the owner of the vehicle. Overall, subjective assessment is not only the sole basis for making a decision during certain phases of vehicle inspection, but it is often also the hardest part of the work: "The most sensitive part would be the decision-making process where we are responsible for it and where, so to say, there has to be a subjective impression".

Therefore, it is not surprising that devices are seen as something that facilitates and speeds up work, regardless of the confusing situations. The devices to conduct an eco-test and to check the brakes and the lights were the ones most often mentioned. However, other phases of inspection have been mentioned as well, in which the importance of subjective assessment was emphasized, such as checking the shock absorbers. Essentially, participants without exception consider that the existing technology and the introduction of digitalisation are positive and represent an active assistance which does not undermine nor remove the elements of a human factor, i.e., their contextual knowledge and subjective insights which they consider to continue to be an integral part of their work. The only difficulties were mentioned in relation to the initial stages in the process of digitalisation (e.g. introduction of RFID cards) which were observed in terms of time necessary to make the technology work ("until it works") and as an integral part of inspectors' own adjustment to a slightly different way of doing things.

There are several baselines confirming that technology and devices facilitate work. First of all, it has been mentioned multiple times that devices, analogue and digital ones, speed up the overall inspection. Secondly, during the different inspection phases, work process has been simplified in terms of drawing conclusions on the roadworthiness and non-roadworthiness. Thirdly, although data from the earlier analogue devices allowed for some derogations, the increased precision of data from digital devices is considered a good thing since it indicates the accuracy without the rest. This is adequately summarized in the following statements:

> "That OBD is quite helpful. For me, it's much simpler. OBD is a connector that connects to the vehicle and shows the number of revolutions and temperature. It can do some other things as well, but to us it's important that it shows what we got through the clamp on the battery and the probe for oil temperature measurement in the engine. Now we get that information through that connector. It simply speeds up the process, on and off."

> "The difference is, well, big. We cannot read from the analogue devices, so to say, a hundred percent, each decimal of the braking force. While the digital ones are much, much more precise, much more accurate so to say, and we write down what we see. The pointers on analogue devices don't show the tiny, fine lines, you know, the lines which would indicate exactly the correct one. So it's not as

precise and the digitalisation and all of it is, in my opinion, much better and much more accurate, so to say."

*This difference in accuracy – how crucial is it for the assessment?*

"Well, it's not crucial, it's not possible that there is such a big difference. Previously we worked with analogue devices and there was more rounding off, let's say. Let's say that we have 2 500 kilo-newton shown on the digital one, or 2 540, then we cannot read this 40, 44 on the analogue one, we always round it off to the whole number. The difference may vary only for a few percent, but, as I said, the digital one is simply more accurate."

Finally, it was revealed that participants consider technology and devices as something that also facilitates relational aspect of work [10], especially in terms of ruling out clients' suspicions regarding the outcome of the inspection. It is indicated that it is simply easier to give the news to the clients about the negative outcome of the inspection when it is substantiated by "hard" data, especially when it comes to the results that were read digitally and there are no doubts regarding human or subjective errors.

## INTERACTIONAL PATTERNS

According to the findings, we identified two basic interactional patterns in the work of supervisors. The first one refers to the communication among themselves during working hours, and the second one to the communication with clients. Considering that each supervisor completely inspects the vehicle independently and gathers, writes down and assesses testing results on his own and does not forward or explain them to someone else for the purposes of further analysis, it was shown that the interaction with colleagues at work was occasional and mainly functional. It happens mainly in situations when there is a need to seek or give advice regarding a problem during the inspection, or when the business is slow and it is possible to talk about work or something else. The supervisors share the space where they work, they are close to each other at every moment, and yet the optional conversation is sporadic and concerns some casual comment when passing by or happens when the business is slow. Therefore a big importance is attached to the conversations which solve the problems, i.e. when an assistance is sought to determine the roadworthiness of a certain part during the inspection.

On the other hand, the supervisors consider that the communication with clients is the biggest problem not only in a relational part of the work, but also altogether. To that extent, immediate social context shapes the actors, the character and the content of the communication in a specific manner. The actors are technicians and clients who are mainly not technicians. In terms of communication character, both technicians and clients recognize and internalize their roles when it comes to decision-making powers and outcomes of those decisions. The communication is normally one on one. Communication relates to vehicle (non-)roadworthiness, briefing of clients on the state of the vehicle, propositions and suggestions in case of repairs, preparations for the next technical inspection, etc.

Supervisors point out that this is an extremely stressful situation which is not shaped only by them, but also by clients – a situation manifested through the process which involves two sides. A minor part of supervisors indicated that clients and interaction with them should be completely eliminated, while one supervisor stated that he even considered engaging security guards:

"But in my opinion I shouldn't have anything to do with clients. Because I'm not here to talk endlessly about what isn't roadworthy and so on. It would be good to have a policeman or a guard since that would solve the problem when a churl comes and starts swearing, especially when more complicated problems need to be dealt with".

Nevertheless, most of them indicated that they do not have problems with all clients, but mostly only with those who do not want to accept a negative outcome of a technical inspection. For instance:

> "Most often it happens when a vehicle doesn't pass the technical inspection. Most often. And some people are simply angry, some probably don't understand what exactly is a technical inspection and why they have to fix something. So ... people are different, we are not all the same. Some simply overreact, some won't calm down, and some really insist on passing the technical inspection. We have to explain to them, or at least try, try to explain that that's simply the case, that the car is... some things need to be fixed because they are not safe for the road. So in that respect there is a lot of arguing with people and discussions why, how, why you can't, why you won't let me pass. Sometimes there is some yelling and everything."

Such situation is problematic because the supervisors have to insist on their assessments of roadworthiness based on the inspection, despite the fact that clients are pressuring them (by arguing, etc.) to change their assessment. Nevertheless, some supervisors stated that communication implies two sides, i.e. that they themselves have to work on improving their communication with clients.

> "Some colleagues should definitely work on communication. You can't just come to the car and say LIIIGHTS. No, first you have to say hello. And that's what I already mentioned, that is, some people are not entirely comfortable with going to the vehicle testing station. Because he doesn't know, especially, if he has, I don't know, Skoda Fabia let's say, he doesn't know if that car is, I mean... You know what, everybody is afraid, they are all afraid of getting the note to go to the mechanic, you know. And then that gives them a headache. Why? Because social circumstances in Croatia are the way they are. And then you just come and don't know how to talk to people. But then again, that's not ... That's a question of how they were raised at home. I don't know, I guess I was raised better than that. I guess, I don't know. It's not difficult to smile to people".

Overall, participants interpret the interaction with clients as the hardest part of their work. Not only it is stressful, but the supervisors see it as an extremely important element in assessing vehicle roadworthiness because clients need to get, for their own road safety, quality information about the urgency of certain repairs or less significant problems that need to be resolved before the next inspection. Finally, some participants interpreted interaction with clients through the perception of the performed good quality work, where the outcome of the inspection is irrelevant, and a client advised by an expert is put in the foreground.

## DISCUSSION AND CONCLUSIONS

Two main topics of the present study aimed to descriptively determine potentially patterned elements of subjectivity-technology issues in specific organizational context of PTI inspectors' work in two PTI stations and to relate our findings to referent theoretical concepts mentioned in the analytic frame.

Descriptively based themes which emerged through the procedure of summing up the findings suggest strong and enduring intertwining of human factor and technology in this specific context. Subjective judgements were estimated as crucial, single and irreplaceable point of reference only in one segment of "assessing vehicles' roadworthiness" theme, although even there technology is not interpreted as generally unwanted but mostly as currently unavailable. Also, subjective judgements are strongly mediated by the use of

senses. Otherwise, subjective judgements are regarded as a necessary human activity permanently related to simultaneous use of devices in the process of inspection, where recognizing complex task related appearances and spotting unusual and unexpected events is integral part of the work. Our participants indicated that subjectivity is always present, even when devices are interpreted as the sole or crucial basis for evaluation. On the other hand, technology is also present all the time: even where devices for inspection are not available, the subject of inspection, the vehicle itself represents some kind of knowledge-derived tool or device that has to be tested and checked. However, in terms of working equipment, technology is interpreted as a constitutive and integral element in everyday working activities and related to devices needed for inspection to be done even when they display confusing or suspicious data. In that sense, participants considered digitalisation as proper and welcomed part of technological advancement which allows for more precise estimates, and which does not exclude but corresponds to their subjectively based judgements and decisions.

Generally, when it comes to issues of work autonomy, discretion, skills and work experience, we found no strict division in the meanings attributed to subjectivity and technology. In that part, it corresponds to Liker, Haddad and Karlin's notions of the contingent nature of work-technology relationship at an organizational level [3]. In the present study, organizational contingencies refer to significant autonomy and discretion in inspectors' work in which subjectivity and technology are interrelated and complementing rather than mutually exclusive. If there is no device available, evaluation is subjectively made and it can be interpreted as valid and objective. In other cases, if subjective indication is persuasive, it is checked by devices anyway. If devices offer suspicious data, these are additionally sensory checked or considered in dialogue with coworkers. If the subjectivity is the toughest part of the work, devices and technological advancement can make it easier and faster. However, inspectors are always the main actors when it comes to making decisions on the vehicle's or its segment validity. It has been most clearly visible in "is it valid or not" expression which participants frequently repeated, pointing out that it is up to them to make a clear, final and responsible estimate.

In sum, these findings represent the main patterns of subjectivity-technology aspects in specific organizational context we could outline. These findings can be related mostly to findings in a number of research Barley and associates conducted in different settings [9-12]. For example, in the study of CT scanner technicians' work it was found that technological advancement does not necessarily threaten their work, but, at least partly, rather broaden the scope of interpretation of data and making decisions. Correspondingly, in the present study, our participants described digitalisation of some devices as welcoming advancement in work which is already marked by autonomy and discretion in the process of careful data interpretation and objective and responsible decision making. Furthermore, the meaning of professionalism that our participants expressed mostly in terms of responsible evaluations which stem from their mechanical experience and knowledge and abilities to transform technologically and subjectively derived representations of vehicles' conditions allows us to put in the forefront Barley's notions of transforming the mainstream meaning of professionalism toward possibilities for more horizontally organizational structuring. As it turned out, our participants did not complain to existing organizational structure and did not relate that issue with their sense of professionalism, maybe mostly because the character of their work left a room for autonomous use of devices, relatively independent estimation and decision making on vehicle's condition. In that part, there were no hierarchically superior professionals to interpret the data they collected or to check their interpretations on the grounds of inspectors' unprofessional workplace status. Even in unclear and rare troubling situations with regard to data and estimates they referred to their immediate coworkers – also technicians.

At first glance, most of the meanings which inspectors attributed to subjectivity-technology aspects of their work can be qualified in Barley's terms of non-relational core of technicians' work [10]. They do really manage the empirical interface, i.e., bridge the material world (vehicles and devices) and a world of representations (data and test results) in the process of interpretation and decision making. However, Barley's "relational logic" of technicians' work in the present study seems to be manifested and interpreted by supervisors in a slightly different way. In the local division of labour they were not primarily oriented to superior positions of professionals who would use the data stemming from technicians' work nor were they "primarily responsible for creating or maintaining the technical infrastructure that enabled other people to do their work" [10; p.422]. Although we found Barley's differentiation of non-relational and relational aspects of work inspiring and useful and we realized it was created in an attempt to build the ideally-typed (and historically contingent) model of technicians' work, we also found that these two aspects cannot be strictly separated in daily work routines, but are constantly integrated in the process of presenting the results of inspection to clients. This interaction is hierarchically structured with supervisors having authority over the final outcomes of the inspection no matter what the client's expectations or opinions on the vehicle's condition are. Since in many cases presented outcomes do not match the expectations of, and often are even challenged by clients, this interaction was interpreted as the most difficult part of work which includes not only disagreements, but also refusals, often followed by verbal aggression and insult. It is mostly one-on-one type of communication, with PTI station manager involved very rarely, mainly in the most troubling and incident situations. PTI inspectors' authority and power to decide whether a vehicle is in condition to be licenced for participation in traffic is "non-relationally" based on professionally conducted testing procedures involving all subjective and technological sequences and "safety first" principle in mind, but, on the other hand, it is "relationally" openly, and mostly unsuccessfully undermined by clients who in this interaction occupy a subordinate position.

In local organizational division of labour, these autonomy, discretion and authority do reflect possibilities for rethinking the meaning of professionalism along more horizontal ways of organizational structuring, but in the case of supervisors in vehicle inspection stations it includes some kind of unintended consequences related to the strong feeling of work-stress and anxiety in their interactions with clients as the key actors involved in work interactions. These interactional configurations are somewhat corresponding to patterns of occupational identity Darr and Scarlletta described in the case of computer technicians [13] with the important difference contained in the fact that computer technicians in their study were working primarily in the sector of services while the job of PTI inspectors in PTI stations falls under the public authority and activity of general public welfare. It means that interactions with clients in the present study were not limited to the matter of technical support and eventual usage-supervising, but were rather characterized by communicating outcomes that are binding for clients. In that sense, communications *are* perceived as the integral part of the job, often as the most difficult, stressful and therefore sometimes mere unavoidable element, but simultaneously indispensable condition [14] for work to be done correctly.

Generally, the present study's findings coincide with notions on theoretical importance of great varieties with regard to technicians' identity and organizational contingencies which do not allow for excessive and hasty generalizations. As Darr and Scarselletta simply put: "... not all technicians are alike" [13; p.71]. We tried to contribute to their indication that interaction with technology represents an important component of technicians' work, particularly in occupations where subjective assessments play a more significant role than it is usually taken into account. When these findings are complemented with highly contingent character of

"relational" part of technicians' work, it is possible to provide an empirical basis for more dynamic approaches to the research of technical work. On the other side, limitations of the present study are related to sample size and inability to conduct extended field and ethnographic work. Since we do consider extended fieldwork participation as constitutive for qualitative research, a warning in this regard has to be clearly issued. However, we conducted other activities which allowed us to triangulate interview data with extended conversations with second author and her suggestions during repeated field visits. Therefore, our findings enabled us to descriptively analyse one among many highly contingent and socially specific contexts of technicians' work which can help in future people-technology-organization studies.

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