

Designing for Conflicting Information Needs between Machine Setup and Production Planning

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Abstract. Today's society is increasingly developing into an information society. Here, data-driven processes determine the industrial landscape. In such highly data-driven processes, the data from early process steps determine the quality of the following process steps. But what happens when there are opposing interests and requirements for the data? What happens if the main coordination mechanisms trigger conflicting interests? Within this workshop paper, we take a look at the work practices of machine setters and production planners within a small German enterprise and uncover design challenges in order to mediate between the conflicting perspectives on the shift book and the team meeting as formal and a WhatsApp group as an informal coordination mechanism. We will outline open research questions and the next steps to improve cooperation between both sides while focusing on the primary activities and simultaneously supporting the respective role with the relevant information.

Introduction

Cooperative work is in principle distributed in the sense that decision making agents are semi-autonomous in their work (Schmidt 2011). The semi-autonomous and distributed activities need to be articulated among the involved actors. Schmidt (2011) describes those kinds of activities required to manage the distributed nature of cooperative work as articulation work such as 'dividing', 'allocating', or 'scheduling'. How to coordinate work and determining the role

technology can play – and therefore supporting articulation work – is one of the main endeavors of CSCW. Or in other words: CSCW aims at designing (technical) artifacts that support articulation work (Schmidt and Bannon 1992). These artifacts embedded in the organizational context are described as coordination mechanisms.

A coordination mechanism is a specific organizational construct consisting of a coordinative protocol imprinted upon a distinct artifact, which, in the context of a certain cooperative work arrangement stipulates and mediates the articulation of cooperative work so as to reduce the complexity of articulation work of that arrangement. (Schmidt and Simone 1996).

Within small and medium-sized companies, employees and their experience and work capacity ensure economic success (Ludwig et al. 2018). This experience is one of the main advantages towards the course of standardization and growing automation. Within this workshop paper, we describe formal and informal coordination mechanisms within a small German manufacturing enterprise and explore information needs of involved actors. We show that there are mismatches between the information needs of production planners and the information provided by the machine setters. We perceived conflicting perspectives on the shift book as the main coordination mechanism and outline open research questions as well as next steps to mediate between the conflicting information needs of machine setup and production planning.

Coordination Mechanisms and Conflicting Information Needs

To gain insights into the work practices of manufactures, we conducted a participatory observation over the duration of two weeks followed by several interviews with the main actors. We will now describe the activities of the machine setters as well as production planners and their information needs.

Production planning needs to be informed each time incidents such as machine breakdowns or quality issues occur in order to adapt the production schedule as well as to find out about the performance of machine setters to better schedule for specific tasks. These machine setters, on the other hand, are supposed to deliver this information in form of a shift book (see figure 1). For every shift and every working process, they must write down one comment per planned machine into a pre-structured formula about which article was produced, occurrences (general comments, problems or simply ok) and, in case of problems, the respective cause and duration until fix or workaround.

The shift book is stored in an office at the front side of the production hall as a physical document file. However, for their perceived primary task, which is setting up machines for manufacturing as well as repairing and constructing tools, machine setters do not use the shift book, but rather other means of coordination. They perform face to face shift handovers or leave notes on the machines as

asynchronous communication. Additionally, especially to help inexperienced machine setters or foremen, they informally use a WhatsApp group to provide help also outside official working hours. Usually, texts supplemented by pictures are used to describe the problem to make it easy for the colleagues to answer.

At least once a week production planning convenes a meeting with all machine setters. All pages of the shift book since the last meeting are discussed and the machine setters provide additional explanations about their notes or causes of errors when asked by the planner. The machine setters also discuss problems and possible solutions to uncommon incidents. Such meetings, however, have more a character of justification than a constructive one. Throughout the meeting, the planner's main concerns were mistakes or negligence regarding the task or unconsciously filled out forms, often assuming laziness or disregard of instruction. Consequently, machine setters not only find it impractical to use the shift book but also fear that the information they provide could be used against them.

According to the machine setters, however, they would provide this information more likely, if they could be extracted out of their primary task. They would like to use a tool similar to an IT ticket system where they could input, comment and search for issues and solutions per machine or see statistics about frequent incidents as an indicator for maintenance. They state, that especially new or inexperienced colleagues could use this tool as a knowledge source to solve unfamiliar problems independently. As a by-product, the required information needs by the planners could automatically be extracted and visualized.

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		Schicht: <u>Spät</u>				Datum: <u>13.08.2014</u>		
Abteilung	Maschine	Mitarbeiter	Artikel	Uhrzeit	Allgemeines	Probleme	Fehlerursache	
Fräsen	VF1							
	VF3 (Nr. 2)							
	VF3	ZN		30min	7,5 höher problem; Maschine wenige Nummer nachstellen	Kühlmittelwasser		
	VF-4	ZN		15min		Spindel durchmesser problem mit Hubert besprechen		
	Micron							
	Chiron							
Drehen	Masch. 10	ZN			Alles i.O			
	Masch. 8	ZN			Alles i.O			
	Masch. 9	ZN		6std 22 ⁰⁰ 23 ⁰⁰	Teil produzieren AGZ programm selvenbauen Umbauen xbra			
	Masch. 7							
	Masch. 6 Sl	ZN		1,5std	Maschine fertigbauen ET vermessen Alles i.O			
allgemeines	Personal							
	Sonstiges							

Figure 1. Example page from the shift book

Design Suggestions and Next Steps

The challenges outlined in our empirical study outline some design implications for a target IT-based coordination mechanism called “Setup Log” (see fig. 2), which benefit from machine data logging to provide further context such as error codes or current machine state automatically. Thus, for the primary tasks of the machine setters, apart from effective means for manually describing an issue (autocomplete, multimedia attachments, etc.), machine data should be gathered and attached to an issue. The machine data will provide further context that support future troubleshooting and sense-making in similar cases. There should also be means to export relevant parts of the WhatsApp conversations to an issue. All this data attached to an issue could also be used to provide manufacturer support. From the planner’s perspective, the system log should additionally provide information about the time and duration of the machine setters’ tasks and subtasks for getting prompt feedback in case of plan deviations.



Figure 2. Merging of the current formal and informal coordination mechanisms and machine data

As future work, we will implement and evaluate such an IT-based coordination mechanism with a specific focus on the conflicting information needs and the changes on the non-technical coordination mechanisms. We will explore if and how the new level of data and process transparency will lead to a new conflict between both involved actors. Potential conflict areas are the availability of decontextualized data that could be aggregated and analyzed regarding employee performance long after its occurrence (e.g. idle time of a machine or the repair time or setup procedures). Recontextualizing for further qualitative explanation could then be impossible for the machine setters.

Acknowledgments

The findings in this paper come from the research project ‘Echtzeitnahes kollaboratives Planen und Optimieren’, funded by a grant of the European Union and EFRE.NRW (No. EFRE-0800459).

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