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Digitalization in Retail Work: Coping With Stress Through Job Crafting **

Abstract

As our working life becomes more digitalized, the issue of providing humane working conditions is raised. However, current research on digitalization and coping with stress conceptualises the players as individuals *passively* coping with stress. Contrary to that, recent technology research studies argue that technological systems do not come with an objectively ingrained function.

In line with constructivist labour and stress research (Wrzesniewski & Dutton, 2001; Moldaschl, 2005, 2010), we primarily seek to contribute to the discussion through a better understanding of actors' job crafting (appropriation) practices in situations where digitalization processes threaten to reduce perceived autonomy. In particular, we suggest that the job crafting typologies developed in the literature (Wrzesniewski & Dutton, 2001; Tims, Bakker, & Derks, 2012, 2015) do not sufficiently account for the practices employed by actors when appropriating their *digitalized* work environment.

We use the case of a digital merchandise management system ('Shelvesfit') recently introduced in a retail trade group to demonstrate that the employees *actively* attempt to reduce their digital work stress. They do so primarily by attributing a function to this technological system that does not conflict with their professional self-perception as sales employees.

Keywords: digital technologies; job crafting; enactment of technologies; social construction; coping (JEL-codes: J81, Q55, L81)

Introduction

As our working life is becoming more digital, the discussion about humane working conditions is raised once again (Day, Paquet, Scott, & Hambley, 2012; Pfeiffer, 2015; Van Yperen, Wörtler, & De Jonge, 2016). The reason for this is that the new digital technologies provide possibilities to improve working conditions on the one hand but also evoke new forms of stress on the other hand.

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Unlike previous changes and forms of rationalisation in the working world, it is symptomatic for the new digital technologies, that they are capable of making 'independent' control decisions. This means that an employee's autonomy to act is not just challenged by, and subsequently negotiated among other people, but in interaction with the digital technology itself (Ittermann & Niehaus, 2015).

Defining work stress as a limitation of the individual autonomy of action (Bakker & Demerouti, 2007; Bradtke, Melzer, Röllmann, & Rösler, 2016; Moldaschl, 2005, 2010), this, first, raises the question, if work stress levels increase due to the lost autonomy. Secondly, this raises the question, which strategies of coping with stress employees will choose when interacting with technological artefacts that are intangible or capable of 'total control'. We are interested in these, potentially new or diverging forms of coping with digital stress.

What is surprising about the current research on digitalization and coping with stress is that, on the one hand, there is a call for an *active* designing of technology – in criticism of technology-determinist positions. But on the other hand, the causes of potential work stresses in and due to technology are often simply explained as a missing fit between actor and job situation in the tradition of behavioural approaches in stress research (job demand control model (JD-C), job demand resource model (JD-R), and person-environment fit model (PE fit); Edwards, 1996; Day et al., 2012; Lazarus & Launier, 1981; Van Yperen et al., 2016). Hence, these approaches are largely based on a *static* understanding of interaction and technology (Jian, 2007; Moldaschl, 2005), and the players are conceptualised as individuals *passively* coping with stress. Contrary to that, recent technology research studies argue that technological systems do not come with an objectively ingrained function. Instead, said function can be interpreted in manifold ways depending on the organizational context and the meaning ascribed to it by the users. Technologically determined work situations are therefore created by action of their users ('enactment') (Orlikowski, 2000; see also Jian, 2007; Leonardi & Barley, 2000). Accordingly, potential stress situations as a result of digital systems cannot just unilaterally 'act' on their users. In line with constructivist labour and stress research (Wrzesniewski & Dutton, 2001; Moldaschl, 2005; 2010), we, therefore, advocate an understanding of coping with stress in this paper that places a focus on subjects' *active* appropriation practices, and that asks how the subjects fill these practices with meaning. We thus primarily seek to contribute to stress research through a better understanding of actors' job crafting (appropriation) practices in situations where digitalization processes threaten to reduce perceived autonomy. In particular, we see a need to further advance the job crafting typologies provided in the literature (Wrzesniewski & Dutton, 2001; Tims et al., 2012, 2015). In our view, they do not yet sufficiently account for the practices employed by actors when appropriating their *digitalized* work environment.

We use the case of a digital merchandise management system ('Shelvesfit'[1]) recently introduced in a retail trade group to demonstrate that the employees *actively* attempt to reduce their digital work stress. They do so primarily by attributing a function to this technological system that does not conflict with their professional self-perception as sales employees. This is achieved by a reinterpretation of, or even deviation from, the 'mere' technology function. The questions we intend to answer with our empirical material, therefore, are: (1) Which subjective interpretations and appropriation practices do the interviewees apply in the handling of technological systems to avoid stress? (2) Can they make 'Shelvesfit' their own in such a manner that they can maintain their (perceived) scope for action and prevent stress in this way?

The paper is structured as follows: Section two gives a brief overview of the current discussion on the topic of digitalization, stress and work and on the conceptual and theoretical advantages of an understanding of digitalization, stress and work according to social constructivism. The third section provides information about our methodological approach to data collection and analysis. We also present our empirical data here: The case company has been implementing a new digital software ('Shelvesfit') in order to optimize its merchandise management. We discuss our findings in the fourth section in view of the literature. In particular, we draw attention to the subjective job crafting strategies of employees when handling digital technological systems in order to reduce or to avoid stress.

Theoretical Perspectives: Coping With Stress From Digital Technologies

For some years now, the 'digitalization of work' (Pfeiffer, 2015) has been added to the discussion about the range of potential work stresses due to the 'informatisation of work' (Boes, 1996). On the one hand, authors refer to the well-known changes in the working world resulting from information and communication technologies (ICT) (e. g. issues of work-life balance despite or because of flexible communication media; Jian, 2007; McKechnie & Beatty, 2015). Digitalization, on the other hand, *also* means that the things themselves (e. g. software, machinery, tools, but also goods) are equipped with 'artificial intelligence' and capable of making *independent* control decisions (hence: 'smart technology'). This raises the question whether potential work stresses are caused by digital technology in a much more fundamental manner than before, since the employees' autonomy of action and decision-making is potentially not just limited by technology-based interaction (such as emails, electronic calendars); rather, it is the intelligent machine itself that challenges the employees' autonomy (Ittermann & Niehaus, 2015).

1 This software is nowadays used in all larger retail trade companies for planning and forecasting merchandise placement, however company-specific variants frequently have their own software names. We will therefore use this pseudonym below for anonymity reasons.

There are numerous empirical studies in stress research that deal with changes in the working world as a result of new information and communication technologies (Day et al., 2012; Pfeiffer, 2012; Van Yperen et al., 2015). They are, however, often based on an understanding of coping with stress that conceptualises the players as those who *adjust* to a stressful situation (Edwards, 1996).

Coping With Stress: The JD-R Model

Much of the empirical work on the effects of ICT on employee stress in organizational psychology research is based on established models such as the person-environment fit paradigm (PE-fit) and the job-demands-resources (JD-R) model. In this tradition, stress is conceptualized as a function of individual disposition, technological characteristics and organizational structures (Bakker & Demerouti, 2007; Edwards, 1996). Applying the classic JD-R perspective to the effects of ICT, employees perceive ICT depending on personality factors (e. g. age, self-efficacy, traits such as neuroticism and openness) and organizational conditions (e. g. as supporting and/or controlling) either as a 'requirement' or as a 'resource' (Day et al., 2012). ICT perceived as 'resources' can result in positive effects on job satisfaction, work engagement and productivity. Job resources may also help to cope with exhausting job demands when individuals are able to re-assess them as 'challenges' rather than demands (Tims et al., 2012). The JD-R model thus explains positive as well as negative psychological effects of ICT usage. For example, Van Yperen and colleagues (2016) show that the impact of high work stress levels is mitigated if ICT is used to offer flexible working conditions to employees who value autonomy (in particular through 'blended working'). High work stress thus only has a negative effect on employees' intrinsic motivation and well-being if they have a pronounced need for autonomy and at the same time do not see any ways of using ICT as a resource for flexible working (Van Yperen et al., 2016).

The authors thus convincingly show that the implementation of ICT may result in higher or lower levels of perceived stress – depending on personal dispositions (need for autonomy) and organizational design (Van Yperen et al., 2016). Regarding our focus on coping with ICT-induced stress, it is interesting to note that Van Yperen and colleagues conceptualize employees as *passively reacting* to the resources and/or requirements perceived in the work situation at hand. Organizational design features (job autonomy, corporate culture, training) remain within the domain of management. Accordingly, the possibilities employees *themselves* have to alter their working conditions are not part of this research perspective.

Coping With Stress Through Job Crafting

More recently, authors in the JD-R tradition recognize a more active role of employees in coping with stress. Although not concerned with the particular issue of ICT or digitalization, Bakker and colleagues (Bakker, Demerouti, & Sany-Vergel,

2014; Tims & Bakker, 2010) suggest that employees experiencing exhaustion will try to *actively* alter their situation through processes of 'job crafting'. The concept of job crafting is based on original work by Wrzesniewski and Dutton (2001) which is discussed in more detail below. In the extended JD-R model, Bakker and colleagues (2014) argue that employees will seek to reduce perceived exhaustion and stress by altering job demands and job resources across situations. For example, employees might actively ask for support and feedback from their colleagues, thus increasing job resources which in turn moderate perceived exhaustion from job demands (Bakker et al., 2014). The authors hypothesize that job crafting is more likely to occur when employees hold certain personal resources such as enthusiasm or vigour. Employees who feel already exhausted might be unable to mobilize the necessary resources to alter their working conditions (Bakker et al., 2014). In line with the extended JD-R model, empirical work by Tims and colleagues (2012, 2015) reveals three job crafting strategies. In order to reduce exhaustion and/or enhance work engagement employees try to (i) increase structural or social job resources, (ii) increase challenging job demands (when high on job resources) or (iii) decrease hindering job demands.

Although the extended JD-R model provides a sound theoretical foundation for understanding employees' reaction to situations of stress, it also holds some limitations: First, from this perspective employees only resort to job crafting *if and when* they perceive an exhausting work situation in the first place, i. e. as an adaptive response to situational stimuli. However, in the original concept by Wrzesniewski and Dutton (2001), job crafting is an on-going activity and part of an alternative conception of organizational design as interactive construction. Second, Tims and colleagues (2012, 2015) leave open *how* job crafting is conducted, i. e. what employees actually do when engaging in job crafting. While their paper focuses on potential effects of job crafting (increase of job resources and/or job demands), we are interested in better understanding the actual practices of job crafting, i. e. how actors actively make sense of and (re-)appropriate their working environment. Third, to our knowledge, the extended JD-R model has not yet been applied to the context of digitalization or ICT at work. As discussed above, digitalization poses substantial challenges for an individual's ability to hold onto her/his autonomy and thus may require different strategies of job crafting.

The model is thus only partially suitable for the purpose of this paper. We, therefore (re-)integrate insights from the original concept of job crafting by Wrzesniewski and Dutton (2001) and from the theory of technology appropriation developed in the field of organizational sociology (Orlikowski, 1992, 2000) in order to account for job crafting practices in dealing with digitalized working environments.

Job Crafting as a Practice of Technology Appropriation

Job crafting is defined by Wrzesniewski and Dutton as 'the physical and cognitive changes individuals make in their task or relational boundaries of their work' (Wrzesniewski & Dutton, 2001, p. 179). It is conceptualized as 'creative action' through which individuals are able to 'sustain a viable definition of the work they do and who they are at work' (Wrzesniewski & Dutton, 2001, p. 180). As such, job crafting does not only occur when employees perceive their working situation as demanding – as suggested by the extended JD-R model – but reflects the on-going interactional sensemaking processes of individuals at work. This clearly marks a paradigmatic difference between the proponents of the JD-R model, albeit extended, and a constructivist understanding of work as exhibited in the original concept (Wrzesniewski & Dutton, 2001, p. 187f.). Consistent with their paradigmatic approach, Wrzesniewski and Dutton (2001) pay more attention to what individuals actually *do* in subjectively constructing their jobs (the practice of job crafting) rather than to outcomes of these processes (effects on job design elements) as in the work by Bakker, Tims and colleagues (Bakker et al., 2014; Tims & Bakker, 2010; Tims et al., 2012; 2015). Based on secondary data, they identify three types of job crafting strategies: (i) task related, (ii) cognitive, and (iii) relational strategies (Wrzesniewski & Dutton, 2001). Whereas the first mode refers to changes in the number, scope and type of job tasks, cognitive strategies change the way individuals see and frame their job. Relational strategies alter the quality and/or amount of interaction with others encountered on the job (Wrzesniewski & Dutton, 2001, p. 185). For the purpose of this paper, the typology retains two limitations: First, rather than proper strategies, the typology covers modes of strategic action. We suspect that in practice individuals may tend to combine modes, e. g. when a reduction in the number of tasks (task strategy) requires a mental rearrangement of the individual's responsibilities and role identity (cognitive strategy). Second, the relational mode as described by Wrzesniewski and Dutton (2001) is limited to human relationships and does not cover job crafting strategies directed at and interacting with machines and artefacts. These, however, turn out to be the core strategies in our case study on technology appropriation described in detail below.

In line with the constructivist perspective taken by Wrzesniewski and Dutton (2001) but focusing explicitly on the practices of coping with new technologies, we, therefore, advocate an understanding of job crafting that places a focus on active technology appropriation practices of the subjects as proposed by Orlikowski (2000). In this constructivist understanding of technology appropriation, there is agreement that the use of technology is not determined by a structure or mode of operation *ingrained* in technology *itself*, but by interpretations of its users regarding the functionalities *attributed* to technology (Orlikowski, 2000). In criticism of the structuralist understanding of technology, this also means that 'technology has no absolute identity' (Jian, 2007, p. 520) but that its specific use constitutes this identity, and can, therefore, be changed. Consequently, potential stress effects due to the

implementation of digital systems are not determined by structures, functions, and intentions with which the ICT system might be introduced but are a result of the employees' interaction with the technology (Moldaschl, 2005, 2010). It is this interaction that constitutes the structure and functionality of technology through practices of subjective interpretation and appropriation.

We therefore advocate an understanding of coping with stress in this paper that, on the one hand, uses a constructivist understanding of work and stress (Wrzesniewski & Dutton, 2001; Moldaschl, 2005, 2010) and, on the other hand, uses an understanding of technology that does not view the appropriation of technology as a passive process but as an active interpretation and design effort by the subjects (Orlikowski, 2000). In short: We recommend broadening the scope of the existing concept of 'job crafting', developed by Wrzesniewski and Dutton (2001), to coping strategies responding to stress effects due to a digital working world.

Method and Data

The Empirical Case: Introduction of Digital Software at a Retail Group ('Shelvesfit')

The question we intended to address with our company case study was to clarify how employees in chain stores of a retail group are coping with digital stress. In detail, we analysed the implementation of a digital software ('Shelvesfit'), that optimises the merchandise management in this retail group. According to the literature on digitalization of work (Ittermann & Niehaus, 2015; Pfeiffer, 2015), we could expect a new quality of stress due to the implementation of the digital software 'Shelvesfit'. The digital software does not only support already well-known processes of standardisation and centralisation of decision-making processes but, as 'smart technology', is also capable of making its own decisions. This challenges the employees' autonomy of action in a much more fundamental manner than before, as the division of roles between the working humans and the (intelligent) machine now becomes a matter to be settled (Ittermann & Niehaus, 2015). Defining work stress as a limitation of the individual autonomy of action (Bakker & Demerouti, 2007; Bradtke et al., 2016; Moldaschl, 2005; 2010) we expected an increase in work stress levels (due to the lost autonomy) and other (and perhaps: new) forms of coping with this digital stress because the individuals have to cope with the (intelligent) machine.

Merchandise management denotes all activities in a retail company dealing with planning, controlling, and performing the merchandise flow from the producer to the end consumer (Ahlert & Kenning, 2007; Barth, Hartmann, & Schröder, 2015). The core functionality includes product range planning, purchasing, logistics/warehousing, and sales. The merchandise management system provides the modelling of these processes using information technology and the processing of all data that accompany the merchandise (Henning, n. d.). Unlike previous rationalisation pro-

cesses in the retail sector, the new quality of the current digitalization process is that optimisation processes are not just performed by mere automation. Instead, these systems are equipped with artificial intelligence and thus enabled *self-organised* production control: They optimise processes independently ('deep learning'), link physical objects (e. g. machines, goods) using data connections ('Internet of things'), and independently exchange data ('big data') (Pfeiffer, 2015). How does this new quality of automation in the working world limit the personal autonomy of the employees and lead to new forms of digital stress? In particular, for the software of interest here, this means that the system 'Shelvesfit' is itself capable of adjusting and recombining quantity forecasts depending on situational conditions (e. g. weather forecast, pending holidays, price changes, vacation) and of learning from forecasting errors in the past. Merchandise placement can also be performed automatically in accordance with predetermined algorithms (e. g. price group, product group) and corrected error messages. The professional autonomy of the employees is therefore limited because it is the *digital system's* – and not their – decision how many goods are ordered when they are ordered and where they will be placed on the shelf. Secondly, the software is one building block in the complex system of merchandise management and should be used to optimise interfaces between individual functions of merchandise management, in particular, of ordering and placing merchandise and of logistics. Work processes must, therefore, be standardised to be interface compatible. As a consequence, the professional autonomy of the employees is limited further because they lose flexibility and freedom of decision-making. For example, users cannot just place goods on the shelves as they please (e. g. where there is a free spot or where they look aesthetically pleasing in the opinion of the employees) but have to place them where they belong according to placement planning. Automatic interface optimisation between optimal quantity of goods, optimal delivery cycle and predicted sale will only work if the actual shelf is an exact image of the virtually planned shelf.

The digitalization of the merchandise management system can evoke new forms of stress because 'Shelvesfit' limits the professional autonomy of the employees in two dimensions: First, it is the digital software which 'decides' the quantity and timing of ordered goods as well as their placement on the shelves. Second, the implementation of the software is the reason for a massive standardisation of work processes, which limits the professional autonomy as well.

Method

We conducted a company case study at a German retail company in the period from June 2015 to February 2016. This company is among the ten largest retail companies in Germany (Metro, 2015). At an organizational level, the company so far had a rather decentralised setup, which was necessary in view of the relatively small number of chain stores and a company strategy that pursues both quality and

price strategies. The decentralised organizational structure is currently under pressure for change.

As mentioned above, we intended to explore the effects of a digital management tool in the subsidiaries of a retail company. Thus, we focussed our analysis on the digital work stress and the coping strategies of the *sales employees* in the chain stores. In their professional role as sales employees, they had been responsible for the assortment, the ordering as well as the placement of the goods *before* 'Shelvesfit' was introduced. *After* the introduction of the digital management system the formal job descriptions of the sales employees have changed. Now it is the digital management system, which 'decides' which, when and how many goods are ordered and where they are placed on the shelves (see above for more details).

Overall, we conducted 30 guideline-assisted expert interviews (60-80 minutes each) (Froschauer & Lueger, 2009; Meuser & Nagel, 2009) with sales employees and team leaders (half/half) in five chain stores of the retail company. 80% of the interviewees were female; data sampling followed a 'qualitative sampling' strategy (Kruse, 2015). Interviews were conducted by both authors.

All interviews were transcribed according to the GAT 2 basic rules (e. g. notation of pauses, overlaps, emphasis and extra-linguistic actions, e. g. laughing), and the data was made anonymous (Kruse, 2015). The data material was analysed using an open coding strategy, which however was influenced by heuristic concepts (e. g. understandings of stress, job crafting strategies) (Kelle & Kluge, 2010). Kelle and Kluge advocate a coding strategy that inductively develops new codes in dealing with the material and at the same time 'applies' existing categories to the material.[2] It enabled us, on the one hand, to explore the conceptual categories developed by Wrzesniewski and Dutton (2001) and, on the other hand, to remain open to eventual new job crafting strategies in our particular case. Unlike strict content analytical approaches to analysis (e. g. Mayring, 2008), which only consider the 'what' of an action at the meaning level of 'utterances', the approach by Kelle and Kluge (2010) also includes the meaning level of 'statements', that is the performance of an action (the 'how' of an action). Only this makes it possible to reproduce the meaning that the interviewees attach to their action (see also Kruse, 2015). In particular: (1) How do those interviewed take possession of 'Shelvesfit' in their everyday practice to avoid stress? (2) Can they appropriate 'Shelvesfit' in a way that enables them to maintain their (perceived) scope for action and to reduce stress? We structured our data analysis in two steps: First, we tentatively applied in a deductive manner the job crafting strategies developed by Wrzesniewski and Dutton (2001) to our data. Secondly, we explored in an inductive way whether the specific case context elicited

2 According to Kruse, this is a method mix of 'reconstructive (statement-related) methods', which ask for the 'how' of an action, e. g. using grounded theory, and 'content-analytical (utterance-related) methods', which are only interested in the 'what' of an action (Kruse, 2015).

new/other job crafting strategies indicating a modification of the original typology. We illustrate our coding procedure in Table 1 and 2.

Table 1: Data analysis - deductive step

Category (Wrzesniewski & Dutton, 2001)	Definition	Example	Coding Rule
cognitive coping strategies	Employees change the way seeing and framing their job (Wrzesniewski & Dutton, 2001)	'There [are] of course always blurs in the system, and so I always have a plan, I know: ok, there must always be a small finger of space on the shelf bottom. Otherwise, I won't be able to place it there. And then I cannot put it in at the bottom. If I did not think of that, I will have to start rearranging from below.'	The formal job descriptions of the sales employees have changed due to the introduction of „Shelvesfit". This management tool limits the professional autonomy of the employees. The interviewees frame and legitimate their actual work in a way that deviates from the formal job descriptions.

The 'cognitive coping strategy' (see example in Table 1) in particular reveals the need for an additional *inductive* coding strategy in a second step because there are at least two 'cognitive coping strategies' with *different* meanings for the interviewees. As one can see below, the interviewees differentiate in their framing practices between an organizational meaning on the one hand and their own professional understanding as sales employees on the other hand, which can deviate from the organizationally intended meaning. In a constructivist perspective of work, they address different meanings in their sensemaking and framing processes.

Table 2: Data analysis - inductive step

Paraphrase	Generalisation	Category (Wrzesniewski & Dutton, 2001)	Category (inductive)
'Shelvesfit' has technical problems with the automatic placement of goods. It does not work without errors. The interviewee can anticipate and correct these errors in advance. Only the human correction of the errors of 'Shelvesfit' enables the management tool to work. Thus, the enabling of 'Shelvesfit' by the interviewee is her legitimation for her actual work beyond the formal job descriptions.	Framing the actual work as an enabler of the management tool 'Shelvesfit'	Cognitive job crafting	Compensating for subcomplex technology

Paraphrase	Generalisation	Category (Wrzesniewski & Dutton, 2001)	Category (inductive)
The automatic placement of goods by 'Shelvesfit' leads to discomfort for customers because they can't find their favourite goods anymore. Subsequently, losses in returns have to be accepted. To avoid these losses, the interviewee deviates from the organizational placement strategy and develops an own and local strategy only for 'his/her' shelves. Thus, preventing the retail trade group from losses is the legitimation for the interviewee to deviate from the formal job descriptions.	Framing the actual work as a local replacement of the management tool 'Shelvesfit'	Cognitive job crafting	Locally reassigning the technology's function

Findings: Subjective Coping Strategies of the Employees When Dealing With 'Shelvesfit'

We have above advocated an understanding of coping with stress that on the one hand uses a constructivist understanding of work and stress, (Wrzesniewski & Dutton, 2001; Moldaschl, 2005, 2010) and on the other hand uses an understanding of technology that does view the appropriation of technology as an active interpretation and design effort by the subjects (Orlikowski, 2000). Accordingly, potential stress effects as a result of the implementation of digital technology are not ingrained in that technology itself but are generated by the practice of its interpretation and appropriation by users. Consequently, users can reduce their stress levels through their respective subjective interpretation and appropriation practices when dealing with this technology by attributing 'their' meaning to it. The data analysis thus delineates how the interviewees appropriate 'Shelvesfit' and whether they *attribute* a role to 'Shelvesfit' that strengthens their autonomy to act and their professional self-perception. Empirically, we find four different appropriation practices in our material.

(I) Compensating for Sub-complex Technology

The first appropriation practice is based on an interpretation of 'Shelvesfit' as a technology that is too sub-complex for handling real situations that cannot be standardised or planned. Following Wrzesniewski and Dutton (2001), this is a cognitive coping strategy in which sales employees provide a different framing of their jobs vis-à-vis their formal job description. Although 'Shelvesfit' has put a limit to the scope of their professional autonomy, employees do not react by adapting to the limitation. Instead, they re-affirm their scope of action as a salesperson and thus

maintain *their* interpretation and meanings of their work, namely that their work is absolutely necessary for the correct functioning of 'Shelvesfit'.

Accordingly, the sales employees at the chain stores consider themselves 'guarantors' of the new technology. In this way, they do not render their expert knowledge superfluous, but turn it into a requirement for the effective functioning of 'Shelvesfit'. The employees' empirical knowledge (Böhle, 2010; Pfeiffer & Suphan, 2015) is leveraged whenever the tendency towards standardisation and algorithmization of social situations becomes apparent. In particular, employees handle situational imponderabilities arising from technical standardisation by smoothing technical faults and adjusting standard solutions to local requirements. Knowing that only they can remedy these social contingencies in the implementation of 'Shelvesfit', they remain the experts – despite standardization targets set by the software. They thus reaffirm and retain their expertise and their status as sales experts.

In particular, these situational imponderabilities occur in product range management. During the ordering process, for instance, sales employees oftentimes have to correct the quantity forecasts calculated automatically by the software. These forecasts can be inaccurate due to unforeseeable factors such as new listings of products or outliers from the average sales. So far, these occurrences are not covered by adequate predictive algorithms in the system. In these cases, chain store employees have to intervene in the automatic ordering process.

> 'We now have increased sales and the software always takes the six weeks average, that is a guess, and if I, well, if I always sold 10 and all of a sudden I am selling 20, then of course I have an empty spot in my shelf because the system won't get that. And then I go and replenish manually. […] And then I see what is going on.' (LIM_TL_D)

The same applies to the issue of so-called faulty 'inherited properties of core items'. Core item inheritance means that new core items are automatically placed in the system according to predetermined criteria (e. g. by brand or product group). If the automatic assignment of a new item is incorrect, the placement will also be predicted incorrectly. This is where the practical knowledge of the chain store employees comes into play again, as one interviewee illustrated with reference to an oral hygiene product. The software placed this product according to the 'brand' criterion and not to the 'product group' criterion. As a result, it ended up at the very bottom, on the shelf for under-the-counter items, rather than at the customers' eye level, although it was a high-priced product.

> 'There are these whitening products that allegedly give your teeth a brilliant white within 14 days. Colgate launched a new product with a toothbrush and this whitening pen. Costs €14.95. That is quite stiff. And the item inherited its placement and was therefore placed next to Colgate toothpaste. Now, a tube of Colgate toothpaste is €1.35. So it is pretty far down. And this is where this new item went by inheritance: to inexpensive Colgate toothpaste. This is where I say – no. […] And it inherited that place. So they recommend or determine a placement, where I say, no, I won't do that. I simply won't do it. […] That is crap […], and so I place it up there, where the customer expects it to be, and first and foremost at the customer's eye level, for €14.95.' (ZWI_TL_D)

The practical knowledge of the chain store employees is also used for compensating technical errors and for adapting standard solutions. For example, the standardised placement forecast often has to be adjusted to the physical conditions on site. Or the item master data stored in the system (price, packaging size, storage location, product group, stock levels) are incorrect and would result in faulty placement if it were not for the intervention of the chain store employees. For example, when product dimensions are incorrect, the merchandise will not fit onto the planned shelf. Due to their specific practical knowledge, the sales employees are able to detect *in advance* that the placement projection for a specific item cannot be correct. For example, one of the interviewees said about coffee products that

> 'there [are] of course always blurs in the system, and so I always have a plan, I know: ok, there must always be a small finger of space on the shelf bottom. Otherwise I won't be able to place it there. And then I cannot put it in at the bottom. If I did not think of that, I will have to start rearranging from below.' (ZWI_BRL_F)

It is characteristic of this appropriation practice that the interviewees are well aware of the limitation of their professional autonomy to act. However, they attribute a sub-complex function to 'Shelvesfit' which makes their practical expert knowledge indispensable for the successful functioning of the system. They try to find relief in that they create new, subjectively relevant scope for action, which is compensating for a sub-complex technological function.

(II) Locally Re-assigning the Technology's Function

This appropriation practice entails that the employees see the software as something that prevents optimal work with the customer because the harmonisation of merchandise placement and product range does not allow an accurate response to customers' needs. According to Wrzesniewski and Dutton (2001), this is also a cognitive coping strategy involving a subjective re-definition of the formal job design. The difference to the former mentioned coping strategy is that the employees do not frame their jobs as supporters for the correct functioning of 'Shelvesfit'. Instead, they frame their action as selective deviations from the system solution necessary and legitimate with a view to the long-term success of the company. According to their professional self-image of 'good consulting and selling practice', this deviation from the system is the only possible and legitimate way of acting. This can be observed mainly in the case of standardised placement and product range decisions. Due to their specific experience, chain store employees know their customers' *situational* search strategies for each product group while the central placement decision is *standardised* for all stores. In their view, this fact requires selective deviation from the automated placement specification, as this interviewee describes:

> 'This is something I find completely stupid, I won't do that because I know it is the better decision for the customer. This is what [Shelvesfit] sometimes does not think of, to decide from the customers' point of view. Where does the customer see such a product, where does the customer expect such products?!' (ZWI_TL_D)

And another interviewee explains this necessity to overrule the software solution with reference to the 'tea' product group:

> 'I think a customer who buys Teekanne products will keep buying Teekanne. It makes no sense to show him fruit teas from seven different suppliers next to one another, because that simply looks sloppy. The shelf generally has an untidy, unorganised appearance, and it is difficult to convince the customer of it. I am convinced that we would be more successful if we had brand shelving.' (LIM_TL_T)

Regardless of whether the interviewees attribute a sub-complex function to 'Shelvesfit' in their appropriation practices or whether they resist the technical function intended by the organisation for the sake of customer needs, they always interpret the function of 'Shelvesfit' as not appropriate for coping with real work situations. 'Shelvesfit' can only contribute to process optimization because the chain store employees keep a clear overview of the complexity and of sales situations characterized by imponderabilities. Smooth functioning of the software is only possible with the help of human expertise, which either remedies systemic errors or overrules the system decision for the customer's sake. The interviewees try to maintain their (perceived) scope for action by cognitively replacing the technical function intended by the organisation with their own expert knowledge and skills.

(III) Reducing Decision-Making Responsibility

The third appropriation practice is outside the logic of the other three appropriation practices. It is not about retrieving scope for action restricted by 'Shelvesfit' or about creating new scope for action. Instead, it aims at using 'Shelvesfit' as a justification why specific areas of decision making *must* be cut from their personal sphere of influence due to 'cogent reasons' which the interviewees consider *useful*. When applying this coping strategy, the interviewees remove the respective areas of decision making from their sphere of responsibility and do no longer feel responsible for the outcome. The interviewees justify this reduction of decision-making responsibility by means of role assignment, confidence in and identification with the company, or externalisation into the organizational environment.

In the perception of the interviewees, organizational role assignments imply 'that each has his or her assigned role [from which] responsibilities [are derived], which he or she has to fulfil.' (GER_TL_D). This role assignment is not questioned. Furthermore, reduction of decision-making responsibility is revealed in a sales employee's trust that only central administration has the required expert knowledge to act and therefore he/she can easily yield decision-making responsibilities. A team leader notes that

> 'the [feeling of belonging] is very very important, this ranks very very high for us, because it makes the employees out there really aware that they belong to the company. […] In my eyes, this is very important.' (LAH_TL_D)

Third, the interviewees find relief in externalising decision-making responsibility by referring it to the organizational environment. Since the company is moving in the highly competitive environment of the retail trade sector, central administration is perceived as driven by market forces, *responding* rather than acting. Hence, the centralisation of placement and product range planning decisions, which is technically supported by 'Shelvesfit', constitutes just a rational consequence.

> 'Meanwhile we are centralising more and more, including purchasing costs. If everyone has the same, if every market carries the same products, then your purchasing situation improves, right? This also is about money, after all. No, in view of that I think that I cannot influence that as much anymore, for example.' (LIM_TL_D)

It is characteristic of this appropriation practice that the interviewees do not attempt to regain lost scope for action or to create a new scope for action. In contrast, they redefine their personal sphere of responsibility and find that they do no longer 'have' to be responsible for the respective areas of decision-making. Only then they feel able to keep control of the remaining areas of decision-making autonomy.

(IV) Transforming Virtual Worlds Into the Real[3] Shelf World

While strategies (I) to (III) confirm the job crafting modes as defined by Wrzesniewski and Dutton (2001), the fourth coping strategy lies beyond their typology and is grounded in the specific working conditions in a digital working world. As already mentioned, 'digital' also means, that the working tools are intangible for the users because they consist mainly of software algorithms. So, the first characteristic of this appropriation practice is that the sales assistants try to make the virtual world of the software visible and haptic in the real world of their chain store. This results from the fact that the virtual world of 'Shelvesfit' does not take real spatial and physical constraints into consideration, which, however, restrict the actions of the sales employees.

First, this can be observed when employees attach 'placeholder' price tags if 'Shelvesfit' does not automatically provide price tags in time due to technical and organizational errors. Since their daily work is set in the world of real shelves (and not, for example, at a computer in an office), electronic reminders that the respective price tag still has to be replaced provide little help. They translate the virtual reminder into 'placeholders' on the real shelf to bridge this media gap.

Second, the transforming strategy occurs when the sales employees adjust the new technical working conditions ('Shelvesfit' actually requires an office workplace which does not fit into everyday routines at the chain store) to their work situation – not the other way around. This is achieved by overcoming the spatial separation of office and chain store work using a 'laptop shopping cart'. The sales employees

3 We use the term 'real' as opposed to 'virtual' here to denote objects in the analogue sphere although we acknowledge that the virtual reality nowadays is often much more 'real' to human actors than their analogue reality.

mounted an office laptop onto a shopping cart and used it to approach their real shelf world. One interviewee described this as follows:

> 'Simply because I never see the local conditions on the laptop. This is always a make-believe world, but we are in the real world, and I decided that I won't do that up there in the office. I take my laptop, put it on the shopping cart, which has a board for it, and take it with me to the chain store.' (ZWI_TL_D)

Third, placement planning in the virtual world of 'Shelvesfit' poses the challenge that this planning never exactly matches the real conditions on site (e. g. variable shelf widths), such that virtual shelf planning using 'Shelvesfit' is helpful to a limited extent only. Here again, the chain store employees translate the virtual planning steps for their actual shelf. One of the individuals interviewed reported:

> 'The partitions, for example, particularly in the toiletries department, they are not taken into account. So at the laptop, you think by yourself, well, you still have about 8 inches of space at the back. But no, if you place a partition per item, you won't have 8 inches left. One inch at best, is all you have. The item won't fit in there.' (ZWI_TL_D)

It is characteristic of this appropriation practice that the interviewees are aware of the stresses associated with the introduction of 'Shelvesfit' (e. g. work interruptions when placing price tags, standardised placement planning as an interference with their professional autonomy). Still, they try to make this technology their own so that it is compatible with the practical requirements of their everyday routine at the chain store, and not the other way around by adapting to the virtual logic of the software. In this way, they create a new scope for action, since only they have control over the function of material application (setting 'placeholders', 'laptop shopping cart') thanks to their specific empirical knowledge.

In summary, all appropriation practices have in common that the interviewees frame their actual job designs in a way that they can maintain their perceived scope for action regarding those decisions they feel responsible for, even if they lose autonomy in their formal job designs due to the implementation of 'Shevelsfit'. If they can control these decisions – and do not just feel responsible for the related outcome – they will regain their autonomy to act. This can be achieved by the emergence of new, subjectively relevant scope for action (IV), by regaining lost scope for action (I and II) or by reducing their own responsibility for decisions (III) through redefining spheres of responsibility. The appropriation practices are summarized in Table 3.

Table 3: Appropriation practices

Appropriation practices	Scopes of autonomy from the perspective of the sales employees
I: Compensating for sub-complex technology	Retrieving scopes of action because of the necessity of human expertise in making the system work: 'Shelvesfit' only functions because I ensure it does.
II: Locally re-assigning the technology's function	Retrieving scopes of action because of the necessity of human expertise in making the system work: 'Shelvesfit' only functions because I locally overrule the system solution.
III: Reducing decision-making responsibility	Redefinition of spheres of responsibility: 'Shelvesfit' provides the justification why specific scopes have to be cut from their personal sphere of influence. (Competition, role assignment)
IV: Transforming virtual worlds into the real shelf world	Emergence of new, subjectively relevant scopes: 'Shelvesfit' only functions thanks to my material application.

Discussion

Based on our empirical case study, we were able to show that the way in which sales employees handle the 'Shelvesfit' software does not just consist in passive adjustment to a demanding novel and now digitally framed work situation. Instead, we delineated employees' active practices of appropriating and interpreting this technology. While previous studies on the connection between stress and digital working conditions already integrate an active role of employees in coping with stress, they so far lack an in-depth understanding of the actual practices of job crafting in digitalization processes. Applying the job crafting typology developed by Wrzesniewski and Dutton (2001) and extending it to a digitalized working environment we provide a better understanding of employees' active appropriation of these new technologies.

In view of the theoretical framework introduced above, our empirical findings contribute to advance our understanding of job crafting as a form of coping with stress-inducing digitalization processes at work. While the typology developed by Tims and colleagues (2012) focuses on the effects of job crafting strategies on job design (i. e. whether they increase/decrease job resources/demands), our results describe the practices of job crafting as such, that is, what employees actually *do* to counter or prevent stress-inducing situations at work. As shown in Table 3, the practices identified in our study do in fact lead to a reaffirmation of existing or to the creation of new areas of individual autonomy (increase job resources; Bakker et al., 2014). Furthermore, we found practices regarding the reassessment and legitimization of lost scope of action (decrease hindrance job demands; strategy I/II). In this respect, our typology of job crafting practices supplements the typology developed by Tims and others (2012) yet takes a different view on the phenomenon. This divergence in perspective is also related to a divergence in paradigmatic standpoints.

Whereas proponents of the JD-R model (Bakker et al., 2007, 2014; Tims et al., 2012, 2015) seek to explain the *outcomes* of job crafting in situations of stress – which is in line with a still dominant objectivist paradigm in much stress and coping research –, we intended to better delineate how employees themselves (re-)construct and thereby subjectively make sense of their digitalized work environment. To this end, we recur to constructivist perspectives of work and technology appropriation.

Regarding the job crafting strategies introduced by Wrzesniewski and Dutton (2001), our results also provide an additional angle on the phenomenon rather than a competing model. The typology provided by Wrzesniewski and Dutton (2001) – similarly to our work – describes the actual practice of job crafting by delineating what employees essentially *do* in constructing their work environment. In fact, we can also detect their strategic modes in the actions undertaken by individuals in our sample, particularly cognitive strategies. Strategy I, for instance, reveals a cognitive response in crafting the task at hand (Wrzesniewski & Dutton, 2001) when sales employees retrieve their scope of action through re-affirming their expertise vis-à-vis a sub-complex technology. The practices derived from our data, however, tend to combine different modes of action. In fact, strategy II in our study combines cognitive (re-interpreting the own role) as well as task-related changes (relinquishing tasks) in order to subjectively diminish the burden of personal accountability. For these cases, the typology provided by Wrzesniewski and Dutton (2001) does not sufficiently discriminate between diverse job crafting strategies. As demonstrated above, our data also indicate the need for refinement of cognitive job crafting strategies: Employees apply diverse cognitive strategies in order to cope with stress arising from the implementation of 'Shelvesfit'. We, therefore, used inductive data analysis which led to a better understanding of different cognitive strategies in use in technology appropriation processes. In particular, we saw a need to differentiate between cognitive strategies legitimating human corrections of a faulty technology (I), re-assigning a new function/meaning to the technology at large (II) and redefining the employee's personal responsibilities (III).

Furthermore, the inductive data analysis enabled us to supplement the job crafting typology with regard to the importance of materiality and artefacts in coping with stress. In particular, strategy IV reveals how sales employees seek to translate the virtual world of the machine/software into their analogue, tangible reality. Here, we can find conceptual links to actor-network theory (Knorr-Cetina & Bruegger, 2000, 2002; Latour, 1999) and practices research (Putnam, 2015; Reckwitz, 2002) where social systems and practices are generated through the relationship between human actors and artefacts/materiality. A broader discussion of these approaches, however, lies beyond the scope of this paper.

The identified appropriation practices further have in common that they raise the question of decision-making competence when interacting with technical artefacts

which, being intelligent systems, are themselves capable of making control decisions. The recent debate on digitalized work consequently distinguishes between a so-called human-centred control design and a machine-centred control design (Windelband et al., 2011; Dworschak, Zaiser, Martinetz, & Windelband, 2011). Therefore, stress is now raised not only at the interpersonal level but also at the level of negotiating with the technical artefact, which can not only make decisions that the user can no longer manage but is capable of 'total control' (e. g. tracking at Amazon, where vital data of its employees are analysed). This, however, will raise the question of (regaining) subjective control of action in a new light.

Limitations primarily derive from the methodology selected for his paper: Since the paper is mainly explorative in kind, particularly regarding the differentiated cognitive job crafting strategies and the dimensions of materiality, and limited to observations in a single company, empirical generalization is precluded. Also, we wish to emphasise that the data were collected through interviews at a single point of time – the long-term effects of the technological change and routinization processes are therefore not included. We are thus unable to observe whether the job crafting strategies applied in the case take hold over time or are further modified, e. g. through interaction with management and/or software adjustments. In view of further research in this area, we also wish to emphasize two critical aspects deriving from the constructivist understanding of 'stress' in this paper. First of all, we base our argument on the assumption that subjects play a fairly active role in coping with stress through job crafting. However, it should not follow from there that the sole responsibility for coping with stress is attributed to them. Such individualisation of responsibility is a frequent misunderstanding in constructivist research and has been rightfully criticised as the 'flip side' of constructivist approaches, e. g. in health care literature (Samerski, 2013). Second, and connected to the former, the actors' design efforts (i. e. job crafting strategies) are themselves not arbitrary. It is, unfortunately, beyond the scope of this paper to delineate how organizational norms and other forms of organizational control (e. g. incentive or career systems) impact on job crafting practices. Future research could provide a better understanding of the interaction between organizational control practices and job crafting strategies on the employee level.

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