

Working from home during Covid-19 – Effects on employees of a German university and implications for the design of telework for knowledge workers

Selina PALIGE, Ina FRIEDRICH, André DETTMANN, Angelika C. BULLINGER

*Institut für Arbeitswissenschaft, Technische Universität Chemnitz,
Erfenschlager Straße 73, 09125 Chemnitz.*

Abstract: The Covid-19 pandemic was accompanied by drastic changes in working conditions for many organizations. For instance, many employees had to permanently work from home due to infection protection measures – often for the first time and without an alternative working space. This paper explores the consequences that this change in employees' working environment and implementation of telework had on productivity as well as internal organizational communications. Two online surveys (n= 129; n=78), seven months apart, were conducted during the pandemic to accompany this changeover phase. Results provide an insight into the effects that the change has had on knowledge workers. For example, the use of telework makes the exchange of information among colleagues more difficult. In the end, implications for an employee-oriented design of telework are given.

Keywords: telework, working from home, COVID-19, pandemic, working conditions

1. Motivation

The consequences of the Covid-19 pandemic have led to changes at all levels of society – including employment. With the infection control measures, there has been an unprecedented increase in telework. This led to a permanent change in the working conditions of many employees.

From previous research, it is known that the use of telework can have both positive and negative effects on the well-being and work performance of employees. Working from home can have a positive impact on productivity and work-life balance (Allen et al. 2015). However, a negative impact on the exchange and relationships with colleagues is possible as well (Lengen et al. 2020; Golden et al. 2008). Moreover, attitudes towards working from home and whether one perceives its use as more conducive or obstructive vary interindividually (Frodermann et al. 2021). Studies on the consequences of pandemic-related telework show a similar divided picture. For example, a German study conducted during the pandemic showed, that over 38% of surveyed company representatives reported that the productivity of their employees had increased, while only just under 10% reported that it had decreased (Hofmann et al. 2021). These data are remarkable considering the increased care work that many employees suddenly faced (Jessen et al. 2021). At the same time, a report by the Confederation of German Trade Unions (DGB 2021) shows that working from home was also accompanied by an increased workload for employees, which was primarily due to the inadequate design and equipment of the home office as well as double

burdens caused by childcare responsibilities. It remains to be seen how employees adapted to this unexpected and thus unprepared change of their work situation.

In the case of the Chemnitz University of Technology (TU Chemnitz), the pandemic was accompanied for most employees not only by the possibility but also by the temporary obligation to make use of telework and by – willingly or not – shifting their work to their private living spaces for the first time. All public buildings of the TU Chemnitz closed on 23.03.2020 for many months (Strohmeier 2020). For many employees, this meant that they had to move their work to their homes for the first time and were unprepared to do so. This arrangement remained in place during 2021, with varying attendance limits in the office building of 25 to 40 percent. This article provides insight into the consequences that these changes had for knowledge workers and what organizations can do to ensure a sustainable transformation process.

2. Methods

To measure these effects, we conducted a quantitative study at the TU Chemnitz with two online surveys, each seven months apart. The first survey was conducted between April 17th and May 22nd 2020 ($n = 129$); the second survey between December 11th and February 9th 2021 ($n = 78$). The questionnaires were addressed to all employees of TU Chemnitz, who were invited via different channels (i.e., mailing lists, the TU Chemnitz website, and newsletters) to participate.

The questionnaires consisted of three parts. In the beginning, demographic data and work-related information (i.e. weekly working hours, and type of employment) were collected. The second part contained items addressed subjectively perceived productivity and opinions on telework. The third part included open questions such as "What has been the biggest challenge related to telework under the current circumstances?" or "Do you have any concrete suggestions for improving telework?". Another question asked which tasks could not be performed in telework.

From the dataset of both surveys, duplicate cases and data points with insufficiently completed data protection agreements were removed. Furthermore, in line with Halford (2005), the analysis only included responses from individuals who, according to their own assessment, had spent at least 50% of their working time in telework. After cleaning the dataset, 207 data points went into the subsequent analysis.

The data processing and analysis were carried out using the statistical software SPSS Statistics 29. Since most of the scales were not normally distributed, we used a nonparametric alternative for a two-sample t-test. Mann-Whitney-U-Test was used to determine if there were differences between the two surveys regarding individual items (Fay & Proschan 2010). The distributions of the two groups differed from each other (Kolmogorov-Smirnov $p < .05$). Therefore, the descriptive statistics of the Mann-Whitney U-test are presented by mean ranks (M_{Rank}). To account for the range of responses to the open-ended questions, an inductive approach for evaluation was used. This gave an overview of the characteristic structure of the sample.

3. Results

Most respondents in both surveys were male. The mean age was 35 in the first and 38 in the second survey and among them, 27.2 % of the first survey and 32.1 % at the

second had formal or informal leadership responsibilities. A detailed description of the sample is shown in table 1.

Table 1: *Demographic and work-related profile of both samples*

Variable	First Survey; <i>n</i> = 129 (Apr. - May 2020)	Second Survey; <i>n</i> = 78 (Dec. 2020 - Feb. 2021)
Gender		
female	55 (42.6%)	38 (48.7%)
male	74 (57.4%)	40 (51.3%)
Year of birth	<i>M</i> = 35; <i>SD</i> = 7.79	<i>M</i> = 37.74; <i>SD</i> = 9.71
Persons with formal or informal leader responsibility	35 (27.2%)	25 (32.1%)
Type of Employment		
scientific employee	103 (79.8%)	57 (73.1%)
non-scientific employee	19 (14.7%)	13 (16.7%)
professor	7 (5.4%)	4 (5.1%)
management activity in the scientific area	0	3 (3.8%)
management activity in the non-scientific area	0	1 (1.3%)

The subjectively assessed productivity of the respondents was measured with two items, which can be seen in Table 2. According to this, most of the respondents (48.8%) were able to implement 75% or more of their usual workload at the first time of the survey. 50.5% stated that they were only able to complete half or less of their usual workload. Between the two measurement points, employees managed to work significantly more productive (1st: $M_{Rank} = 77.30$ vs. 2nd: $M_{Rank} = 148.14$; $U = 1510$; $Z = -8.632$; $p < .001$). A similar picture emerged for the question of which deadlines could be met during the respective time ($\Rightarrow 75\%$: $t_1 = 37.7\%$; $t_2 = 96.2\%$; $< 50\%$: $t_1 = 62.2\%$; $t_2 = 3.9\%$). A significant increase can be seen here as well (1st: $M_{Rank} = 76.01$; 2nd: $M_{Rank} = 150.29$; $U = 1264.5$; $Z = -9.273$; $p < .001$). Hence, a significant difference was found between the two survey times regarding the general feasibility of task (1st: $M_{Rank} = 56.66$; 2nd: $M_{Rank} = 97.08$; $U = 1380$; $Z = -5.995$; $p < .001$). While in the first survey half of the respondents stated that only half of the tasks or less were executable, this in the second study this was only the case for nearly ten percent of the participants.

Table 2: *Differences in productivity between the two surveys*

Survey ^a	< 25%	25%	50%	75%	100%	> 100%
In the current situation, I have managed ... of my usual workload.						
1st (<i>n</i> = 128)	5; (3.9%)	21 (16.3%)	39 (30.2%)	48 (37.2%)	15 (11.6%)	0
2nd (<i>n</i> = 77)	1 (1.3%)	0	2 (2.6%)	23 (29.9%)	43 (55.8%)	8 (10.4%)
In the current situation, I have managed to complete ... of my tasks/ deadlines.						
1st (<i>n</i> = 127)	7 (5.5%)	23 (18.1%)	49 (38.6%)	36 (28.3%)	12 (9.4%)	0
2nd (<i>n</i> = 78)	1 (1.3%)	0	2 (2.6%)	23 (29.5%)	51 (65.4%)	1 (1.3%)
In the current situation ... of my normally occurring tasks have been realizable.						
1st (<i>n</i> = 76)	8 (10.5%)	13 (17.1%)	17 (22.4%)	31 (40.8%)	7 (9.2%)	0
2nd (<i>n</i> = 77)	1 (1.3%)	0	7 (9.1%)	39 (50.6%)	30 (39%)	0

^a *n* varies between variables due to missing values.

Respondents' opinions regarding the impact of telework on varying factors changed between the two surveys (Table 3). We see that across both time points, most respondents agreed with the statement that "Telework goes hand in hand with a better work-life balance". In the second survey, we found a significantly stronger agreement with this statement. Overall, in both survey periods, respondents were more likely to agree with statements indicating a negative influence of telework on work-related personal relationships and informal exchange. Regarding formal exchanges, fewer people agreed with the statement. All three statements on the effects of working from home on the exchange and relationship with colleagues were evaluated more critically in the second than in the first survey.

Table 3: Differences in opinions of telework between the two surveys (scale from 0 = "does not apply at all" to 4 = "applies completely")

Survey	Md; IQR	M _{Rank}	p-value	Survey	Md; IQR	M _{Rank}	p-value
Telework goes hand in hand with a better work-life balance.				Telework goes hand in hand with poorer formal interaction with colleagues.			
1st (n = 129)	3; 1	95.89	.009*	1st (n = 129)	2; 2	97.57	.04*
2nd (n = 78)	3; 2	117.41		2nd (n = 78)	2; 2	114.63	
Telework goes hand in hand with the loss of personal relationships in the professional environment.				Telework goes hand in hand with poorer informal exchange with colleagues.			
1st (n = 129)	3; 1	96.97	.02*	1st (n = 129)	3; 2	99.17	.117
2nd (n = 78)	3; 1	115.63		2nd (n = 78)	3; 2	111.98	

* = $p < .05$.

The evaluation of the open questions can be used to give background to the statistical analysis. Here, too, it can be seen that one reason for the generally lower productivity of the employees can be traced back to the fact that some of the usual pre-pandemic tasks were not feasible in telework. The most frequently named non-feasible activity in the first survey concerns research experiments and laboratory activities which are essential in university work. There were also mentions of the cancellation of workshops, business trips, and conferences. In contrast, the immediate changeover from face-to-face to digital university teaching required increased effort on the part of some of the employees.

Additionally, infection control measures and ad hoc decreed telework created challenges for employees. Increased care work, in particular, posed a significant drag on work productivity due to home-based childcare, as shown by the following quote:

"With homeschooling a child and caring for a toddler, teleworking in an undelimited workspace doesn't make much sense. The distraction and, more importantly, stress levels are so high that work suffers massively."

Another challenge related to the lack of or limited technical equipment at the telecommuting workplaces, e.g., slow internet connections or other equipment (i.e. secondary monitor) that was not available. Consistent with the results from Table 3, there were comments regarding lack of or limited (face-to-face) communication with colleagues and supervisors. Digital communication was also perceived as more time-consuming, as study participants reported:

"Need for (even) more arrangements (a lot of working time is lost due to telephone conferences)."

The lack of separation between work and private life was also named as challenging. Working at home also demanded efforts from some employees in terms of maintaining motivation, self-discipline and their own work structuring under changed working conditions and tasks, as illustrated by the following example:

"There are no more distractions from colleagues and informal conversations. As a result, I work in a more concentrated manner. Finding a balance here - allowing myself regular breaks and at the same time not letting them get out of hand - is what I see as the biggest challenge right now."

In the open response section of the second survey, respondents also addressed the challenges through (limited) opportunities to work in the office. Compared to the first survey, employees were now confronted with alternating conditions of work in presence and telework. These had an effect on finding routines in hybrid telework.

Suggestions for improvements were largely related to the previously mentioned challenges. Many answers related to the provision of working equipment such as hardware, smartphones, and software for more efficient exchange as well as an overview of the availability of colleagues. There was also a call for more meaningful guidance and training on the use of software and individual self-organization. In addition, there were requests for less administrative burden while teleworking, acceptance of digital signatures, and a reduction in paper-based processes. In the second survey, suggestions for greater support of telework by superiors and uniform guidelines within the team were named. There was also a strong desire to interact with colleagues in a more formal and informal way and in a structured manner.

4. Discussion

The widespread and rapid introduction of teleworking at the TU Chemnitz was accompanied by lower employee productivity. Even though we can see a positive habituation effect, as the productivity of the respondents increased significantly between the two survey dates, it was still comparatively low on the second survey. Data has shown that one-third of the respondents did not achieve nearly 100% of their usual workload. Reasons for this can be found in the qualitative responses and are primarily related to tasks that are not realizable during telework as well as the sometimes-persistent lack of childcare. Our results, therefore, support the research results of DGB (2021). We also found organizational reasons, for instance the fact that most of the respondents were sent into telework unprepared, without necessary organizational structures or the provision of technical equipment as well as a therefore more difficult (in-)formal exchange with colleagues and superiors. Here, it should be emphasized, that the perception that telework makes exchange with colleagues more difficult had increased. On the other hand, respondents of the second survey point rated the statement that telecommuting leads to an improved work-life balance significantly more positive than respondents of the first survey, which indicates that employees were able to improve this balance while teleworking.

To ensure a sustainable change in working conditions and further improve teleworking, there are several factors that can be implemented in the short and long term. Short-term factors include adequate work equipment and training in the used and/or new tools. Longer-term implementation requires the adaptation of structures regarding the reduction of administrative work in teleworking (greater digitization of processes), training of employees in self-organization, and limitation measures

regarding the boundaries of work and private life at home. Furthermore, the implementation of guidelines and processes as well as the adaptation of an adequate management culture are important to meet the requirements for teleworking. Remote leaders especially need to strengthen informal communication opportunities of working teams.

Finally, it should be noted that the results can only be generalized to a limited extent, as the survey took place during the Covid-19 pandemic. During this time many employees were confronted with a great amount of care work, which, depending on the individual situation, often lead to a double burden on the person. Nonetheless, the results described above can be used to identify factors that should receive attention before and during the implementation of telework.

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