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Kirchner, Kathrin; Ipsen, Christine; Andersen, Anders Reenberg

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Knowledge Sharing Challenges in Hybrid Knowledge Work: Lessons from Denmark

Kathrin Kirchner, Christine Ipsen and Anders Reenberg Andersen
Technical University of Denmark, Kgs. Lyngby, Denmark
kakir@dtu.dk
chip@dtu.dk
arean@dtu.dk

Abstract: During the COVID-19 pandemic, knowledge workers worked from home (WFH) and had to share knowledge mainly online. Studies show that remote work influence knowledge sharing. Beyond the pandemic, several studies report that companies expect more people to work partly or fully from home or anywhere. Therefore, we investigate how knowledge workers experience working from home (WFH), full or part-time, and how it affects their work and knowledge sharing. We conducted an online survey at six different time points between May 2020 and November 2021, allowing us to analyse different working from home situations for the first time. Our survey included 23 questions covering positive and negative experiences from WFH and demographics. Data was collected from 3406 knowledge workers in Denmark working fully or partly from home. The answers were analysed by fitting proportional odds logistic regressions. During the lockdown around February 2021, when Danish restrictions were high, knowledge workers reported that they could focus less on their work at home than at other points of time when they were allowed back in the office. Furthermore, they missed seeing their colleagues more during the lockdown period than at times when the society was completely open again, as they felt a lack of discussion and creative problem-solving. Despite using software solutions for collaboration and communication, knowledge workers missed opportunities for knowledge sharing when WFH. In general, during the whole period, female respondents reported that they got more time to focus on their work when WFH than males did. Finally, older respondents experienced more time to focus on work than the young respondents did when WFH. The results show the differences in the situation of knowledge workers, whether it is enforced or flexible/voluntary to work from home. Thus, this study contributes to a better understanding of the challenges when knowledge workers WFH, which groups of knowledge workers can gain from WFH regarding efficiency and knowledge sharing needs. Beyond the pandemic, when companies want to offer more flexibility to WFH, this study provides conclusions on which conditions to be aware of to ensure efficient knowledge sharing.

Keywords: Working from home; Hybrid knowledge work; Knowledge sharing; Work efficiency; Longitudinal study

1. Introduction

Knowledge workers are employees with a high educational level, using intellectual and symbolic skills in knowledge work, which results in a high degree of professionalism (Alvesson, 2004). During COVID-19, knowledge workers were forced to work from home (WFH) and experienced the advantages and disadvantages of the home office.

On the one hand, WFH can lead to an improved work-life balance, as workers do not need to commute and have more time for their family, increase work efficiency, and control their working day (Kurland and Bailey, 1999). On the other hand, knowledge workers may miss social interaction, feel tied to their computers, lose meaning in work, or miss essential work tools (Ipsen et al., 2021).

The efficiency and productivity of knowledge workers are crucial factors for organizational innovation, competitiveness, and sustainable development of an organization (Kianto et al., 2019). Changes in efficiency, motivation, and knowledge creation of the employees working at home can thus improve or hamper the productivity of an organization. Additionally, WFH can facilitate cost reductions and use these free resources for productivity-enhancing innovation (OECD, 2020). Therefore, working from home can be a viable option for the future of knowledge work, especially if organizational support is provided (Mattern et al., 2021). However, working fully from home, in unsuitable spaces, with limited office days, might create a productivity problem for companies and lead to fewer innovations and creative ideas (Gorlick, 2020). Thus, companies during COVID-19 were concerned about the work efficiency of their knowledge workers while working from home.

Our paper aims to investigate how knowledge workers experienced working from home (WFH), full or part-time during the pandemic and how it affected their work efficiency and knowledge sharing. Furthermore, we derive conclusions for the post-COVID workplace. We ask the following research questions: How can knowledge workers efficiently work from home? What is the role of distance, i.e., not being able to see colleagues? Can they share knowledge efficiently despite being at home? Are there any differences between people in

demographics, e.g., regarding gender and age? Moreover, how can challenges be mitigated? To answer these questions, we collected data from Danish knowledge workers at six different time points between May 2020 and November 2021. By collecting and analysing longitudinal data, our paper is among the first to cover different WFH situations – from enforced WFH to a reopened society with a free decision to WFH or to be in the office.

2. Literature review

The COVID-19 pandemic and the required physical distancing measures to avoid spreading the virus forced many firms to introduce working from home on a large scale. Throughout the pandemic, studies have repeatedly pointed to a wish for increased use of flexibility and the ability to work from home post-pandemic (Lister, 2020). This may cause a wider adoption of working from home practices after the pandemic, with broader impacts on productivity (OECD, 2020). Decades ago, Drucker pointed out that the rise of productivity in knowledge work is one of the companies' biggest challenges (Drucker, 1991). Furthermore, studies show that knowledge workers get less interrupted (Bailey and Kurland, 2002) and can focus better on their work at home. Furthermore, employees have greater autonomy to decide when and how they work (Kossek and Thompson, 2016), leading to higher productivity. Nevertheless, WFH is less controlled by managers and colleagues, contributing to work avoidance and reduced productivity (Knights and McCabe, 2003).

Essential for productivity and efficiency at work are social relationships with colleagues (Sluss and Ashforth, 2007). The geographic proximity between co-workers influences the building and strengthening of social ties between colleagues, communication, knowledge creation, and innovation (Catalini, 2017). Proximity helps build trust so that colleagues might lose the fear of losing power when sharing their knowledge with others or getting negative evaluations when asking too often for help. Knowledge sharing within an organization is necessary to learn from the experiences of others (Argote and Guo, 2016) which contributes to the productivity of an organization. A study found that when colleagues often meet, they develop a strong relationship that positively influences knowledge sharing. Proximity can minimize the effort of engaging in knowledge sharing and support the creation of social relationships that indirectly influence knowledge sharing (Holdt Christensen and Pedersen, 2018).

Working from home and only connected digital can be more stressful and tiring. It requires higher coordination, more online meetings and can lead to technostress and zoom fatigue (Richter, 2020). Furthermore, the lack of access to relevant and new knowledge causes frustration, stress, repetition of mistakes, and loss of time as the same information has to be retrieved multiple times (Ipsen and Jensen, 2012).

During COVID-19 waves, when schools and day-care were closed, efficient WFH depended on the presence of dependent children, which led to conflicts between work and family needs. However, when children could go back to school and kindergartens, families benefited from WFH with more flexibility, less commuting time, and more family time (Ipsen et al., 2021). In the post-COVID time, the discussion on gender and equity has become current as mothers/women can benefit if fathers work more at home. Then they have more time for family and household or strengthen traditional gender roles, as women's career perspectives might be negatively influenced if they are not as much in the office as men (Arntz et al., 2020).

Young people whose professional careers just started and whose professional self-confidence is yet to be developed, were found in previous studies as especially challenged by WFH (Sándor et al., 2021). They missed the challenges in the work, competition, and team spirit. Participating in the work routines of colleagues and learning from their experience (tacit knowledge exchange) is difficult over distance, and problems with solving tasks are less easily detected. The hunger of young knowledge workers to prove themselves and develop their careers is difficult to satisfy in the home office (Starchos and Schüll, 2021).

Managers might be influenced by WFH differently than employees, as leading over distance is an additional challenge. Managers need to get in touch with their employees and ensure that they get in touch with each other. Smalltalk about an employee's wellbeing is more difficult in an online meeting, and also, on-boarding of new employees or firing employees is more demanding than face-to-face (Kirchner et al., 2021).

Waizenegger et al. (2020) already investigated collaboration between knowledge workers in the phase of enforced working from home. They found that technological affordances allow equal communication

opportunities regardless of physical proximity, but the limitations of enforced working from home can influence the wellbeing of knowledge workers.

3. Data Collection and Method

We developed a survey with 23 questions to collect data, asking about perceived advantages and disadvantages when working from home, using communication tools and demographic information. The complete survey is published in (Ipsen et al., 2020). Most questions used a Likert scale (1 strongly disagree to 5 strongly agree). Demographic questions were of nominal or ordinal nature. We also asked open questions to get more insights into the WFH situation, especially regarding personal experiences while WFH or hybrid.

We collected data online as representative samples in Denmark for six different periods between May 2020 and November 2021 via a Danish market research company. After the first lockdown on 12th March 2020, the society slowly opened again in May 2020, knowledge workers were still working from home, but children were allowed back in school. In November 2020, knowledge workers could partly work from the office. Denmark was back in a second lockdown at the time of the third data collection, February 2021, when schools were closed again, and knowledge workers were advised to work from home. In June 2021, 50% of knowledge workers were allowed back in the office, and 100% in August 2021 (Vendramin et al., 2021). In November 2021, people were back in the office with a COVID-19-passport, showing that they were vaccinated, tested, or recovered from COVID-19. An overview of the characteristics of the different stages of COVID-19 in Denmark is shown in Table 1. By collecting data for all these six time points, we covered different situations of WFH and hybrid work for all knowledge workers.

Table 1: COVID-19 stages in Denmark, adapted and extended from (Vendramin et al., 2021)

Stage	**First Lockdown**	**First opening after lockdown**	**New restrictions**	**Second Lockdown**	**Second opening/ reopening**	**Restrictions again**
Time-line	12th March – April 2020	April 2020 – June 2020	August 2020 – Dec. 2020	December 2020 – February 2021	March 2021- August 2021	November 2021 – February 2022
Data collec-tion round	----	Round 1: May 2020	Round 2: November 2020	Round 3: February 2021	Round 4: June 2021 Round 5: August 2021	Round 6: November 2021
Charac-teristics	Closed businesses, schools,… Public and private sector encouraged to WFH unless critical work function requires presence; Social distancing	Gradual opening Schools opened again in April 2021 Knowledge workers still WFH, some organiza-tions experi-ment with hybrid work models	Allowing of gathering of max. 10 people Knowledge workers returning to work from home offices	Lockdown from 16th December till 7th February Schools closed again Knowledge workers advised to WFH, while service employees sent home with salary compensations	Gradual opening, returning step-by-step to office work June 2021: 50% capacity allowed in offices, COVID-19 pass and masks required August 2021: 100% capaci-ty allowed in offices, COVID-19 passport at events still required	After lifting all restrictions in September 2021, now re-introducing COVID19-passports and masks again Recommended to WFH as much as possible

Initially, a representative sample of the population in Denmark was collected. Our data set for this paper only includes knowledge workers who are not students and have attained an educational level corresponding to a

bachelor's, master's, or doctorate (Ph.D.) degree, resulting in 3406 knowledge workers. Table 2 gives a demographic overview of the collected data from knowledge workers.

Table 2: Demographic overview (N=3406)

Variable	Percent	Variable	Percent
Data collection round		Education	
May 2020	15.0%	Bachelor's degree	48.8%
November 2020	13.4%	Master's degree	47.6%
February 2021	16.6%	Doctorate degree	3.7%
June 2021	19.5%		
August 2021	17.6%		
November 2021	18.0%		
Gender		Age	
Female	51.5%	18 to 30	15.2%
Male	48.5%	31 to 50	42.9%
		51 to 60+	41.9%
Children at home (while WFH)		Manager	
Yes	20.7%	Yes	18.6%
No	79.3%	No	81.4%
Ordered to work from home		Prefer to work from home	
Yes	47.5%	Yes	49.8%
No	52.5%	No	50.2%

The questions were analyzed by fitting proportional odds logistic regressions (POLR) (Cullagh, 1980). A proportional odds model for ordinal logistic regression extends the binary logistics model where the dependent variable has ordered categorical values. It is the most commonly used regression model in the context of ordinal scales (Lall et al., 2002). Dependent variables were "I get time to focus on my work" and "I do not get to see my colleagues as much as I would like to" for the two POLR. As dependent variables, we included the main and interaction effects listed in table 3. While the main effects are single independent variables, interaction effects describe how the effect of an independent variable changes depending on the values of other independent variables. For instance, looking at Gender:Age, there might be differences between younger/older males and females, but gender and age alone would not influence the dependent variable. The quality of regression results was measured with Hosmer-Lemeshow and likelihood-ratio tests (Lemeshow and Hosmer Jr., 1982).

Table 3: Included independent effects into regression analyses

Main effects	Interaction effects
Data collection round	Ordered to work from home:Prefer at home
Ordered to work from home	Gender:Data collection round
Prefer to work from home	Age:Time of observation
Children at home	Manager:Data collection round
Gender	Ordered to work from home:Data collection round
Manager	Ordered to work from home:Children at home
Age	Manager:Gender
	Gender:Age

4. Findings

The Hosmer-Lemeshow test (g=10) accepts all POLR models in the analysis. A likelihood-ratio test accepts the proportional odds assumption in a fair number of cases.

4.1 Influence on efficiency – time to focus

Table 3 shows the results of looking at increased efficiency while working from home, especially on time to focus on work without interruptions. The POLR regression results in Table 4 show that the agreement to be able to focus on work is affected by: (1) The time of data collection, (2) if the respondents replied that they were ordered to WFH, prefer to do so, or both, (3) the respondent gender, and (4) the respondent age.

Table 4: Effect sizes in the regression models for "I get time to focus on my work"

Variables	Beta
November 2020	-0.029
February 2021	-0.246
June 2021	0.090
August 2021	0.306
November 2021	0.402
Prefer to work from home	0.753
Children at home	-0.311
Gender=Female	0.567
Age of 31-50	0.279
Age of 51-60+	0.346

During the lockdown in February 2021, knowledge workers could focus less on their work at home (negative Beta). They could better focus in August and November 2021 (i.e., when society was partly open again). Furthermore, women and people who preferred to WFH (and were not ordered to do so because of COVID-19 restrictions), and people over 30 could better focus at home. Naturally, people working from home with their children under 15 could not focus well. Table 5 shows that the effects of the different variables on "I get time to focus on my work" were all significant.

Table 5: Significant effect in the regression model for "I get time to focus on my work"

Variables	X^2	Df	p-value
Data collection round	41.912	5	.000
Prefer to work from home	121.333	1	.000
Children at home	13.602	1	.000
Gender	79.277	1	.000
Age	13.820	2	.000

Some open answers shed light on the knowledge workers' ability to focus on their work in the home office. A woman (aged 21-30) answered in May 2020: "*This is great because you sit at home without disturbances*." Many other respondents also liked the time of undisturbed work from home, but not all. A female knowledge worker answered in November 2020: "*This is boring. I miss the social aspect of working, and I feel that my productivity is decreasing because of this*."

The use of electronic tools might help to overcome distance. A male knowledge worker (aged 51-60) mentioned in November 2020: *"This works well because via MS Teams, I have a connection to my employees and colleagues, and part of my working tasks can be done from home."* Nevertheless, tools cannot help in all cases of knowledge exchange. A woman (aged 51-60) wrote in August 2021: "*You cannot get into a discussion or quick feedback for ideas or small problems if you are sitting home for a longer time – compared to being in the same room with colleagues.*"

Overall, we can see an inherent dilemma between the possibility to focus and immerse in a task versus the lack of the social element of work and time spent with colleagues, which is connected to knowledge sharing. A female knowledge worker (aged 51-60) summarized in February 2021: "*Some things are more effective, but discussions or creative work is more difficult*."

4.2 Influence on knowledge sharing – meeting colleagues

To gain deeper insights into possibilities for knowledge exchange, we analysed the variable "I do not get to see my colleagues as much as I would like to", which could hinder successful knowledge sharing and collaboration. Table 6 shows that respondents miss their colleagues less as they get closer to November of 2021, and they were voluntarily allowed back in the office. Respondents having children at home (while WFH) feel that they need to see their colleagues more. People over 30 missed their colleagues less than younger knowledge workers.

Table 6: Effect sizes in the regression model for "I do not get to see my colleagues as much as I would like to"

Variables	Beta
November 2020	0.009
February 2021	0.176
June 2021	-0.115
August 2021	-0.230
November 2021	-0.297
Ordered to work from home	0.820
Prefer to work from home	0.035
Children at home	0.192
Age of 31-50	-0.260
Age of 51-60+	-0.310
Ordered to work from home: Prefer to work from home	-0.739
Ordered to work from home: Children at home	-0.312

Table 7 lists whether the effects of the ordinal regression "I do not get to see my colleagues as much as I would like to" are significant. Instead of main effects, some interaction effects have higher Betas and are therefore listed here instead of the main effects.

Table 7: Significant effects in the regression model: "I do not see my colleagues as much as I would like to"

Variables	X^2	Df	p-value
Data collection round	18.124	5	.000
Age	10.706	2	.000
Ordered to work from home: Prefer to work from home	25.575	1	.000
Ordered to work from home: Children at home	3.929	1	.000

WFH can hinder good contact with colleagues and exchanging knowledge with them, as the open answers from our survey reflect. A female journalist reflected: "*It is not easy to keep a good team spirit and help each other when sitting at home. I heard it is even worse for young people. Colleagues are also important in idea development. I also think that many written messages are more difficult to follow – compared to that people just talk together.*"

However, if knowledge workers had certain flexibility, like in August 2021, to work both at home and in the office, the challenges would be minor. A female knowledge worker (aged 31-40) explained:" *I miss the social aspects at the workplace when I work from home. But if this is only one day per week, it does not matter that much.*"

From our longitudinal data throughout the pandemic, we can see that people miss their colleagues and that it influences one's perception of work. As knowledge sharing is central to knowledge work, the lack of accessibility to colleagues may impact knowledge sharing. Therefore, it is essential to investigate whether missing colleagues relate to the interpersonal and social part of work or whether it is work-related and may affect the knowledge-sharing activities.

5. Discussion

Building on positive experiences while working from home, workplaces might offer their employees higher flexibility in answering their requests (Gartner, 2021).

As our results reveal, working from home can improve the efficiency of knowledge workers. They could focus well from home, especially if they were not forced to WFH, but had the flexibility to choose and no children at home while working. As employees would like to have the opportunity to partly WFH after COVID-19, organizations need to consider balancing the higher focus when WFH and the missing opportunities for knowledge sharing based on different factors. As our study showed, can females and knowledge workers over 30 better focus at home, and knowledge workers over 30 miss their colleagues less than young colleagues. This also depends on the concrete tasks – as some tasks connected to discussions and creative work are easier with colleagues face-to-face in the office. Companies could use these findings as the first basis for decision-making on how to organize WFH in the future – based on the demographics and nature of the tasks. Furthermore, elder knowledge workers should not only think about their preferences for WFH, but also consider the needs of their

younger colleagues for knowledge exchange. Our study revealed that young employees could focus less from home and need more opportunities to connect to colleagues and learn from their knowledge.

We also found that knowledge workers miss opportunities for discussions, creative work, and exchange with their colleagues when WFH. In order to overcome distance and establish closer proximity, digital tools were used that allow communicating, having meetings, and collaboration. The lockdown led to using a huge number of tools in the first lockdown. Companies need to put effort into consolidating this tool landscape in the future (Richter, 2020). However, using digital tools is not enough. Planned meetings can be arranged in electronic calendars, and then conducted online. However, spontaneous discussions and idea generation facilitating knowledge exchange are challenging to plan. Knowledge cannot freely flow and be exchanged without personal interactions between knowledge workers. When they were forced to stay home and could not meet colleagues face-to-face, it caused knowledge exchange problems. The positive effects of WFH, the higher efficiency, and the negative sides of less knowledge exchange must be balanced. Efficiency, and thus productivity, is maximized at intermediate levels of WFH (OECD, 2020). This corresponds with the wish of knowledge workers in our study, where the majority would like to keep 1-2 home working days per week.

We found that knowledge workers could concentrate less and missed the exchange with colleagues during lockdown periods while fully WFH. Another study found that team performance is worse when co-workers often WFH, as digital presence cannot compensate for physical presence (van der Lippe and Lippényi, 2020). Working very often from home can lead to social and professional isolation. It is thus essential to acknowledge the social part of work and how it affects knowledge sharing and peoples' motivation and wellbeing in the hybrid-remote work setting.

Video conferencing systems, electronic communities of practice, etc., can help overcome the isolation. Business meetings can have different reasons, e.g., information exchange, decision-making, relationship building, or communicating sentiments. These different meeting types might require different capabilities (hear voices, share screens, see body language, experience co-location) that influence how the meeting should be conducted (Standaert et al., 2021).

Virtual reality could serve as an alternative to video conferencing systems as it can create a more realistic setting for spontaneous collaboration and knowledge exchange. In the role of an avatar, a knowledge worker can freely walk around in the virtual office and meet other avatars (colleagues) for knowledge exchange (Kirchner and Nordin Forsberg, 2021). Augmented reality can be a way of assisting knowledge workers in remote collaboration and training. It allows overlaying the real world with virtual information. By sharing the same augmented environment, employees transfer knowledge. A knowledge worker at the office can then learn to use a tool like a 3D printer with augmented reality, supported by an experienced colleague sitting at home (Chantziaras et al., 2021).

6. Conclusion

In conclusion, knowledge workers experience working in a fully remote or hybrid work setting differently, depending on whether WFH is forced or not. This study contributes to a better understanding of the challenges with hybrid knowledge work, which groups of knowledge workers can gain from WFH regarding efficiency and knowledge sharing needs. Beyond the pandemic, when companies want to offer more flexibility to WFH, this study provides some pointers for which conditions to be aware of to ensure efficient knowledge sharing. Our study is limited as we only collected data from knowledge workers under COVID-19 in Denmark. In the future, we plan to collect more data from different WFH situations after the Corona pandemic.

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