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How Working from Home during COVID-19 Affects Academic Productivity

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Abstract:

The coronavirus disease of 2019 (COVID-19) pandemic has forced most academics to work from home. This sudden venue change can affect academics' productivity and exacerbate the challenges that confront universities as they face an uncertain future. In this paper, we identify factors that influence academics' productivity while working from home during the mandate to self-isolate. From analyzing results from a global survey we conducted, we found that both personal and technology-related factors affect an individual's attitude toward working from home and productivity. Our results should prove valuable to university administrators to better address the work-life challenges that academics face.

Keywords: Work From Home, Academic, COVID-19, Productivity, WFH, Technology Usefulness, Family-Work Conflict.

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1 Introduction

The coronavirus disease of 2019 (COVID-19) epidemic had an abrupt and absolute impact on academic life. Soon after its sudden appearance around the world, the pandemic caused almost all universities in the world to temporarily shut their doors and send all students, faculty, and staff home to work. The indefinite working-from-home (WFH) period led university employees and especially faculty to dramatically alter their work methods, schedules, and responsibilities. The unusual circumstances that COVID-19's rapid spread created provides a unique opportunity to study the role that information systems play in supporting people through this pandemic and beyond. Topics worth studying include the pandemic's impacts on jobs (including job loss, job changes, and job outcomes), on home life (including home-life changes, effects on children, social life and life-related outcomes), and in different contexts, population groups, and countries (Venkatesh, 2020).

In this paper, we report the results from a survey we conducted about how academics from around the world have adapted to the WFH period. We explore the dramatic changes to individual work-life balance that the COVID-19 pandemic caused as families juggle childcare, instructors teach remotely, roommates vie for Wi-Fi bandwidth and office space, and employees adapt to a raft of new technologies to work and communicate. We found that that both personal and technology-related factors affect an individual's WFH attitude and productivity.

This paper proceeds as follows: in Section 2, we introduce our model and hypotheses, present our research methods, and report on and analyze our survey data. In Section 3, we discuss the results. In Section 4, we provide recommendations for university administrators to address the constraints faculty and staff face to provide needed technology and related resources that ameliorate the impact of the work-life challenges that academics face. Finally, in Section 5, we conclude the paper.

2 Research Model

In recent decades, some employers have promoted virtual offices and working from home as a way to improve organizational performance by providing flexibility to employees (Zhang, 2016; Bloom, Liang, Roberts, & Ying, 2015). However, WFH does not necessarily constitute the panacea its promoters intend as concerns arise when workers find it difficult to balance work and family responsibilities and to deal with growing stress (Dockery & Bawa, 2014). Studies have confirmed that, while WFH increases how flexibly one can achieve work-related tasks and positively relates to overall job satisfaction, it can also lead to more job-induced stress and negative personal wellbeing due to work overload and work-life conflicts (e.g., Anderson, Kaplan, & Vega, 2015; Hayman, 2010).

The pandemic has upended people's work and personal lives (Venkatesh, 2020), much of which one can link to the unexpected move to WFH. From the earliest days in which people began working from home due to the COVID-19 pandemic, we have been inundated with advice on how to manage suddenly juggling personal and job responsibilities while at home and working alongside family members or other cohabitants who also must collocate and manage their own obligations. In this study, we examine the impact that these circumstances have had on the academic community's ability to work effectively.

This confluence of roles and temporary working conditions has the potential to reduce worker productivity. Thus, we examine the role of two factors widely thought to affect productivity: 1) family-work conflict and 2) perceived technology usefulness. First, family-work conflict reflects the work-life challenges that WFH exacerbates and refers to the degree to which responsibilities from the work and family domains are incompatible (Netemeyer, Boles, & McMurrin, 1996). Second, perceived technology usefulness refers to how useful workers perceive the technologies that they adopt to work and communicate in their temporary location. No matter the tools workers have access to while WFH, technologies' perceived usefulness may explain changes in productivity (Venkatesh & Davis, 2000). Because workers must communicate from afar, they will rely on access to the Internet to perform much of their work. Most academics already access the Internet at home; however, not all live in areas or choose plans that provide greater speed or bandwidth to accommodate an increase in their own and/or their cohabitants' workload.

Both factors (family-work conflict and perceived technology usefulness) likely contribute to academics' attitude toward WFH. Therefore, we anticipate that an employee's attitude toward WFH will directly affect productivity by mediating the relationship between family-work conflict and technology usefulness. That is, lower family-work conflict and access to more useful technology (e.g., higher-speed Internet access)

should lead to a better WFH attitude. Having job satisfaction and a positive attitude toward work increases the likelihood that workers will achieve higher productivity levels (Tenney, Poole, & Diener, 2016).

We depict these relationships in our model in Figure 3.

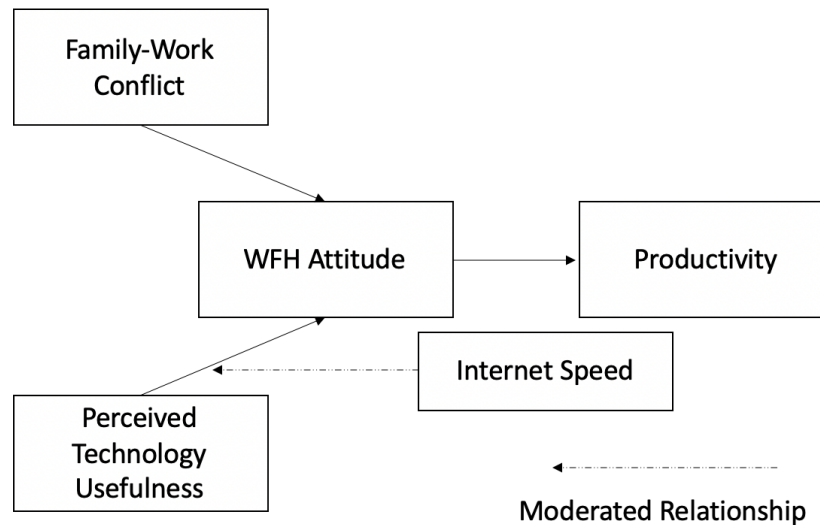


Figure 1. Factors that Affect Productivity While Working From Home

Below, we present the hypotheses that correspond to the model. We use these hypotheses to assess how academics perceive their productivity in view of family-work conflict, WFH attitude, technology usefulness, and Internet speed.

- H1:** WFH attitude mediates the relationship between family-work conflict and productivity.
- H2:** WFH attitude mediates the relationship between perceived technology usefulness and productivity.
- H3:** Academics with acceptable Internet speed experience a stronger relationship between perceived technology usefulness and productivity.

2.1 Procedure and Sample

We employed an online questionnaire to collect data from employees who have had to move their jobs home due to the COVID-19 pandemic. In the survey, we combine demographic questions with items that characterized the work environment (e.g., tasks, space, time, technology). Items captured characteristics of respondents' home and work environments to measure circumstances and conditions that enable or compete with WFH demands. We also measured how they handled the dual demands of work and personal life under co-location. We pilot-tested the survey with a convenience sample that we primarily drew from academia. Response times confirmed our estimate that it took approximately 10 minutes to complete the survey. We made minimal wording changes based on feedback from the pilot and dropped or combined two questions due to item duplication.

We recruited survey respondents using our personal and professional networks from 27 April to 8 May, 2020. We recruited participants over 18 years old and who had newly begun working from home due to the pandemic. In total, our sample comprised 221 academics.

To maximize our findings' generalizability, we recruited participants from various countries for the study: 41.2 percent from Germany, 39.8 percent from the United States, and 18.5 from 25 other countries. Furthermore, 11.8 percent of participants were in management roles (deans and department chairs), while 88.2 percent were in non-management positions (mostly full-time faculty). We show additional demographic information in Table 1.

Table 1. Participant Demographics

Gender	
Female	66.1%
Male	33.9%
Age	
18-24	14.9%
25-34	21.3%
35-44	19.5%
45-54	21.3%
55-64	16.7%
Over 65	6.3%

In Table 2, we show the main study constructs that we measured using multi-item scales that we adopted or adapted from prior studies and tested in a pilot study.

Table 2. Survey Constructs

Survey constructs	Source
Family-work conflict: five items	Netemeyer et al. (1996)
Perceived technology usefulness: four items	Venkatesh & Davis (2000)
WFH attitude: three items	Edwards, Van Laar, Easton, & Kinman (2009)
Productivity: three items	Belanger, Collins, & Cheney (2001)

The scale for all questions ranged from strongly disagree (1) to strongly agree (5). We coded the moderator, Internet speed, as a binary measure (1 = inadequate speed and 2 = adequate speed). Of the 221 participants, 107 reported their Internet speed as inadequate and 114 reported it as adequate.

2.2 Analytic Approach

We used partial least squares structural equation modeling (PLS-SEM) (SmartPLS 3.0) to analyze the data. As we focused on collecting data about academics’ perceptions during the COVID-19 pandemic, self-reported measures suited our study. Nevertheless, the potential exists for common method bias when one collects data from a single source. We tested for common method bias using a full collinearity approach (Kock, 2015). The results indicate no common method bias problems occurred as the VIF values at the factor level model estimation were less than the recommended threshold of 3.3 (Kock, 2015). We present a correlation matrix for the survey constructs in Table 3. Next, we assessed the measurement model to ensure the measures’ reliability and validity and examined the structural model.

Table 3. Correlation Matrix

	1	2	3	4	5
1) Family-work conflict	1				
2) Internet speed	-0.094	1			
3) Productivity	-0.637	0.174	1		
4) Perceived technology usefulness	-0.144	0.138	0.225	1	
5) WFH attitude	-0.392	0.096	0.532	0.237	1

2.3 Measurement Model

Results from the measurement model supported composite validity with all Cronbach’s alpha (CA) and composite reliability (CR) values higher than 0.70 (Hair, Hult, Ringle, and Sarstedt, 2017) and convergent validity with all AVE scores higher than 0.5 (Hair, Risher, Sarstedt, and Ringle, 2019). The indicators outer loadings all exceeded 0.7, which indicates good reliability levels.

We used the heterotrait-monotrait (HTMT) method to assess discriminant validity. HTMT values were all below 0.75, and the confidence intervals did not include zero or one (Franke & Sarstedt, 2019; Henseler, Ringle, & Sarstedt, 2015). We summarize the measures for reliability, convergent, and discriminant validity in Table 4.

Table 4. Reliability, Convergent, and Discriminant Validity

	CA	CR	AVE	1	2	3
Family-work conflict	0.95	0.96	0.83	HTMT		
Productivity	0.87	0.92	0.80	0.69		
Perceived technology usefulness	0.90	0.93	0.77	0.16	0.25	
WFH attitude	0.85	0.91	0.77	0.43	0.59	.28

2.4 Structural Model

Assessing structural model results includes examining model collinearity, the size and significance of path coefficients, the R^2 of endogenous constructs, and the f^2 effect sizes of endogenous constructs (Hair, Howard, & Nitzl, 2020; Shmueli et al., 2019). The inner model variance inflation factors for constructs were all below 3.0 (Hair et al., 2020). We used the PLS bootstrapping procedure with 5,000 samples to examine the size and significance of path coefficients.

We found that family-work conflict negatively predicted perceived WFH attitude (path coefficient = -0.37, $p < 0.01$), which, in turn, positively predicted productivity (path coefficient = 0.32, $p < 0.01$). Thus, we found support for H1 and a competitive partial mediation (indirect effect = -0.12, $p < 0.01$). We also found that perceived technology usefulness positively predicted perceived WFH attitude (path coefficient = 0.18, $p < 0.01$), which, in turn, positively predicted productivity (path coefficient = 0.32, $p < 0.01$). Thus, we found support for H2 and a full mediation (indirect effect = 0.04, $p < 0.1$).

We also examined the moderation effect that Internet speed (i.e., inadequate and adequate) had on the relationship between perceived technology usefulness and WFH attitude. We evaluated the relationship using (bias-corrected) confidence intervals and PLS multigroup analysis (PLS-MGA). The bias-corrected confidence intervals for adequate and inadequate Internet speed significantly differed and did not overlap. Similarly, we conducted the PLS multigroup analysis non-parametric Welch-Satterthwait test and found that, for inadequate Internet speed, the path coefficient between perceived technology usefulness and WFH attitude was -0.04. On the other hand, for adequate Internet speed, the path coefficient between perceived technology usefulness and WFH attitude was 0.40. The difference between the two path coefficients (i.e., -0.44 or -0.04 - 0.40) was significant ($p < 0.01$) (Sarstedt, Henseler, & Ringle, 2011). Thus, we found support for H3.

Next, structural model evaluation examines endogenous variables' explained variance. The R^2 for productivity was .50 and WFH attitude had an R^2 of .19. Furthermore, f^2 effect sizes indicate how much an exogenous construct contributes to the R^2 of an endogenous construct. Table 5 shows the f^2 values that represent the endogenous constructs; values less than .01 indicate no effect, while values more than 0.3 indicate a medium effect (Cohen, 1988).

Table 5. F^2 Values

	Productivity	WFH attitude
Family-work conflict	.43	.19
Productivity		
Perceived technology usefulness	.01	.04
WFH attitude	.15	

These analyses demonstrate that both personal (family-work conflict) and technology (perceived usefulness as moderated by adequate Internet speed) factors affected academics' WFH attitude and that this attitude had a significant impact on their productivity.

3 Discussion

Higher education has suffered greatly from the COVID-19 pandemic. The way academics work has changed as universities face an uncertain future encompassing a return to campus. This “new normal” alters established responsibilities and work patterns. In this paper, we provide university administrators with valuable information to help reduce the impact of the heightened work-life challenges that academics face given their conflicting personal and professional responsibilities.

We found that tool usefulness affected academics’ attitude toward WFH, which, in turn, affected their ability to work productively. Of note, academics with acceptable Internet speed experienced a stronger positive relationship between perceived technology usefulness and their WFH attitude, which carried over to productivity. While not a surprising result, it emphasizes the importance of having the proper technical resources readily available, especially good Internet access. Indeed, survey participants corroborated this finding in making comments that identified challenges with hardware and software when WFH. For instance, one respondent wrote: “At my rural location, it was almost impossible to do work. I had to move to a location that had Wi-Fi.” Other comments echoed the need for both hardware and software resources, such as “Provide technical equipment to meet the same conditions an employee would have at the office” and “Make sure that you have good software in place”.

WFH attitude also mediated the relationship between family-work conflict and productivity. Respondents commented on challenges in transitioning to online teaching. They wrote that transitioning to online teaching consumed much time since they had to develop new adequate teaching materials and required more time to prepare. For instance, one respondent wrote:

As a college professor, making changes from face-to-face to online has been difficult. ...Working individually with students takes far more time than I would experience in the classroom. I also feel as if I'm on call anytime. I now work many more hours and effectively reach fewer students.

Their research and writing also suffered. For example, one respondent said: “Writing has been a big challenge for me. 4 kids at home means a lot of time spent helping with homework and generally keeping them happy.”.

Family-work conflict emerged as a common theme that drove a negative attitude to WFH. For instance, one respondent said: “Home is the place to cook and relax. It is not set out for Deep Work. Both functionalities interfere and decrease productivity”. Another said:

There is the expectation that I am always on, the inability of mid-level management (Deans) to understand work-life balance and need for personal time. Excessive demands from them, while senior management (President / Provost) are saying to pace yourself and don't burn out.

These findings show that many academics have struggled with work-life boundaries that have become far more complex than before—a challenge that university administrators need to address.

Respondents often found it difficult to achieve a work-friendly home environment. For example, comments included:

It's not working from home. I can do that. It's working while at home with kids and my spouse during a pandemic that's the problem.

When my partner works also from home it is difficult to work: I have teaching duties and need to video/audio-record my seminars.

I use an ironing board as a desk and have my folders in bins on the floor.

Some reported challenges with a full house of people who all conducted simultaneous zoom calls, such as “Finding a quiet space to conduct synchronous online lectures is a problem”. Productive workspaces may not exist for individuals who collocate with others. Schedule flexibility and other support would help faculty and staff who have dual roles at home and must share office space maintain their productivity.

In Section 4, we offer recommendations for university administrators.

4 Recommendations for University Administrators

No one knows when we will fully return to campus. As COVID-19 cases continue to fluctuate and remain high, university administrators face decisions about when and how to bring everyone back to campus safely. As a result, many faculty will continue to work remotely as we enter another semester. Thus, our finding that academics' WFH attitude is a key contributor to their productivity means that helping them establish a positive WFH attitude plays a critical role in universities' ability to survive and thrive until the pandemic's threat subsides. We offer some recommendations and guidelines for universities to think about as they continue to offer support for remote workers.

4.1 Hardware and Software Resources

Technology usefulness has a critical role in WFH productivity. Administrators should provide faculty with access to equivalent hardware and software to what they use in their on-campus office to ease the transition and support all aspects of academic productivity. As we look ahead to the future, administrators should plan to supply portable hardware that employees can use in both office and home environments. From a software perspective, faculty need access to the same software they use in the office. WFH highlights the added need for other tools such as video recording and editing software and the microphones and cameras to produce high-quality student interaction. A surprising number of respondents could not obtain adequate Internet access. Where possible, universities should offset this productivity hindrance with enhanced equipment or access to remote sites to ensure academics can safely work in isolation.

4.2 Flexibility and Support

Several respondents mentioned the need for more time to prepare online teaching materials. Instructors have taken on new roles as video producers, video editors, and learning management system (LMS) specialists. Administrators must acknowledge the additional roles that faculty members have taken on in order to deliver an online or hybrid experience that mimics a face-to-face class and offer support via training, technical assistance during class, and ubiquitous virus-prevention resources.

4.3 Support for a Work-friendly Home Environment

Family-work conflict emerged as a common theme that drove a negative attitude to WFH. Adequate workspaces, especially for synchronous instruction, may not exist for individuals who collocate with others. While administrators cannot directly impact living arrangements, they can provide support by offering flexible work schedules for individuals who must share office space and/or have multiple housemates who attend online meetings or classes at the same time. Academic managers can also create virtual support groups to bring faculty together to discuss best practices and offer support to each other.

How and when the world's academics return to a "new normal" on campus remains uncertain. Nevertheless, faculty, staff, and administrators must work together to address the challenges that face individuals who must WFH.

5 Conclusion and Future Research

In this study, we examine the impact that personal and technological challenges that the COVID-19 pandemic has created have had on the academic community's ability to work effectively. To provide university administrators with valuable information to help reduce the impact of work-life challenges university members face, we surveyed academics around the world to explore the dramatic changes that COVID-19 has had on their work-life balance.

Our results lead to several important recommendations for universities. First, they should provide workers with the proper hardware and software resources and good Internet access. Second, training and practice with needed technology should assist in improving work attitudes toward an unexpected work situation. Finally, since academics struggle with the absence of work-life boundaries during the pandemic, universities should accommodate the flexibility and support that faculty and staff who cannot separate their dual home and work-based roles require.

In this study, we conduct an early analysis on our rich data set about academics' productivity while they work from home during the COVID-19 pandemic. In the future, we plan to employ time and boundary-spanning theories to investigate scheduling, personal factors, and home situations that may influence academic WFH productivity and performance. We plan to examine factors (including those linked to technology) that contribute to increased stress levels when academics WFH. Furthermore, we plan to assess whether specific technologies' availability affects academics' performance and productivity.

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