# Adapting to Working from home as a Software Business Project Manager during the COVID-19 pandemic

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## Abstract

Working from home (WFH) was the only option of operation for many businesses and organisations during the COVID-19 pandemic where social distancing measures were introduced by governments worldwide. In an attempt to adapt to WFH, businesses, organisations and professionals of all backgrounds had to modify their previously established practices as well as adopt new practices and tools to enable remote working. To date, no previous study has explored how project managers of UK software businesses adapted to WFH during the COVID-19 pandemic. The aim of this mixed-methods study was to explore how project managers adapted to WFH during the COVID-19 pandemic. 16 experienced project managers (11.3±8.8 years of experience), ranging from junior to senior level, took part in this study. For the quantitative part of this study, 16 project managers took part in a 22-item survey and answered questions in relation to their experience with WFH during the COVID-19 pandemic. For the qualitative part of the study, 5 project managers took part in semi-structured interviews with questions relating to being a project manager and WFH during the COVID-19 pandemic. The triangulation of the results from the survey and semi-structured interviews showed that WFH had a neutral to positive impact on the project management (PM) practices of software businesses with some of the challenges that emerged from WFH relating to delays in project time delivery and communication. Overall, new communication tools and practices were adopted by project managers as a result of WFH and project managers felt that WFH had a neutral effect on their position within their respective businesses.

# Introduction

The history of working from home (WFH) goes back to the mid-1970s, where Jack Nilles used for the first time the terms “telecommuting and telework”. In the literature, evidence for WFH can be dated back to as far as the 1940s (Blount, 2015).

Working from home (WFH) has a number of different names such as: telecommuting, telework, remote work, working remotely or virtual work (Nakrosiene et al., 2019). WFH started becoming more prevalent in the 1980s and 1990s as businesses adopted it as a cost-effective option for enhancing personnel performance by improving their work-life balance (Avery and Zabel, 2001). As technology continued advancing, more businesses began offering employees the ability of WFH, as part of their general contract, sometimes as part of flexible employment (van der Lippe and Lippenyi, 2020) something that was not very common prior to the beginning of the COVID-19 pandemic (Brick et al., 2021). Previous research demonstrates that most employees had some part-time experience in WFH but full-time WFH experience was rather rare (Sullivan, 2003). WFH was not a very common professional practice due to the general consensus among employers being somewhat negative when considering WFH (Blount, 2015). Previous research has demonstrated a level of “distrust” when managers are unable to directly watch their employees working (Parker et al., 2020). “Distrust” in the workplace can directly impact collaboration as trust is a critical condition for successful collaboration (Jarvenpaa et al., 1998). A successful WFH setup can heavily depend on the culture of a business, built-in processes as well as the style of management employed by the business’ managers. Dynamic adoption of new practices is associated with positive business outcomes, especially when the adoption involves new practices and technology that has not been extensively used in the past (Morton, 1991; Garner et al., 2016; Pilarta et al., 2021).

The COVID-19 pandemic, which began spreading rapidly towards the end of 2019, caused major disruptions to a plethora of businesses from various sectors. As a means of adapting to the COVID-19 pandemic, which required limiting social contact to control the spread of the disease, plenty of businesses were required to adopt a WFH framework (Dziewit, 2021).

When the COVID-19 pandemic began, business managers, who were previously used to managing people in-person, had to adapt to the new working conditions but also needed to ensure that employees were being productive. They also needed to ensure that the business adopted the tools necessary to successfully establish remote working conditions as well as potentially adapt even the product itself to fit the remote working environment that the world shifted to. Managers were also required to redesign and adapt several well-established business processes to fit the WFH reality.

Very few organisations, about 6% in the US (Coate, 2021), were indeed already primarily WFH before the COVID-19 pandemic and had developed a WFH culture, but full-time WFH was not a widely spread practice, something that heavily impacted businesses and project managers worldwide. WFH during the COVID-19 pandemic was the only option for many businesses, something that differs from WFH pre-pandemic as one would not suddenly be told to "WFH full-time". Businesses that offered WFH did so in either part-time capacity, or just included it as an option when being physically present in an office was not possible. The COVID-19 pandemic forced thousands of employees and employers to WFH, something that often found people in environments that were not suitable for WFH (eg: no home office space and/or equipment and multiple family members present in the same environment) (Ralph, 2020)

According to the UK Office for National Statistics, in April 2020, 46.6% of employees were WFH with 86% of those doing so as a result of COVID-19 (ONS, 2020). In addition to WFH, several businesses had to also adapt their overall practices, work schedule and in many cases seek financial support from the government in order to remain in operation (Bartik et al., 2020).

The need to adapt resulted in the adoption of new practices for several businesses. Several businesses adopted a plethora of new tools and practices to assist them in productivity, processes and overall organisational planning (Valero et al., 2021).

However, not all businesses and sectors were able to adequately adapt (Vyas et al., 2021). In some sectors, jobs require collaboration with others and involve human-centred activities which must be performed at the work location. Vyas et al (2021) investigated the impact of WFH during COVID-19 in Hong Kong and found that WFH did not prove to be a great option for many of Hong Kong's workforce as companies and employees were not able to properly adapt to some of the newly set demands of WFH (software, working space etc). Contrastingly, previous research has demonstrated that WFH can be beneficial for certain businesses, resulting in increased employee productivity & work satisfaction (Bloom et al., 2015). Previous research had also found that WFH sometimes resulted in less sick leave being taken as well as an overall decrease in being absent from work (Gajendran and Harrison, 2007).

Successful project management (PM) often requires the coordination of multiple people from various departments, external stakeholders as well as a well-established procedure (Dziewit, 2021). Project managers are responsible for planning, overseeing and ensuring constant and effective communication is present at all stages of a project's life. Software companies utilise various PM practices, including the use of various tools & techniques to successfully plan & deliver projects (Jones et al., 2004). Previous research has identified that poor project planning was one of the most common problems that were observed when analysing and

comparing large software projects that had either succeeded or failed, highlighting the importance of PM in the software business (Jones et al., 2004).

A recent editorial by Muller et al (2020) explored the COVID-19 pandemic and its implications on PM research. In the editorial, Muller et al (2020) expanded on how one of the identified research streams would be focused on investigating the use of new practices realised from experience and foreseeing substantial changes. Pashchenko (2020) conducted research with the experience of 26 software development and IT support teams in companies with headquarters in different countries from Russia to the USA. He investigated the process of rapid adaptation of software development (and support) teams to the pandemic and shift into fully remote working mode as a new industry standard.

To date, no studies have investigated how project managers in software businesses adapted to the WFH framework imposed as a result of the COVID-19 pandemic (Dziewit, 2021). Therefore, the aim of this study is to investigate how project managers of software businesses adapted to the WFH arrangements imposed as a result of the COVID-19 pandemic. A secondary aim of the study will be to evaluate the effect and lesson learned of WFH on the PM practices of Project Managers in software businesses (Dziewit, 2021).

# Literature Review

The effect of the COVID-19 pandemic on businesses has been recently heavily explored by many researchers (Xiao et al., 2021, Vyas et al., 2020). Due to the disruption that COVID-19 caused many organisations had to move from reactive to a proactive way of functioning. The findings from the recent studies are key for many organisations to adapt and adjust and optimise their practices for the future.

The currently available evidence on WFH in the UK, and specifically in software businesses, is very limited, as only a handful of studies have investigated how PM practices of software businesses adapted to WFH (Pashchenko, 2021). Previous research has been done to explore home working practices and better understand the potential challenges an individual may face when WFH (Golden, 2012; Yordanova, 2015; Belzunegui-Eraso & Erro-Garcés, 2020; Papagiannidis et al., 2020; Power, 2020; Waizenegger et al., 2020). There is also a vast amount of research that is focused on software developers and their adaptation to the WFH during the COVID-19 pandemic (Smite et al., 2022). The current available literature includes mixed findings and is somewhat limited, especially when looking specifically at software business project managers.

The study of Gajendran and Harrison (2007), showed that only a small number of personnel always work remotely, the majority have a flexible working arrangement where a few days per month are WFH. Interestingly, prospective employees would be happy to accept lower wages in return for the option to WFH (Mas et al., 2017).

The main reason why employers are sometimes reluctant to offer WHF arrangements is due to concern that workers exploit the freedom when WFH and drop their work effort (Gariety et al., 2007). In many research papers, the problem seems to lie in the business' approach and organisational culture. There is a lot of scepticism toward WFH and is the most critical factor that must be considered to improve the successful implementation of WFH.

Kira Rupiettaa and Michael Beckmann (2016) investigated how telecommuting affects employees' work effort. They used the German Socio-Economic Panel (SOEP) and investigated WFH across all industries and occupations. The study showed that WFH greatly improved work effort and also demonstrated that there is a relationship between the frequency of WFH and work effort. Additionally, individuals who work at home are less likely to be distracted by co-workers and they are generally more likely to work in a quiet environment which reduces work-related stress (Bélanger 1999; Bloom et al. 2015, Pilarta et al. 2021)

Additionally, the option of WFH may have not been traditionally popular as certain businesses may not be able to afford WFH. Optional WFH comes with certain additional costs, like home-office equipment & communication software, that would be difficult to justify unless WFH provided a host of business performance related benefits vs in-person working. Moreover, adjusting to WFH and ensuring that all departments in a business are communicating appropriately, can add further layers of complexity to the WFH equation, especially if WFH is optional for certain people and/or departments (Bick et al., 2021)

Bloom et al (2015) conducted a study with Ctrip, China's largest travel agency, with 16,000 employees and a NASDAQ listing. The stakeholders were interested if WHF benefits the business with a reduction of office rental cost as Shanghai rental cost was increasing rapidly as well as reducing employees' travel costs. The findings of their study showed that workers who work at home have raised work effort as well as shown to be more productive. The performance of WFH employees increased by 13%, something that was measured over the nine months of the experiment. However, it is important to note that employees were not required to do any teamwork or have any face-to-face time. Also, teleworkers reported greatly improved work satisfaction and psychological attitude scores. Wheatly (2016) examined flexible working arrangements (FWAs) and employee satisfaction. One of the aspects of FWAs that he investigated was the location of work as home working. The findings of Wheatly (2016) indicated that WFH was correlated with significant job and leisure satisfaction. A 2012 survey found that nearly 40 percent of employees felt like their productivity increased when working in a flexible manner. Additionally, nearly 60 percent of employers mentioned that "absenteeism" had significantly decreased since the introduction of more flexible working conditions (CIPD, 2012).

Employees also benefit from the reduction of work-life conflict as well as lowering stress levels. Remote working was employee-friendly giving better flexibility in both place and timing of work, in some examples adjusting work schedule to their lifestyle (Tietze et al., 2009, CIPD, 2012). Improvements in work-life balance can often result in more favourable project outcomes (Bradleyt et al., 2010).

Even though most of the evidence shows a positive outcome of WFH, WFH can be employer-driven, something that can limit its positive effects if the approach towards it is sceptical. The absence of face-to-face communication, loss of social networks and inadequate management approach limiting training/promotion are negative career concerns of the employees (Wheatley, 2016).

Boell et al., (2016) discussed the disagreement and paradoxes of the available literature on WFH, saying that some of the available studies are inconclusive when it comes to WFH outcomes. He discussed the contradictory findings in studies where WFH is outlined as beneficial, for example when examining its effects on improving work-life balance. Despite some of the literature showing an improvement in work-life balance as a result of WFH, there are studies that have reported contradictory findings (Jarvenpaa and Lang, 2005; Gajendran and Harrison, 2007; Sorensen, 2011). Golden (2012) found that WFH can cause conflict between one's professional and family responsibilities, something that can then contribute to burnout and exhaustion, leading to further deteriorations in mental health. Additionally, in an environment that has not been properly organised for WFH, one can be heavily distracted by their surroundings, especially if cohabiting with other individuals. Research looking at how employees adapted to WFH through the COVID-19 pandemic found that when combining professional and family responsibilities, employees felt significantly more stressed when WFH as the expectations of balancing both were overwhelming (Bartsch et al., 2020).

Controversial findings were also reported in the study of Van der Lippe et al (2019). van Der Lippe et al (2019) found that individual workers perform better when they are all working in the office, indicating that performance depends not only on each individual employee, but their location reflects on the performance of other co-workers. However, on the other hand, they've pointed out some limitations of their study in relation to the use of IT technology which potentially could help optimise employee performance. It is not a novelty that WFH is strongly linked with use of technology and many authors acknowledged this. IT tools have definitely helped with information sharing among works within the organisation (Martínez-Sánchez et al.,2007). Although IT technology enables employees to effectively telework it depends on whether a physical environment, tools and devices were provided (ONS, 2021).

The COVID-19 pandemic resulted in many businesses having to adapt to the social distancing measures imposed, thus adopting a WFH approach. A plethora of employees suddenly had to convert their home spaces into workspaces to adapt to

the situation (Felstead et al., 2020). According to Felstead and Reuschke (2020), people in the UK that were WFH increased from 5% to almost 45% in the span of less than a year. Data also showed that in 2021, businesses in the information and communication industry had the largest proportion of individuals WFH, approximately 80% (BICS, 2021). Felstead and Reuschke (2020) found that during the COVID-19 pandemic, WFH did not have a negative effect on the productivity of employees and also found that the majority of employees would be happy to continue with a WFH arrangement. On the other hand, there is a handful of research showing the opposite. Several studies conducted prior and during the COVID-19 pandemic, found that WFH resulted in communication, trust and work-life balance issues (Belzunegui-Eraso & Erro-Garcés, 2020; Papagiannidis et al., 2020; Power, 2020; Waizenegger et al., 2020).)

In 2022 CIPD conducted a study where they confirmed the positive outcomes as per Felstead and Reuschke (2020). Their research included an online survey with a total of 2,133 senior decision-makers in UK organisations as well as an interview with 32 senior managers and directors. The survey results indicated that nearly 70% of participants expressed that WFH did not negatively impact their productivity. Of those ~70% participants, approximately 32% mentioned that productivity increased and around 38% mentioned that productivity remained unaffected when WFH (CIPD, 2021)

Successful adaptation of WFH can depend on a number of factors like the type of the job, the organisational characteristics of the working environment, business objectives and regulations as well as practices that a company implements to support WFH (Bolisani et al., 2020). Pilarta and Norona (2021) investigated perceived effectiveness among software developers. They found that company factors can significantly affect the WFH arrangement made by a company, in contrast to personal factors that seemed to not have a meaningful effect on it. The results also demonstrate that the WFH arrangement has a significant direct effect on employee commitment and employee effectiveness. Based on their study they developed a framework to effectively implement a WFH arrangement.

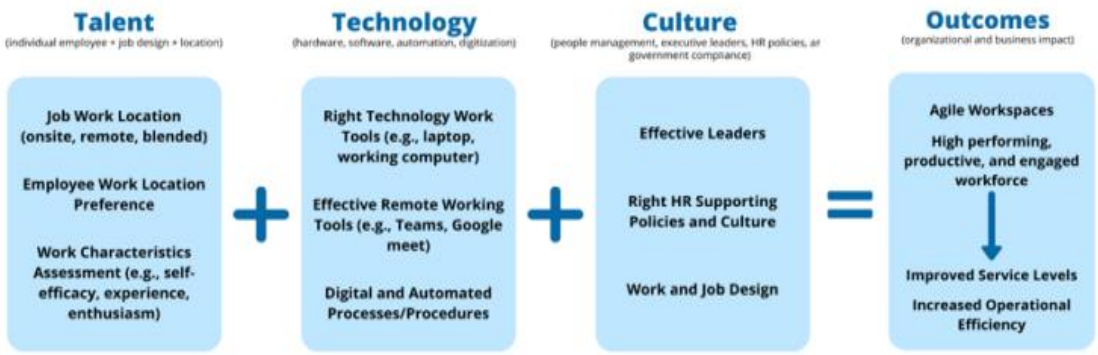


Figure 1. Implementation Framework for WFH Arrangements (Pilarta et al,. 2021)

The COVID-19 pandemic also had a significant effect on many businesses' innovation processes. Since March 2020, approximately 70% of businesses have adopted some new digital tools and new management practices. Approximately 60% of businesses invested in innovating their product while in the case of management practices, businesses adapted by implementing changes where appropriate. Additionally, most businesses that adopted the new technology had no impact on turnover, moreover 25% reported positive results and a small minority negative result. For some businesses, the above changes resulted in an increase in efficiency which in return had a positive impact on the businesses' profits. Those increases were not as positive as initially expected during the beginning of the COVID-19 pandemic, something that could be attributed to optimism bias (Valero et al, 2021).

Previous research has investigated the PM practices of businesses of different nature to contribute to PM theory as well as provide practical guidelines for businesses (Tereso et al., 2018). However, in regards to the PM during the COVID-19, some claimed that collaborative and communication tools have been used and advocated for well before the pandemic struck and thus project managers should be somewhat equipped to deal with the unprecedented WFH conditions (APM, 2020).

Additionally, it has been suggested that project managers can refer back to basic PM principles and attempt to trust remotely working colleagues, rather than trying to adopt a plethora of new and sometimes "unorthodox" management practices (APM, 2020).

So far, the research on WHF in software businesses has been very limited and the potential reason for this is due to the fact that employers in this sector allow workers to WFH (Russo et al., 2020). Additionally, it seems that the IT companies were the best prepared for the crises as homeworking PM, as well as geographically distributed teams has been adopted for a long time. (Sonjit et al. 2021, Pashchenko 2020)

Recent evidence demonstrated that WFH experience as well as a collection of different communication tools and PM software can really help in improving overall project delivery efficiency, something that may take time to implement depending on the business size, the product they're offering as well as the business' organisational structure. Adapting to new tools, practices and WFH in general, took the majority of teams a few weeks, while some teams were able to fully adapt within a week (Paschenko, 2020)

Pashchenko (2020) was the only one who investigated how PM practices were affected by WFH and how software business adapted to WFH during the pandemic. The study covered the journey of transformation of 26 teams from a leading IT corporation, software vendors, and high tech companies with high business maturity level. The results of the study show that the adaptation process was strongly connected with the business pre-pandemic processes and implemented framework as well as the motivation of team members. According to the study by Paschenko

(2020), roughly 60% of teams' current PM frameworks are well suited to fully remote working without any major modifications. The remaining 40 percent of teams have to adapt some PM processes within ~4 weeks. The main areas of change in PM were discipline and responsibility in teams communication as well as task and progress monitoring. In regard to the team's motivation, it appears that more than 40% of the team used additional effort to adopt remote team building, change the corresponding organisational processes and centralised programs. Although the study showed mostly the positive outcomes as a result of the adaptation, some teams reported that they experienced slow progress in professional development of the newly employed personnel as well as they needed more time for discussion about the product features. Despite some challenges and risks the study showed that for over 30% of teams, WFH became common practice in their organisation. For approximately 60% of teams, a hybrid model was adopted.

Butt et al (2020), investigated Agile PM and its effect of COVID-19. Agile methodology is one of the PM practices used by businesses to manage the development of software or product, essentially making it a PM methodology. The results of Butt et al (2020) show that Agile practices were negatively affected by the COVID-19 pandemic. However, some previous, as well as new research, has demonstrated that Agile practices are more practical compared to other methodologies. As per the Agile handbook, "Agile Project Management provides an approach that offers agility and flexibility" (AgilePM, 2017).

Agility is defined as "the ability to implement change in a timely, effective, and sustainable manner when it results in a performance advantage" (Worley and Jules, 2020). Organisations need to adapt continuously to effectively adapt to the quickly evolving economic environment. Agility is critical to the success of an organisation. Transformation to Agile PM can speed up and increase the effectiveness of project implementation using a wide selection of tools such as Kanban, P2M, Kaizen and others (Bushuyev et al. 2020). The findings from the Sonjit (2021) study indicated that the implementation of agility can assist team members to better collaborate and community during "stand-up" meetings, enhancing teamwork atmosphere and establishing better decision-making processes. Moreover, the research 'Latest Project management Trends and Challenges with COVID-19' by Savio (2021) also reports the benefits of using Agile. In fact, implementing Agile helped businesses manage to change priorities, it gave better project visibility and fasted delivery time. (Savio,2021). Apart from the Agile approach Savio also found that in response to Covid organisations also adopt other PM strategies, such as Artificial Intelligence (AI) & Automation tools, Virtual meetings and video conferencing, cloud base tools that enable remote teams to communicate and collaborate on everything project related as well as can allow for emotional intelligence to support employees mental wellbeing especially when people are prone to experiencing feelings of isolation while working remotely.

Some companies around the world published their own action plan to adapt to the impact of COVID-19. According to the KPMG group, there are four horizons of adaptations to the COVID-19 pandemic – reaction, resilience, recovery and the new reality. The reaction is a stage when the business addresses challenges and sets clarity for project people. It is a reaction to switching to WFH and re-setting the environment to conserve effectiveness and productivity. Resilience is focused on bringing back an unsettled environment and adaptation of the new practices. The next stage, recovery, is about making sure that the adaptations are in line with the business objectives. "The new reality is the new normal", is about enabling a newly adopted strategy in the business as usual as well as creating strategic options for long growth (KPMG, 2021). KPMG (2021) also highlighted the importance of business collaboration and identified six themes that are potentially critical when transferring to WFH and adapting to the new practices. A similar framework was created for project-based organisations to support knowledge exchange during the project delivery. The study Abualqumboz (2021) shows results from analysing four IT businesses and how they innovate and communicate with their customers during the pandemic in three phases. The three stages of the process are disharmony, normalisation, and harmony. Each of those phases was then unfolded from the perspective of processes, strategies involved, capabilities operationalised, and support mechanisms. Similar to the KPMG, the first stage addresses the challenges and identifies new practices and tools to deal with the pandemic. The second stage 'normalisation' is about baselining of the newly adopted processes and tools which were mainly focused on effective communication both with their clients and across the teams as well as developing new services and products. New tools such as video streaming, automatic minutes taking and creating social communities of practice were then alline internally and externally to begin a new normal. This was a way to harmonise teams knowledge exchange, communication, and resilience. Abualqumboz (2021) concluded that this framework can be translated by similar businesses that draws on lessons learned from this study enabling them to develop systems, guidelines and tools to help overcome similar crises. Abualqumboz (2021) also highlighted that the above depends on individuals being aware of their variations and accepting their vulnerabilities.

# Methods

## 5.1 Design & Approach to the problem

A survey & semi-structured interviews with Project Managers from software businesses were conducted to explore how software businesses adapted their PM practices to WFH as a result of the government restrictions imposed due to the COVID-19 pandemic as well as explore the overall perceived effectiveness of WFH on PM practices.

This project followed a parallel mixed methods design, where qualitative and quantitative data was collected and analysed simultaneously (Shorten & Smith, 2017). A mixed methods approach was beneficial in gaining a better understanding of links and conflicts between qualitative and quantitative data as well as create new avenues of exploration that helped further enhance the data collected, allowing for questions to be answered in greater detail (Shorten & Smith, 2017).

The semi-structured interviews allowed for a more in-depth exploration of the topic while the survey helped collect participant and business characteristics data as well as attempt to quantify how well Project Managers adapted to WFH as well as the perceived effectiveness of WFH as whole. Semi-structured interviews helped capture the richness of an individual's experiences thus enabling others to learn from them (Hove & Anda, 2005).

The semi-structured interviews were designed using a set of guiding questions but also allowed for some freedom for participants to expand on their responses and further discuss their experience with WFH and how they adapted their PM practices. The questions for both the semi-structured interviews and the survey were designed around the research problem of the study – understanding how Project Managers from software businesses adapted their PM practices while WFH during the COVID-19 pandemic. The survey questions were also designed around the research problem of the study and more specifically around the businesses' characteristics, previous & current PM practices as well as perceived effectiveness of WFH.

## 5.2 Research Philosophy

The research philosophy of this study was pragmatism. Pragmatism considers theories, concepts, hypotheses, and research findings in terms of the roles they have as "instruments of thought and action" as well as in regard to "their practical consequences in specific contexts" (Saunders et al., 2009). A pragmatism approach has a complex & rich ontology and often utilises a range of methods, including a mixed methods approach (Saunders et al., 2009). A pragmatism philosophy was also appropriate to this study as the study aimed to inform future practices of Project Managers in software businesses.

## 5.3 Ethical Approval

Prior to commencing data collection, the study has sought ethical approval from the Ethics Committee of Solent University.

## 5.4 Participants

21 project managers of software businesses (11.3±8.8 years of experience) were recruited for the study. The survey was completed by 16 project managers, their level ranging from senior to junior project managers. 4 senior project managers and 1 junior project manager took part in the semi-structured interviews. To be recruited, the Project Managers had to meet the following inclusion criteria: have at least 2 years of experience working as a Project Manager in a software company, was working as a Project Manager in a software company during the COVID-19 pandemic, was working at a company that was not mainly set-up as WFH before the COVID-19 pandemic. The sample size was convenience based and justified based on feasibility expectations considering the accessibility of the population to be sampled (i.e. a resource constraints based justification; Lakens, 2021). Further, previous research with project managers of software businesses used samples ranging from 5 to 19 participants (Nannette et al., 2006). The survey participants' characteristics can be found in Table 1. The PM methodologies used by the survey participants can be found in Table 3. The interview participants' characteristics can be found in table 2.

**Table 1** – Survey Participant Characteristics

| **Characteristic** | **n=16** |
|---|---|
| Business Size (people) | 168±326.8 |
| Project Manager Experience (years) | 11.3±8.8 |
| Current Position Experience (years) | 5.2±5.2 |
| Teams Managing (no. of teams) | 1.4±.1.1 |
| People Managing (no. of people) | 24.2±73.7 |
| Employees Currently WFH (%) | 54.6±31.5 |
| Position | Senior Project Manager (75%, n=12)<br>Project Manager (18.75%, n=3)<br>Junior Project Manager (6.25%, n=1) |

Results are mean ±SD

**Table 2** – Interview Participant Characteristics

| **Characteristic** | **n=5** |
|---|---|
| Business Size (people) | 247.6±423.9 |
| Project Manager Experience (years) | 13.6±12.5 |
| Teams Managing (no. of teams) | 2±.1.2 |
| People Managing (no. of people) | 5.8±2.5 |
| Position | Senior Project Manager (80%, n=4)<br>Junior Project Manager (20%, n=1) |

Results are mean ±SD

**Table 3** – PM Methodologies Used by Survey Respondents

| **Methodology** | **Sample Representativeness (%)** |
|---|---|
| Agile | 81.2% (n=13) |
| Hybrid | 62.5% (n=10) |
| Prince 2 | 62.5% (n=10) |
| Waterfall | 37.5% (n=6) |
| PMI's PMBOK | 12.5% (n=2) |
| SCRUM | 6.2% (n=1) |

Note: respondents were able to select multiple choices, thus the sum of the sample representativeness scores exceeds 100%

### 5.5 Survey Instrument

A 22-item survey was administered to Project Managers who have met the inclusion criteria and agreed to participate. The survey was separated into 5 areas of questions: participant characteristics, software business characteristics, adapting PM practices to WFH & overall perceived effectiveness of WFH on PM practices. Prior to its use, the survey was piloted with 3 Project Managers to ensure the questions are relevant to the research problem.

### 5.6 Procedures

Participants were recruited via email through personal records and social media such as LinkedIn, Instagram and Facebook. The message that was sent to participants informed them regarding the aims, objectives, and potential risks of participating using a participant information sheet (PIS). In addition to being provided with a PIS, participants who express interest were also required to provide informed consent

prior to their participation in the study. The survey & interview questions can be found in the Appendices.

### 5.7 Survey

Prior to commencing the semi-structured interviews, participants were sent a link to the survey of a study which was hosted on a GDPR-compliant survey platform (TypeForm.com). The online survey was first presented to the participants with the PIS and consent form, a mandatory step required before beginning the survey. The survey lasted 5-10 minutes.

### 5.8 Semi-structured interviews

Similarly, to the survey, participants were required to provide informed consent before beginning the semi-structured interview. Participants were contacted and interviewed using an online video calling platform (Teams, Microsoft). Participants were also informed that the interview process would last up to 60 minutes. The interviews were recorded using the software OBS (https://obsproject .com) for transcription purposes. The interviews lasted an average of ~50 minutes and were then uploaded to an online artificial intelligence transcription service, Otter (https://otter.ai) on the private account of the investigator. Following the automatic transcription of all interviews, the interview transcripts were downloaded as text files and permanently deleted from the transcription service. The generated transcriptions were checked for accuracy and corrected using the original audio files as guides.

Participants were asked questions regarding their experience with WFH and how it has impacted their PM practices as well as questions around specific tools and techniques that they have adopted to adapt to WFH.

### 5.9 Analyses

Qualitative data was analysed using a thematic analysis approach (Meyers, 2009). The thematic analysis was conducted using the NVivo 12 software package (QSR). The participants' transcripts were organised into broad themes to assist in gathering all of the participants' responses. A label was assigned to each broad theme to characterise its content. Following the characterization of broad themes, the coding process followed, identifying individual text units in the participants' interview transcripts. The text units were compared with other text units under the broad themes which allowed sub-themes to be identified. Themes and subthemes were classified based on the guidance provided by Hill et al (2005). The classifications were: general, meaning themes applying to all or all but one participant; typical, themes applying to more than half of the participants, but less than general; variant, themes applying to two or more participants, but less than typical.

For the survey responses, descriptive statistics (means and standard deviations) and % of respondents were calculated.

### 5.10 Validity and Reliability

External validity was assessed by exploring the themes and subthemes that emerged among the different participants during the semi-structured interviews. When similar themes & sub themes emerged, despite the difference in work experience, company size and other characteristics of the participants, this helped establish external validity.

# 1.Results

### 6.1Interviews

The themes and subthemes and their respective sample representativeness can be found in Table 4. The participants' views and percentage of representativeness for each theme are further analysed below. The participants' views are presented in quotes.

**Table 4 -** Interview Themes & Subthemes

| Themes & Subthemes | Sample representativeness (% of sample and number of participants) |
|---|---|
| **Challenges faced as a project manager** | |
| Delays in project time delivery | 60% (n=3) |
| Adoption of new services | 20% (n=1) |
| Communication | 80% (n=4) |
| **Newly adopted project management practices** | |
| Daily Meetings | 20% (n=1) |
| Remote communication and colaboration tools | 60% (n=3) |
| Encouraging frequent communication | 40% (n=2) |
| **Lessons Learned from WFH** | |
| Being effective irrespective of location | 40% (n=2) |
| Improvements in communication | 60% (n=3) |

**Broad theme:** Challenges faced as a project manager

**Subtheme:** Project time delivery

Forty percent of project managers expressed that “projects just took longer because some systems weren’t in place” and that “delivery timeline was much longer when compared to before COVID”. Sixty percent of project managers expressed that having employees on furlough negatively impacted project time due to having “issues with project progress due to people being on furlough". Additionally another project manager mentioned how “there were limited resources because some people weren’t available [due to furlough] to progress projects”.

**Subtheme:** Adoption of new services

One project manager expressed that “tools like Teams took a while to be adopted” explaining that “And there was this contention between zoom and teams and that didn't help. And then obviously, there were some security implications, potentially with one of them. It just made things take longer”.

**Subtheme:** Communication

Eighty percent of project managers expressed that “there was more opportunity for miscommunication because of the narrower channel of communication” and that “dealing with scoping calls on remote calls is much more difficult” because “communication is a lot easier with people when you’re in an office”. One project manager explained how when “multiple people are trying to tell you information at the same time, it has to be very, very carefully organised and managed. So that was probably the biggest challenge”. Project managers also explained how “communication internally, has proven to be more difficult versus when you’re working in an office environment” and that they even faced challenges with “the equipment used” and that “once I had a microphone close to my face, then my team started to understand me better”. Other project managers expressed that “trying to get people together, trying to celebrate project wins, I think was more of a challenge” as it was “difficult to create a shared experience to validate good work”. Some project managers also expanded on how the challenge of communication appeared when “forming new teams and making sure everyone knew each other, as usually everyone gets together in the office so that we can sort of work together. That was the biggest challenge to overcome”. Something similar was expressed when referring to new recruits as “interviewing someone, and not being able to meet them face to face was very strange, you know, onboarding them, the first, you know, the first few weeks, they didn't see any, we didn't meet anyone. We were just sort of name icons on their team's channel lists”. Project managers also expressed that it was “much harder to lead someone or have a one-to-one with someone on teams” because “a lot of the time, you can’t get hold of people because they're either in a

meeting or you have to resort to email, and it's it made it feel a little bit impersonal. So that really suffered".

**Broad theme:** Newly Adopted Project Management Practices

**Subtheme:** Daily Meetings

One project manager expressed that they "had to be a bit more formal with the daily stand-ups. Because it's not just one project, there are many projects, some of them are small, and some of them are less small. There was less opportunity for information to be absorbed by proximity. Sowhen you're all in the office, you know what's happening on this project, because you can hear someone talking about it behind you. And actually, that absorption of other interdependencies was lost. So we adopted a formal daily stand-up, which was welcomed with differing levels of enthusiasm".

**Subtheme:** Remote Communication and Collaboration Tools

Sixty percent of project managers expressed that they adopted different remote communication and collaboration tools. One Senior project manager mentioned how "teams was adopted as the system of choice eventually" while another Senior project manager mentioned that "one tool that has become very helpful for us, it's called Miro, and it's like a virtual whiteboarding tool. So you can put sticky notes on it, you can bring screenshots into it, you can mark them all up, you can draw arrows". Similarly, to the first project manager, other project managers also referred to video conferencing platforms as part of newly adopted remote communication tools, more specifically explaining how "the only other tool that we have started using directly because of COVID was zoom. So the use of zoom meetings, but also zoom is sort of our VoIP solution". This project manager explained that even though zoom had become a newly adopted video conferencing platform for his company, "you can't really do a five day long teams meeting or a five day long zoom meeting. So, we really had to turn that. And that was something we really had to figure out something, so we had a new system brought in to do our Resource Management and a new booking system. So, we now use Microsoft forms to actually submit requests for upcoming engagements for different jurisdictions".

**Subtheme:** Encouraging frequent communication

One project manager expressed that "getting that regular communication and not losing sight of it" was important and that was achieved by "setting up regular meetings in the morning". Similarly, another project manager expressed how they tried to "encourage frequent meetings with set meeting times on a frequency so that there was a continuity or pattern to the, to the time of day".

**Broad theme:** Lessons learned from WFH

**Subtheme:** Effectiveness irrespective of location

Project managers touch on some of the lessons learned from WFH, one of them being that “businesses in general are realising that you can be equally effective from home or anywhere remote, as long as you're effective. And you can equally be ineffective whilst in an office. So I think it's highlighted the fact that performance isn't necessarily tied into location”. Another project manager expressed that “one of the positive lessons we have learned is we can still deliver the projects in our industry remotely, that's actually been a really good, positive thing because we always used to think we only be able to do it on-site with them or face the face”.

**Subtheme:** Improvements in communication

Sixty percent of project managers expressed that WFH “forced me to sort of improve direct communication, so being very clear and concise”, some even using similar expressions as they stated that WFH “forced me to sort of think about that kind of stuff and build on ways to communicate with people through video”. Others expressed that they’ve “also improved a lot in communication” as they can “get into Slack and I can respond to every message that comes to me and be completely dialled in”.

### 6.2 Survey

A summary of the survey responses can be found in Table 5. Of the project managers surveyed, 68.8% (n=11) had experience with WFH prior to the COVID-19 pandemic. Nearly half (43.8%) of project managers found adapting their usual PM methodologies to WFH ‘extremely easy’ while 31.5% found it ‘easy. In terms of the effect of WFH on the project managers’ PM practices, responses varied as the options ‘negative’, ‘positive’ and ‘extremely positive’ all had the same percentage of respondents (18.8%). 43.8% of respondents selected ‘neutral’ for the above question. Of the respondents that selected ‘extremely negative’ or ‘negative’ for the above question, 100% selected “delayed project delivery” as an option for the question on how WFH negatively impacted their PM practice. 68.8% of project managers adopted new tools and techniques as a result of WFH, with 100% of them adopting ‘communication’ tools & techniques and 81.8% adopting ‘team collaboration’ tools & techniques. 43.8% of project managers selected ‘neutral’ when describing the effect that WFH had on their position within the business while 18.8% selected ‘extremely positive’ and 6.2% selected ‘extremely negative’ or ‘negative’. Lastly, the project managers were evenly split when responding to whether they would continue WFH on a full-time basis, with 50% of project managers selecting ‘Yes’ and 50% selecting ‘No’.

**Table 5** – WFH Characteristics

| **Experience prior to the COVID-19 pandemic with WFH** | **Sample Representativeness (%)** |
|---|---|
| Yes | 68.8% (n=11) |
| No | 31.2% (n=5) |
| **How easy was it to adapt your usual project management methodologies to WHF?** | |
| Extremely difficult | 0% |
| Difficult | 12.5% (n=2) |
| Neutral | 12.5% (n=2) |
| Easy | 31.5%(n=5) |
| Extremely Easy | 43.8% (n=7) |
| **What effect did WFH have on your project management practices?** | |
| Extremely negative | 0% |
| Negative | 18.8% (n=3) |
| Neutral | 43.8% (n=7) |
| Positive | 18.8% (n=3) |
| Extremely Positive | 18.8% (n=3) |
| **How did WFH negatively impact your project management practice?**<br>*Completed only by respondents who selected “Neutral” or “Negative” on the previous question<br><br>Respondents were able to select multiple choices, thus the sum of the sample representativeness scores exceeds 100% | |

| | |
|---|---|
| Delayed project delivery | 100% (n=10) |
| Difficulty with stakeholders' engagements | 80% (n=8) |
| Difficulty with teams' engagement | 60% (n=6) |
| Prolonged tasks | 60% (n=6) |
| Lack of resources | 40% (n=4) |
| Requirement for additional resources which were not previously planned | 20% (n=2) |
| Other | 30% (n=3) |
| **Did you have to adopt new project management tools & techniques as a result of WFH?** | |
| Yes | 68.8% (n=11) |
| No | 31.2% (n=5) |
| **In which areas, did you have to adopt new project management tools & techniques?**<br>*Completed only by respondents who selected "Yes" on the previous question<br><br>Respondents were able to select multiple choices, thus the sum of the sample representativeness scores exceeds 100% | |
| Communication | 100% (n=11) |
| Team collaboration | 81.8% (n=9) |
| Project delivery | 54.5% (n=6) |
| Project initiation | 45.5% (n=5) |
| Business objectives | 18.2% (n=2) |
| Project development | 18.2% (n=2) |

| | |
|---|---|
| Other | 9.2% (n=1) |
| **Overall, what effect did WFH have on your position within the business?** | |
| Extremely negative | 6.2% (n=1) |
| Negative | 6.2% (n=1) |
| Neutral | 43.8% (n=7) |
| Positive | 25% (n=4) |
| Extremely Positive | 18.8% (n=3) |
| **If presented with the option, would you continue WFH on a full-time basis?** | |
| Yes | 50% (n=8) |
| No | 50% (n=8) |

# Discussion

The findings of the survey indicate that nearly 70% of project managers had experience with WFH before COVID. An individual is able to WFH only with the use of information technology. The technology creates new possibilities for organisations' viability and extends their activities from traditional in the office to remote working. Through the use of information technology tools, team members can communicate with each other, coordinate, build relationship completing task by sending and receiving written, audio and visual information (Thorstensson, 2020, Cramton and Webber, 2005, Hertel et al., 2005, Lee-Kelley and Sankey, 2008, Montoya et al., 2009, Rad and Levin, 2003). Research by Oettinger (2011) and Mateyka, Rapino, and Landivar (2012) shows that WFH has increased in the US during the past 20 years. Advances in IT infrastructure contributed to the increase of WFH and the adoption of new business practices. Oettinger (2011) also explains how WFH has increased in businesses that use information and communications technology, as well as in jobs where face-to-face interaction is not as important and/or prevalent.

The number of people in the UK who are WFH has increased by almost 10% between 2015 and 2015 (ONS, 2020). Moreover, if we look at the industry type, over 50% of people working in the information and communication sector reported that they have WFH from Jan to dec 2019 (ONS, 2020). And as previously mentioned this suggests that the reason why there is a lack of research looking at the implication of WHF for software businesses is the fact that WHF already was strongly integrated before COVID-19. This means having already in place management support for technology issues, data security and privacy, and governance policies which support WFH ability. This is also potentially the reason why most project managers from the survey found adapting to WFH easy or extremely easy.

Additionally, results from the survey show that most project managers found that WFH had a neutral effect on their PM practices, 18% found it had negative effects and ~36% found it had either positive or extremely positive effects. So overall the effect appears to be somewhat positive. Previous research shows that working remotely has highlighted that projects led by project managers who have plenty of experience, were less likely to experience issues related to the change of processes and introduction of new tools as a result of WFH (KPMG, 2020) The results from the interview show that most of the project professionals had many years of experience and 75% of them were in senior positions. The key competencies of successful project managers are appropriate risk management and the ability to adapt to change and provide a clear plan for action. project managers need to be flexible and adaptive in any situation (Koppensteiner et al, 2004). However, it is important to note that this is combined with organising structured engagement with those who are required to change their ways of working and stakeholders being in demand.

On the other hand, of all project managers who mentioned that WFH had a neutral or negative effect on their PM practices, 100% of them said that one of the negative impacts of WFH was “delayed project delivery” and 80% said “difficulty with stakeholder engagement”. Before the COVID-19 pandemic, research showed that there was a strong trend toward WFH however, it is important to note that WFH was voluntary. The difference between pre and during pandemic times was that WFH became compulsory and some of the businesses were naturally not ready to switch, which made them vulnerable. This sudden change caused many disruptions in which organisations had to in very quick pace adapt to the new situation. It was consequently impossible to avoid the negative effect of the pandemic for some businesses where teams had no or little experience in WFH practices. (Sonji et al, 2021). This confirms what previous research had identified: organisation factors and early WFH adaptation were vital in reducing the negative impact that project managers experienced. (Baker et al., 2007, Grant et al., 2019, Pilarta and Norona, 2021, Paschenko, 2021). In regards to the ‘delayed project delivery’ some of the project managers that were interviewed, reported that due to people being on furlough and limited resources because some people weren't available project progress took longer. The lack of resources from both the project and customer side consequently created a challenge where teams were unable to keep up with the communication, which then negatively affected the planning stage of the project since the decision-making became more time-consuming. Things like getting approval to access planned investments would be prolonged, influencing the project delivery (Shamim, 2022).

This challenge can be also a potential reason why the project managers experienced difficulties with stakeholder engagement. Stakeholder engagement is the process of identifying and communicating effectively with those who have an interest in the project outcome. Effective communication with the stakeholders is key to the project success. The process of stakeholders engagement is creating and analysing the stakeholders profile, defining the approach, planning the engagement and carrying it out (PRINCE 2,2017). Due to the pandemic, every stage of the engagement could have been affected. Things like key people not being interested in the project as priorities for them switched, people being not available for different reasons such as being ill, on furlough or just having closed businesses had a detrimental knock-on effect on communication. Additional research shows that WFH created a challenge where face-to-face communication and ordinary office conversation were totally lost (Shamim, 2022). Results from the interviews also report that the main challenge faced by project managers during covid was “communication” (80% of participants) as well as “project time delivery”. According to Jackson et al (2020) communication plays the most important role as a mechanism in which business norms, rules and values are developed. As stated by Jackson et al “As organisations and people shape one other, people and technology also shape one other and, in turn, shape the rules and norms of the organisations that they constitute.”

During the COVID-19 pandemic, it was critical for project managers to rapidly adapt communication and collaboration tools to successfully remotely engage with the stakeholder and team members to maintain the relevance of project activities and ultimately to keep the project delivered on time as well as stay connected and keep in touch regularly. APM survey conducted by AIPM in 2019 found that over 50 percent of organisations had been using some form of collaboration & communication software to aid in the project delivery process. New technology has significantly helped businesses deliver projects effectively and efficiently, especially when stakeholder engagement has been an area of concern (KPMG, 2020).

Interviews showed similar results. 60 percent of the participants empathised with how they improved their communication and stakeholder engagement by introducing new practices and tools. Due to WFH, remote meetings took on precedence rather than calls or emails and this created positive communication, people were having more regular meetings with the customer, one participant said that “people rather than pick up the phone a few months ago, or a few years ago and speak to the customer, they'll have a team's meeting, which makes it almost like an office-based conversation with the customer”. On the other hand, research shows that virtual conferencing tools can have some disadvantages. Things like poor transmission or connection breakdown, lack of body language and less opportunity for networking, lack of ability to show 3D models as well additional cost for licensing and data protection concerns can negatively impact communication (Byrnes, 2021). Moreover, according to research, being in the office, human interaction, professional environment and face-to-face interaction enhance collaboration (JLL, 2020). The results of this study show ~70% of project managers had to adopt new PM practices when WFH. 100% of them had to adopt new communication tools & techniques. 82% of project managers had to adopt team collaboration tools and techniques. Similarly, to the results of the survey, the results of the interviews show that newly adopted PM practices were “remote communication and collaboration tools” and “encouraging frequent communication”. Despite challenges, the requirement to WFH during the COVID-19 pandemic created a host of opportunities for new technology to be developed and widely adopted. The universal WFH conditions essentially assisted in making certain communication and collaboration practices much more widely adopted.

The adoption of the collaboration and communication tool has proven to bring a lot of benefits across different businesses. Research shows that video conferencing tools, digital technology as well as online and cloud platforms help businesses to improve performance, resulted in great customer satisfaction, minimised work disruption and opened up new opportunities for online teaching, learning and research. They show to be time efficient and low-cost alternatives (Byrnes, 2021). This also confirms as per our study that WFH can be as effective irrespective of location.

From a business perspective overall 43.8% of project managers said that WFH had a neutral effect on their position in the business. ~42% of project managers said that WFH had a positive or extremely positive effect on their position with the business. The survey conducted by Project Management Institution (PMI) and Project Business Foundation found that business transformation projects help generate new opportunities and the performance of the projects was positively affected during the COVID-19 pandemic (PIM, 2020). Wateridge (1997) explained how IT project managers have a very important role when it comes to the adoption and implementation of new technologies and practices, as their performance and ability to adapt can be catalytic in an IT business environment. WFH offers a plethora of benefits for employees, businesses as a whole but also the environment. The lack of daily commuting can help decrease an individual's costs, allow them more time for sleep and self-care as well as benefit the environment through lower automobile emissions. In addition, the lower office costs and potentially increased employee productivity and improvements in work-life balance, are all potential benefits that WFH has to offer. The benefits of WFH previously identified in studies were also observed in some of the research that emerged from the COVID-19 pandemic (Orr et al, 2021).

All project professionals said in the interviews that they have somewhat improved as project managers. This suggested that the pandemic had a positive effect on personal development. Research by PMI showed that during the COVID-19 pandemic several people managed to increase their overall knowledge and skills in various areas of PM as PMI delivered plenty of teaching sessions and certifications. In earlier research Wateridge (1997) presented a guide on being an "effective IT project manager". Wateridge (1997) mentioned that project managers need to constantly develop their practices and further improve their overall skill set throughout their careers in order to remain effective, efficient and competitive.

Interestingly, when asked "if they would continue to WFH on a full-time basis" the responses were 50-50, something that was similarly found in a survey distributed by RADA business where 3000 professionals were surveyed. The results of the survey showed that almost half of the professionals surveyed wanted the WFH on a permanent basis (RADA, 2021). Another survey of nearly 5000 UK working adults found that 21% of respondents never wanted to not WFH at all in 2022 and that 19% of respondents would like to WFH approximately five days a week (CERP, 2021). The results of the study's survey are further supported by the results of the "Covid-19 and Working From Home Survey" (Taylor et al., 2021). The results of the preliminary analysis of findings from the survey involving around 3000 people found that ~78 percent of UK participants would prefer to WFH some days of the week while approximately 30 percent responded that they would prefer to WFH on a full-time basis.

It is important to note that, although this study is the first study to directly investigate the effect of WFH during the COVID-19 pandemic on project managers of software businesses, it has its limitations and future research is needed to better explore the topic in hand. One limitation that the study has is that it only looked at UK software businesses. Looking at how project managers from software businesses across different countries adapted to WFH could have allowed for a better understanding of the effects of full-time WFH on project managers and their practices. Another limitation is the sample size of the survey and interview studies. Despite including experienced project managers and a sample size similar to some of the interview and survey studies available in the literature, it is important to recognize that the sample size of the survey and the semi-structured interviews only allow the results of the study to be viewed as 'exploratory' and should therefore be interpreted with caution. Future research should look to investigate how project managers from different sectors as well as different countries adapted to WFH during the COVID-19 pandemic, as well as explore their WFH practices in the years following the COVID-19 pandemic.

# Conclusion

In conclusion, the results of this mixed-methods study indicate that the overall effect of WFH on project managers in software businesses in the UK was neutral to positive. Project managers faced communication related challenges when WFH during the COVID-19 pandemic and to adapt, they adopted a plethora of new communication and collaboration tools as well as practices. Project managers also faced challenges in regard to project time delivery, mostly caused by employees being on furlough, something that was also combated by adopting new tools and practices. The results of this study also showed how WFH in the COVID-19 pandemic and WFH created an opportunity for project managers to enhance their PM knowledge as well as highlighted the importance that successful implementation and project delivery requires a high degree of expertise and professionalism in a constantly changing environment. Lastly, half of project managers surveyed expressed that they would be happy to WFH on a full-time basis. The literature review part of this study demonstrated that the current literature is mixed in regard to the benefits and effectiveness of WFH, highlighting that the successful implementation of WFH may depend on the nature, culture and overall structure of the business. However, it is important to note that the current literature on the effects of WFH during the COVID-19 pandemic on project managers is very limited and future research should aim to further explore the effect of WFH on project managers and their practices. Additionally, future research should also investigate how the WFH practices of businesses and project managers have changed following the COVID-19 pandemic.

# Recommendations

Based on the results of this study, the following are some practical recommendations for project managers when WFH, especially in the event of mandatory unplanned full-time WFH:

1. Invest and become proficient in remote communication tools & techniques (eg: MS Teams and Slack). It is key for businesses and project managers to have the appropriate infrastructure required to effectively communicate remotely. As a project manager, being proficient in the use of remote communication software and tools will help avoid major communication issues with one's team and project stakeholders, thus assisting in delivering projects on time
2. Invest and become proficient in remote collaboration tools & techniques (eg: Calendly, Whiteboard.com, Monday.com). Similarly to the above recommendation, creating a collaborative environment will be key to successfully implementing WFH, especially when managing projects that involve multiple individuals and/or teams. Implementing the appropriate tools & processes will allow for project managers to better collaborate with other team members and recreate a collaborative environment similar to that when working in-person.
3. Reevaluate current project delivery tools & techniques. The results of this study indicated that over half of project managers surveyed had to adopt new project delivery tools & techniques. Understanding and spotting potential gaps in the currently used project delivery tools & techniques may allow for project managers to better adapt to WFH and avoid potential delays in their project delivery times.
4. The knowledge of the risk of a similar situation to the COVID-19 pandemic occurring, should act as an incentive for project managers to undergo training in regards to resilience and more dynamic risk management practices which can allow them to better adapt in unpredictable circumstances (Shamim, 2022).

# Appendix A: Survey questions

## Survey Questions

*WFH = Working From Home*

1. **What is the size of the business that you work at (in people)?**
2. **How many years have you been working as a Project Manager?**
3. **What is your current position within the business?**
4. **How many years have you been working at your current position?**
5. **How many departments do you manage?**
6. **How many people do you manage?**
7. **Prior to the COVID-19 pandemic, did you have any experience with WFH?**
   Yes/No
8. **What percentage of your business' employees currently WFH?**
9. **What project management methodologies do you usually utilize (select all that apply)?**

- Agile
- Prince 2
- Waterfall
- PMI's PMBOK
- Hybrid
- Other *[will allow participant to enter a custom response]*

10. **How easy was it to adapt your usual project management methodologies to WFH?**

- [1-5 Likert scale, 1 being "extremely difficult", 5 being "extremely easy"]

11. **Have you adopted any new project management methodologies as a result of WFH?**

- Yes/No

12. [if Yes] **Please list some of the newly adopted project management methodologies that you adopted as a result of WFH:**

- [Long-text response box]

13. **What effect has WFH had on your project management practice?**

- [1-5 Likert scale, 1 being "extremely negative", 5 being "extremely positive"]

14. [if previous response below 3] **How did WFH negatively impact your project management practice [select all that apply]?**

- Difficulty with stakeholders' engagements
- Difficulty with teams' engagement
- Prolonged tasks
- Lack of resources
- Requirement for additional resources which were not previously planned
- Delayed project delivery
- Other *[will allow participant to enter a custom response]*

15. **Did you have to adopt new project management tools & techniques as a result of WFH?**

- Yes/No

16. [if Yes] **In which areas, did you have to adopt new project management tools & techniques?**

- Communication
- Team collaboration
- Project initiation
- Project development

- Project delivery
- Business objectives
- Other: *[will allow participant to enter a custom response]*

**17. Please list some of the newly adopted tools & techniques you adopted**

- [Long-text response box]

**18. Overall, what effect did WFH have on your position within the business?**

- [1-5 Likert scale, 1 being "extremely negative", 5 being "extremely positive"]

**19. If presented with the option, would you continue WFH even after COVID-19 related measures were lifted?**

- Yes/No

# Appendix B: Semi-structured interviews questions

**Semi-structured interview questions**

1) How has WFH been for you?
2) As project manager, what were some of the biggest challenges you faced when WFH?
3) How did WFH impact your project management practise?
4) In regards to project management, what were some of the main differences of WFH in comparison to working from your usual workspace?
5) How did you manage to adapt to WFH?
6) What were some of the main lessons learned from WFH?
7) Did your experience with WFH help you improve as a project manager?

# References


1. ABUALQUMBOZ, M., 2021. Project-based work in times of COVID-19: A dynamic framework for knowledge exchange. Knowledge and Process Management, 29(2), 194-202
2. AL-OMOUSH, K., V. SIMÓN-MOYA and J. SENDRA-GARCÍA, 2020. The impact of social capital and collaborative knowledge creation on e-business proactiveness and organizational agility in responding to the COVID-19 crisis. Journal of Innovation & Knowledge, 5(4), 279-288
3. AVERY, C. and D. ZABEL, 2001. The flexible workplace. Westport, Conn.: Quorum Books
4. AXELOS, 2017. *MANAGING SUCCESSFUL PROJECTS WITH PRINCE2*. 6th ed. London: TSO (The Stationery Office), p.425.
5. BARTIK, A. et al., 2020. How Are Small Businesses Adjusting to COVID-19? Early Evidence From a Survey. SSRN Electronic Journal
6. BARTSCH, S. et al., 2020. Leadership matters in crisis-induced digital transformation: how to lead service employees effectively during the COVID-19 pandemic. Journal of Service Management, 32(1), 71-85
7. BÉLANGER, F., 1999. Workers' propensity to telecommute: An empirical study. Information & Management, 35(3), 139-153
8. BELZUNEGUI-ERASO, A. and A. ERRO-GARCÉS, 2020. Teleworking in the Context of the Covid-19 Crisis. Sustainability, 12(9), 3662
9. BICK, A., A. BLANDIN and K. MERTENS, 2021. Work from Home Before and After the COVID-19 Outbreak. SSRN Electronic Journal
10. BLOOM, N. et al., 2014. Does Working from Home Work? Evidence from a Chinese Experiment*. The Quarterly Journal of Economics, 130(1), 165-218
11. Bloom, N., Mizen, P. and Taneja, S., 2021. *Working from home is revolutionising the UK labour market*. [online] CEPR. Available at: <https://cepr.org/voxeu/columns/working-home-revolutionising-uk-labour-market>
12. BLOUNT, Y., 2015. Pondering the Fault Lines of Anywhere Working (Telework, Telecommuting): A Literature Review. Foundations and Trends® in Information Systems, 1(3), 163-276
13. BOELL, S., D. CECEZ-KECMANOVIC and J. CAMPBELL, 2016. Telework paradoxes and practices: the importance of the nature of work. New Technology, Work and Employment, 31(2), 114-131
14. BOLISANI, E. et al., 2020. Working from home during COVID-19 pandemic: lessons learned and issues. Management & Marketing. Challenges for the Knowledge Society, 15(s1), 458-476

15. BUSHUYEV, S., D. BUSHUIEV and V. BUSHUIEVA, 2020. PROJECT MANAGEMENT DURING INFODEMIC OF THE COVID-19 PANDEMIC. Innovative Technologies and Scientific Solutions for Industries, 0(2 (12), 13-21
16. BUTT S.A., et al., 2021. Agile Project Development Issues During COVID-19. In: Przybyłek A., Miler J., Poth A., Riel A. (eds) Lean and Agile Software Development. LASD 2021. Lecture Notes in Business Information Processing, vol 408. Springer, Cham.
17. BYRNES, K. et al., 2020. Communication, collaboration and contagion: "Virtualisation" of anatomy during COVID -19. Clinical Anatomy, 34(1), 82-89
18. CENTRE FOR ECONOMIC PERFORMANCE, 2021. The business response to Covid-19 one year on: findings from the second wave of the CEP-CBI survey on technology adoption
19. CIPD, 2012. Flexible working provision and uptake, CIPD: London. Chartered Institute of Personnel and Development [viewed 20 June 2022]. Available from: http://www.ask4flex.org/UK-_Flexible_Working_Survey_Report--CIPD.pdf
20. COATE, P., 2021. Remote Work Before, During, and After the Pandemic. Quarterly Economics Briefing–Q4, 2021
21. Cramton, C. and Webber, S., 2005. Relationships among geographic dispersion, team processes, and effectiveness in software development work teams. *Journal of Business Research*, 58(6), pp.758-765.
22. DZIEWIT, M., (2021). Research Proposal - Adapting to Working from home as a Software Business Project Manager during the COVID-19 pandemic
23. FELSTEAD, A. and D. REUSCHKE, 2020. Homeworking in the UK: Before and During the 2020 Lockdown. Wales Institute of Social and Economic Research and Data [viewed 10 August 2022]. Available from: https://wiserd.ac.uk/publication/homeworking-in-the-uk-before-and-during-the-2020-lockdown/
24. GAJENDRAN, R. and D. HARRISON, 2007. The good, the bad, and the unknown about telecommuting: Meta-analysis of psychological mediators and individual consequences. Journal of Applied Psychology, 92(6), 1524-1541
25. Garner, C., Forbes, P., Sheldon, H., Shoesmith, D. and Ternouth, P., 2016. Working Anywhere A Winning Formula for Good Work?. *The work Foundation (Lancaster University)*
26. GARIETY, B. and S. SHAFFER, 2007. Wage differentals associated with working at home. Monthly labor review / U.S. Department of Labor, Bureau of Labor Statistics, 130(3), 61-67
27. GARTNER., 2022. Employees Likely to Work Remotely Post COVID-19 | Gartner [viewed 15 August 2022]. Available from: https://www.gartner.com/en/newsroom/press-releases/2020-04-14-gartner-hr-survey-reveals-41--of-employees-likely-to-

28. GASCOIGNE, C., 2021. Working from home: assessing the research evidence | CIPD [viewed 19 March 2022]. Available from: https://www.cipd.co.uk/knowledge/fundamentals/relations/flexible-working/working-from-home-evidence-after-lockdown
29. GOLDEN, T., 2011. Altering the Effects of Work and Family Conflict on Exhaustion: Telework During Traditional and Nontraditional Work Hours. Journal of Business and Psychology, 27(3), 255-269
30. GWA., 2022. Work-at-Home After Covid-19 - Our Forecast - Global Workplace Analytics [viewed 2 July 2022]. Available from: https://globalworkplaceanalytics.com/work-at-home-after-covid-19-our-forecast
31. HAFED, A., 2020. Positive Impact of the COVID-19 Crisis on Project Management [viewed 20 June 2022]. Available from: https://www.pmi.org/chapters/luxembourg/stay-current/newsletter/positive-impact-of-the-covid-19-crisis--on-project-management
32. HBR., 2022. Remote Managers Are Having Trust Issues [viewed 16 May 2022]. Available from: https://hbr.org/2020/07/remote-managers-are-having-trust-issues
33. Hertel, G., Geister, S. and Konradt, U., 2005. Managing virtual teams: A review of current empirical research. *Human Resource Management Review*, 15(1), pp.69-95.
34. HILL, C. et al., 2005. Consensual qualitative research: An update. Journal of Counseling Psychology, 52(2), 196-205
35. HOVE, S. and B. ANDA, 2005. Experiences from Conducting Semi-structured Interviews in Empirical Software Engineering Research. 11th IEEE International Software Metrics Symposium (METRICS'05), 2005, Como, Italy. IEEEa
36. IPSEN, C. et al., 2021. Six Key Advantages and Disadvantages of Working from Home in Europe during COVID-19. International Journal of Environmental Research and Public Health, 18(4), 1826
37. JACKSON, D., V. YOUNG and A. SANDER, 2020. Information and Communication Technologies and Work-Life Balance: Practical Recommendations for Employers and Individuals. Interpersonal Relationships
38. JARVENPAA, S. and K. LANG, 2005. Managing the Paradoxes of Mobile Technology. Information Systems Management, 22(4), 7-23
39. JARVENPAA, S., K. KNOLL and D. LEIDNER, 1998. Is Anybody out There? Antecedents of Trust in Global Virtual Teams. Journal of Management Information Systems, 14(4), 29-64
40. JLL, 2020. Home and away: The new workplace hybrid?. JLL [viewed 18 June 2022]. Available from: https://www.jll.com.hk/content/dam/jll-com/documents/pdf/research/apac/ap/jll-research-home-and-away-jul-2020-latest.pdf

41. JONES, C. 2004. Software Project Management Practices: Failure Versus Success, CrossTalk: The Journal of Defense Software Engineering, October, 5–9.
42. KINMAN, G. et al., 2020. Working From Home: Healthy Sustainable Working During the Covid-19 Pandemic and Beyond. British Psychological Society
43. LAKENS, D. 2021. “Sample Size Justification.” PsyArXiv. January 4. doi:10.31234/osf.io/9d3yf.
44. Lee-Kelley, L. and Sankey, T., 2008. Global virtual teams for value creation and project success: A case study. *International Journal of Project Management*, 26(1), pp.51-62.
45. LIJDING, E. and D. HOUSEMAN, 2021. COVID-19: The new reality for project and program management [viewed 16 April 2021]. Available from: https://home.kpmg/au/en/home/insights/2020/05/coronavirus-covid-19-project-program-management-new-reality.html
46. LIPPE, T. and Z. LIPPÉNYI, 2019. Co-workers working from home and individual and team performance. New Technology, Work and Employment, 35(1), 60-79
47. MARTÍNEZ-SÁNCHEZ, A. et al., 2006. Teleworking and new product development. European Journal of Innovation Management, 9(2), 202-214
48. MAS, A. and A. PALLAIS, 2016. Valuing Alternative Work Arrangements. SSRN Electronic Journal
49. Mateyka, P., Rapino, M. and Landivar, L., 2012. Home-Based Workers in the United States: 2010. Current Population Reports . U.S. *Census Bureau*, pp.P70-132.
50. Montoya, M., Massey, A., Hung, Y. and Crisp, C., 2009. Can You Hear Me Now? Communication in Virtual Product Development Teams. *Journal of Product Innovation Management*, 26(2), pp.139-155.
51. MOORE, T. and E. LINDING, 2020. COVID-19: The new reality for project and program management Addressing the new reality of project and program delivery in Australia, post COVID-19 [viewed 23 June 2022]. Available from: https://home.kpmg/au/en/home/insights/2020/05/coronavirus-covid-19-project-program-management-new-reality.html
52. MORTON, M., 1991. The corporation of the 1990s: Information technology and organizational transformation. Futures, 25(7), 821-823
53. MÜLLER, R. and G. KLEIN, 2020. The COVID-19 Pandemic and Project Management Research. Project Management Journal, 51(6), 579-581
54. NAKROŠIENĖ, A., I. BUČIŪNIENĖ and B. GOŠTAUTAITĖ, 2019. Working from home: characteristics and outcomes of telework. International Journal of Manpower, 40(1), 87-101
55. NAPIER, N., M. KEIL and F. TAN, 2009. IT project managers' construction of successful project management practice: a repertory grid investigation. Information Systems Journal, 19(3), 255-282

56. OETTINGER, G., 2011. The Incidence and Wage Consequences of Home-Based Work in the United States, 1980-2000. Journal of Human Resources, 46(2), 237-260
57. OFFICE FOR NATIONAL STATISTICS, 2020. Coronavirus and homeworking in the UK labour market. Office for National Statistics [viewed 7 June 2022]. Available from: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/coronavirusandhomeworkingintheuklabourmarket/2019
58. OFFICE FOR NATIONAL STATISTICS, 2022. Business and individual attitudes towards the future of homeworking, UK - Office for National Statistics. Office for National Statistics [viewed 18 July 2022]. Available from: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/businessandindividualattitudestowardsthefutureofhomeworkinguk/apriltomay2021
59. ONS, 2021. Coronavirus and homeworking in the UK - Office for National Statistics [viewed 13 April 2021]. Available from: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/coronavirusandhomeworkingintheuk/april2020
60. ORR, A. and T. SAVAGE, 2021. Expanding Access to and Ensuring Equity in the Benefits of Remote Work Following the COVID-19 Pandemic. Journal of Science Policy & Governance, 18(04)
61. PAPAGIANNIDIS, S., J. HARRIS and D. MORTON, 2020. WHO led the digital transformation of your company? A reflection of IT related challenges during the pandemic. International Journal of Information Management, 55, 102166
62. PILARTA, R. and M. NOROÑA, 2021. Perceived Effectiveness of Work from Home (WFH) Employees: A Basis for Enhancing Employee Engagement. IEOM Society International, 2021, Rome, Italy
63. PMI., 2022. the Impact of the COVID-19 Crisis on Project Business: Cooperative Survey of Project Management Institute (PMI®) and the Project Business Foundation
64. PWC, 2021. Supporting you with Project Management (PMO) and governance during COVID-19 [viewed 11 April 2021]. Available from: https://www.pwc.co.uk/services/operate/project-management-and-governance-COVID19.html
65. Rad, P. and Levin, G., 2003. *Achieving Project Management Success Using Virtual Teams*. Boca Raton: J. Ross Publishing, Incorporated.
66. RADA Buisness, 2021. *The new art of business*. [online] RADA. Available at: <https://www.radabusiness.com/documents/461/The_new_art_of_business.pdf>
67. RALPH, P. et al., 2020. Pandemic programming. Empirical Software Engineering, 25(6), 4927-4961

68. RUPIETTA, K., et al., 2016. "Working from Home - What is the Effect on Employees' Effort?," Working papers 2016/07, Faculty of Business and Economics - University of Basel.
69. RUSSO, D. et al., 2021. Predictors of well-being and productivity among software professionals during the COVID-19 pandemic – a longitudinal study. Empirical Software Engineering, 26(4)
70. SAUNDERS, M. et al., 2009. Understanding research philosophies and approaches. In: Research Methods for Business Students (5th Eds.). London: Pitman
71. SHAMIM, M., 2022. The Effects of COVID-19 on Project Management Processes and Practices. Central Asian Journal of Theoretical and Applied Sciences, 03(07)
72. SHORTEN, A. and J. SMITH, 2017. Mixed methods research: expanding the evidence base. Evidence Based Nursing, 20(3), 74-75
73. SMITE, D. et al., 2022. Changes in perceived productivity of software engineers during COVID-19 pandemic: The voice of evidence. Journal of Systems and Software, 186, 111197
74. SONJIT, P., N. DACRE and D. BAXTER, 2021. Homeworking Project Management & Agility as the New Normal in a COVID-19 World. SSRN Electronic Journal
75. STOKER, J., H. GARRETSEN and J. LAMMERS, 2021. Leading and Working From Home in Times of COVID-19: On the Perceived Changes in Leadership Behaviors. Journal of Leadership & Organizational Studies, 29(2), 208-218
76. SULLIVAN, C., 2003. What's in a name? Definitions and conceptualisations of teleworking and homeworking. New Technology, Work and Employment, 18(3), 158-165
77. Taylor, P., Howcroft,, D. and Scholarios, D., 2021. Covid-19 and Working from Home Survey : Preliminary Findings. [online] Available at: <https://strathprints.strath.ac.uk/75945/>
78. TERESO, A. et al., 2018. Project Management Practices in Private Organizations. Project Management Journal, 50(1), 6-22
79. THORSTENSSON, E., (2020). The Influence of Working from Home on Employees' Productivity: Comparative document analysis between the years 2000 and 2019-2020
80. TIETZE, S., G. MUSSON and T. SCURRY, 2009. Homebased work: a review of research into themes, directions and implications. Personnel Review, 38(6), 585-604
81. UDO, N. and S. KOPPENSTEINER, 2004. What are the core competencies of a successful project manager?. PMI® Global Congress 2004—EMEA, 2004, Prague, Czech Republic. PMI® Global
82. UNITED STATES CENSUS BUREAU, 2012. Home-Based Workers in the United States: 2010

83. VYAS, L. and N. BUTAKHIEO, 2020. The impact of working from home during COVID-19 on work and life domains: an exploratory study on Hong Kong. Policy Design and Practice, 4(1), 59-76
84. WAIZENEGGER, L. et al., 2020. An affordance perspective of team collaboration and enforced working from home during COVID-19. European Journal of Information Systems, 29(4), 429-442
85. WATERIDGE, J., 1997. Training for IS/IT project managers: A way forward. International Journal of Project Management, 15(5), 283-288
86. WHEATLEY, D., 2016. Employee satisfaction and use of flexible working arrangements. Work, Employment and Society, 31(4), 567-585
87. Work Foundation., 2016. Work Foundation [viewed 4 May 2022]. Available from:http://www.theworkfoundation.com/wpcontent/uploads/2016/02/398_Working-Anywhere.pdf
88. WORLEY, C. and C. JULES, 2020. COVID-19's Uncomfortable Revelations About Agile and Sustainable Organizations in a VUCA World. The Journal of Applied Behavioral Science, 56(3), 279-283
89. YORDANOVA, G., 2015. Global digital workplace as an opportunity for Bulgarian women to [viewed 17 March 2022]. Available from: https://www.eurofound.europa.eu/data/platform-economy/records/global-digital-workplace-as-an-opportunity-for-bulgarian-women-to-achieve-work-family-balance