Sorry you're on mute: Towards determining the factors that impact the productivity and job motivation of remote workers and a conceptual framework

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The Covid-19 pandemic caused major work disruptions and made remote working the only prevailing work arrangement for knowledge workers and organizations across the globe. The primary objective of this study is to identify the key drivers that impact the self-reported productivity and job motivation of remote working employees. The secondary objective is to identify the underlying factors that remote working employees perceive as important to increase the success of remote work. We adopt a mixed-methods approach through quantitative and qualitative research methods. Through the analysis of a self-administered questionnaire from 142 participants, we identified factors that impact the productivity and job motivation of remote workers and used these insights to create a conceptual framework. We then conducted Exploratory Factor Analysis (EFA) to discover the factor structure of the large set of variables in our study. Based on our findings, an interactive application with three features was proposed. To validate the features and to gather feedback about the usability, we conducted focus group interviews using storyboards in phase two of the study. This paper helps in understanding the five factors that remote working employees perceive important to increase the success of remote working teams. Researchers predict that the post-pandemic work will be a hybrid mix of traditional in-office and remote work where the latter will be more prevalent. Consequently, the findings and factors determined in this research contribute to the knowledge of remote work and can benefit the HCI community for designing usable, meaningful products and services for remote and hybrid teams.

1 Introduction

Remote work is defined as an alternative work arrangement in which employees perform work-related tasks away from a central, conventional place of work for at least some portion of their work schedule and communicate with peers through computer-based technology [1]. Experimentation of remote work programs began in the 1970s. Companies like JCPenney, IBM, American Express, General Electric, and Sears Holdings implemented such programs throughout this decade, many of which are still in place today [2, 3, 4]. Based on a special report of the U.S. Census and Bureau of Labour Statistics data by Global Workplace Analytics, the U.S. saw a 159% increase in the number of remote workers from 2005 to 2017 [5]. Currently, 4.7 million people in the U.S. work remotely, up from 3.9 million in 2015. Multiple

previous studies on remote work have focussed on the precondition that remote workers were voluntarily working from home to serve various purposes. For example, reducing the commute time between home and office [8], taking care of household responsibilities [9], and avoiding distractions at the office [10].

In March 2020, the World Health Organization (WHO) announced Covid-19 as a pandemic after assessing the rapid spread of the deadly virus and its severity across the globe [14, 15]. The Covid-19 pandemic caused unprecedented challenges to public health systems and global economies [16] as governments all over the globe had to implement strict lockdown measures (governments forcing people to stay home) and social distancing (people staying at a certain distance from each other) on many aspects of society, in particular, on the mobility of citizens [17]. These measures caused major work disruptions and many companies had to transition all employees into full-time remote work within days. It was the first time in modern history that knowledge workers around the world were forced to work from home (WFH) every day on such a large scale and deal with many new challenges they may not have been prepared for.

During Covid-19, entire teams were working remotely, and social isolation impacted individuals' personal lives by restricting services such as childcare, school, domestic help, and cleaning services. Knowledge workers were unexpectedly required to use technologies in new ways to perform their work, engage and interact with coworkers, combined with the additional pressure of working from the home environment that may not be ideal for work purposes. The existing remote work literature thus cannot provide a thorough explanation of the special context presented by the pandemic as many workers started working from home by a mandate with no advance warning. In this paper, we present a study of individuals who had to work remotely, willingly or unwillingly, due to the Covid-19 enforced restrictions in India. The objectives of this research paper are two-fold. The first objective is to identify the key drivers that impact the self-reported productivity and job motivation of remote working employees. The second objective is to identify the underlying factors that remote working employees perceive as important to increase the success of remote work. The target group is primarily knowledge workers i.e., employees of both public and private organizations, who were mandatorily required to WFH during the Covid-19 lockdown in India.

2 Related work

Extensive research has focused on comparing remote teams with co-located teams and multiple studies have investigated individual and organizational outcomes caused due to remote work.

2.1 Individual Outcomes

The effects produced by remote work on employees are referred to as individual outcomes and include performance, job satisfaction, and work-life balance. Remote work has been linked to several aspects of importance to the employee's essence, such as their job performance. Despite the booming hype of remote work arrangements, its implication for remote worker's job performance has been a topic of debate as researchers have found both positive [21, 22, 23, 26, 27] and negative effects on performance [1, 24, 25]. Job satisfaction can be defined as the way an employee feels about their job and is a determination of whether they like it or not [28, 29]. Empirical research has consistently demonstrated that perceived autonomy caused by remote work has beneficial effects on job satisfaction [30]. Several studies have found that job satisfaction is highest among remote working employees who have a moderate frequency of remote work as compared to those with either a lower or higher frequency [31, 32, 33]. Effects of remote work on work-life balance and work-family conflict have been a subject of much scholarly debate. Some studies have found remote work to be beneficial and that it leads to greater integration between the work and family roles [34, 35, 20], while few others argue that it may intensify conflict by blurring the boundaries between work and family [36, 37]. Very few studies have resolved this debate or been conclusive [34, 35, 56]. Work-family conflict often results in disengagement from the workplace, work being more difficult, and increasing the likelihood of time-based conflict [38]. During the pandemic-enforced WFH, studies have reported similar results [7,39]. Employees who WFH during the COVID-19 pandemic suffered from contamination between private life and work, increased work-life conflicts, which gave rise to greater work-related fatigue, and worsened work-life balance [7, 39, 40].

2.2 Organizational Outcomes

Remote work outcomes that might affect organizational work have been investigated by researchers. They have addressed a number of themes, viz. productivity, employee engagement, and workplace relationships. Improved productivity is the most widely touted benefit of remote work [41, 42]. A plausible explanation for this proposed advantage could be greater flexibility [43], autonomy to optimize the work routines in ways to better fit the individual's work style and productivity rhythms [35, 44], fewer disruptions while working [1], and increased work hours due to the time saved from not commuting to work [45]. But researchers argue that this might not be applicable to the Covid-19 context since most people were socially isolated (e.g., living alone) during the lockdown restrictions [64] with no opportunities to travel to the office and limited opportunities to form social connections with their coworkers. Needless to say, homes lacked designated workstations or office spaces, and countless individuals had to create makeshift work setups in living rooms, bedrooms, kitchens - wherever there was free space. Moreover, the closure of schools and restrictions on domestic help gave rise to a new challenge for many of those with children or elders at home. People had to juggle homeschooling and caretaking in addition to office work [65]. Numerous employees have experienced lessened productivity and motivation, increased stress, increase in work hours, and mental distress [6, 7, 46, 47, 48, 49, 66, 67, 68]. Not to mention that traditional remote work never considered many experiencing trauma while working [69].

Researchers have found that remote work damages both horizontal relationships, i.e., between remote working employees and their office-based coworkers, as well as vertical relationships, i.e., between these two groups and their managers [31, 50, 51, 57, 58]. Moreover, meta-analyses suggest that relationship quality with supervisors and coworkers can impact job satisfaction, performance, stress, career prospects, and turnover intent [52, 53, 54, 55]. Using a different lens, Gajendran and Harrison (2007) report that remote work has no damaging effects on the quality of workplace relationships and found a positive effect of remote work on the employee–supervisor relationship but no influence was seen on the employee–coworker relationship. Associations have been found between employee engagement and job satisfaction [59]. While job satisfaction basically means the way that an employee feels about their job and if they like it or not [28, 29], employee engagement is defined as the employee's passion for their job, their commitment to the organization, connection to their co-workers, and the desire to put in willful work to meet the organization's mission and goals [60, 62, 63].

In India, WFH has been clearly favored by IT sector employees as they have been successfully able to balance out the positive and negative impacts of telecommuting [94]. WFH has been referred to as a green concept since it leads to lower pollution and a cleaner environment because of lower traveling frequency. A research work by Dubey and Tripathi that analyzed sentiments and emotions of people towards WFH revealed that 73% people had a positive sentiment towards WFH while 27% people had a negative perception towards WFH. 60% people tweeted with emotions of trust, joy, and anticipation for WFH culture while some with fear, anger, or disgust; signifying that people had a positive outlook towards WFH. Multiple studies give insights about the benefits and challenges of working remotely, but these studies primarily compare the work-related outcomes of remote employees with in-office or traditionally working employees. While there has been much research on employees across a single large company [23, 67, 70], on specific teams [49, 71], professions or working sectors [7], however, research considering a comprehensive population is scarce. Existing research does not fully capture the experiences of knowledge workers across an all-encompassing sample that had to switch from a conventional work setting mode to remote WFH almost overnight. Previous work presents shortcomings such as short experimental time-span, focus on a single organization or profession, lack of both qualitative and quantitative analysis, or absence of a user-centered approach; while paving the way for further research in the field of enterprise remote work. Since WFH during a pandemic is not the same as WFH during "normal times", it is an opportunity to study the factors affecting productivity and job motivation in a "natural experiment". Only a handful of works [72, 73] have studied the impact of remote work in the Indian context, but even so, studies during the pandemic are missing.

The following research questions inspired the development of this study:

RQ1. What are the key drivers that impact the self-reported productivity and job motivation of remote working employees?

RQ2. What factors do remote working employees perceive as important to increase the success of remote work?

From the above research questions, we framed the following hypotheses. H1) There is no significant association between the self-reported productivity and job motivation of remote working employees. H2) There is no significant association between the self-reported productivity of remote working employees and having access to tools, resources & documents needed to get the work done. H3) There is no significant association between the self-reported productivity and being informed about the new developments and initiatives at the organization. H4) There is no significant association between the self-reported productivity and the amount of communication from their manager. H5) There is no significant association between the self-reported productivity and perceived social connectedness of remote working employees. H6) There is no significant association between the self-reported productivity and receiving benefits from the organization for remote work. H7) There is no significant association between the self-reported productivity and connecting for non-work-related matters. H8) There is no significant association between the job motivation of remote working employees and having access to tools, resources & documents needed to get the work done. H9) There is no significant association between the job motivation of remote working employees and being informed about the new developments and initiatives at their organization. H10) There is no significant association between the job motivation of remote working employees and the amount of communication from their manager. H11) There is no significant association between the job motivation of remote working employees and the perceived social connectedness. H12) There is no significant association between the job motivation of remote working employees and gender.

3 Methodology

An iterative, human-centered design process was followed and the research was conducted in two phases, using quantitative and qualitative research approaches (Figure 1).
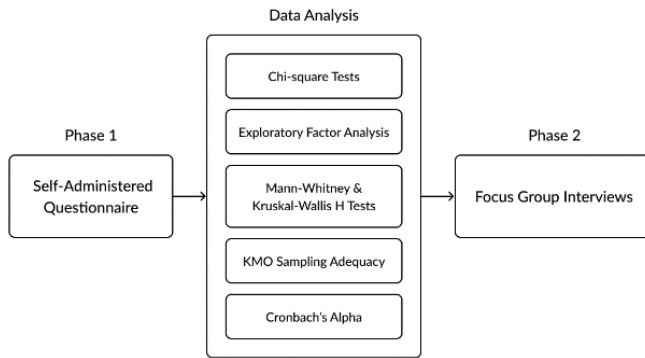

Figure 1: Methodology adopted in this study

3.1 Phase 1: Self-Administered Questionnaire

Data was collected through an online survey consisting of 34 questions ranging from demographics to specific questions quantifying productivity and job motivation on a 5-point Likert scale. Before restructuring the questions for the self-administered questionnaire, a preliminary study was performed. Participants were selected based on their involvement in remote work before or during the Covid-19 enforced WFH restrictions and were recruited via snowball sampling. All participants in this study were employed full-time or part-time at an organization. A total of 142 responses were received. The participants were within the age group of 21 to 50, out of which 73 were female and 69 were male.

A reliability test was conducted to check the internal consistency by computing Cronbach's alpha value, which was found to be 0.6, suggesting that the data is acceptable [74]. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was found to be 0.874, which is above the commonly recommended value of 0.5 whereas the significance level was less than 0.05 indicating that the sample size is suitable for factor analysis. In order to reduce the data to a

smaller set of summary variables, while retaining as much variance as possible present in the data set and to uncover the underlying structure of the relatively interrelated large set of variables in our study, we conducted the Exploratory Factor Analysis (EFA) using the IBM SPSS software version 25.

3.2 Phase 2: Focus Group

Based on the findings from phase 1, we proposed an interactive application with three features each aiming to increase team engagement, physical and mental wellbeing, and knowledge sharing respectively. The objective of this phase was to validate the features & collect feedback about the usability aspects and value of the features from the target user group, rather than about the appearance and functional aspects of them. Many UX researchers argue that good user experience (UX) often comes from the value & meaning of the product concept whereas the user interface (UI) only provides the means to interact with the product [75, 76, 77]. On similar lines, storyboards are a valuable aid to designers in this task by providing a common visual language that people from different backgrounds can 'read' and understand [78]. The storyboarding technique is an iterative, user-centered design methodology that uses a series of sketches to illustrate an envisioned scenario of how an application feature works and helps to obtain feedback early in the design process [79, 80].

On this account, we converted the proposed features into user scenarios and storyboards (Figure 2, Figure 3, Figure 4). They represented the use cases of our concepts and each consisted of a few frames with simple illustrations and supportive text to explain the context. Focus group interviews were conducted with 10 participants in two sessions with each 4 and 6 participants respectively. Participants were selected based on their involvement in remote work during the pandemic through convenience sampling. Focus group techniques are primarily used for exploratory research as they assist in identifying relevant concepts of research, which can be either characteristic of a product or a service, and in the identification and testing of new research ideas [81]. The ideal size of a focus group is usually between 5 to 10 participants [81].

Figure 2: Storyboard for concept 1: Social Activity Feed for 'water-cooler' conversations, discussions and feedback, recognition and rewards - all streamlined in one place
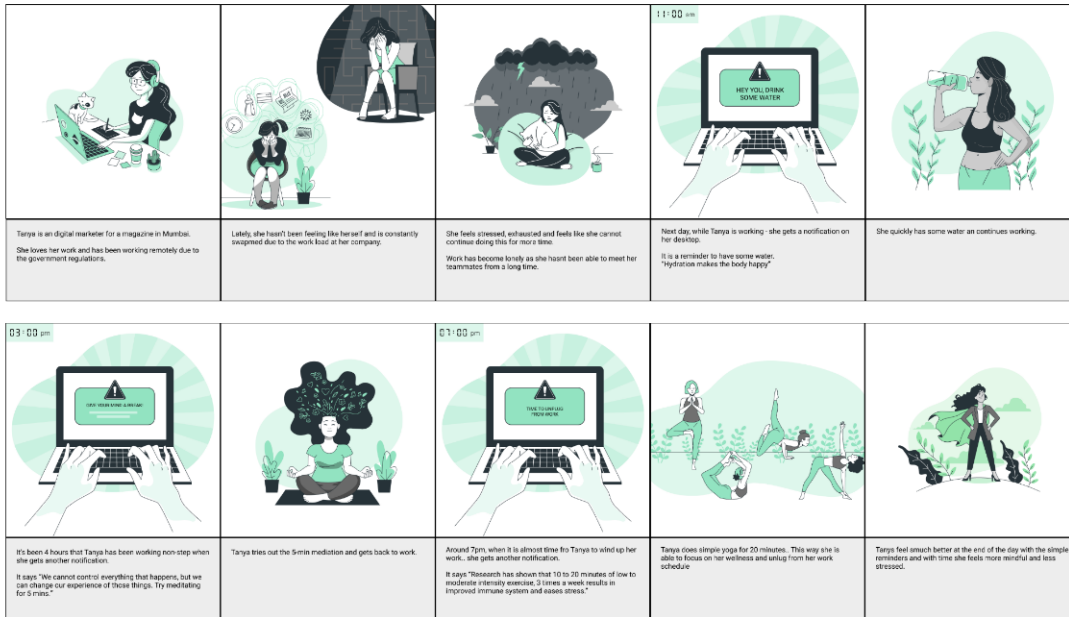
Figure 3: Storyboard for concept 2: 'Guided micro-breaks, science-based exercises' that blend into the workday through reminders to help build better work habits, improve mental health, relieve stress, and increase productivity
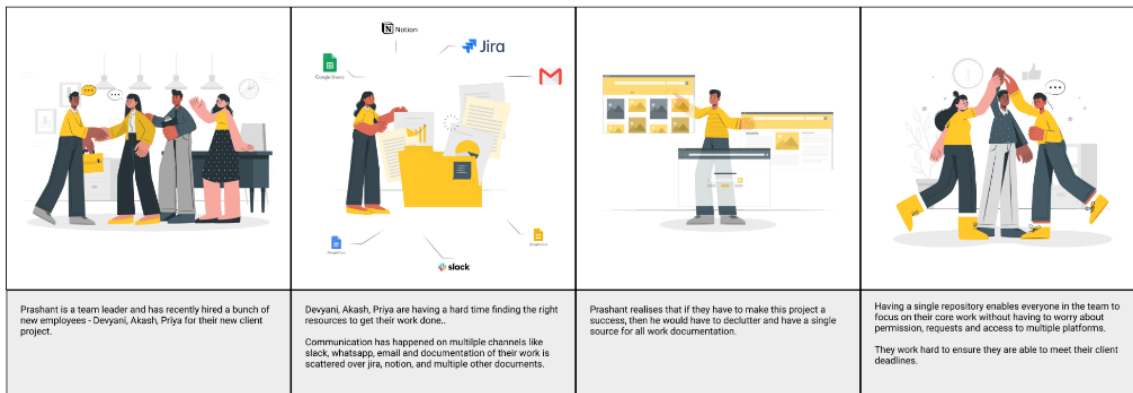

Figure 4: Storyboard for concept 3: A knowledge base for important internal company resources, documentation, and policies. Notice board for official company announcements to bring together relevant news and updates

4 Results

In this section, we present the results of both phases of our research study.

4.1 Phase 1: Self-Administered Questionnaire

Table 1 reports the main socio-demographic attributes of participants. Average age of the participants was 28.6 years. Out of the 142 participants, 51.4% were female, 48.6% were male. More than half of the participants (54.8%) had never worked remotely before the pandemic, while 5.2% had been working remotely full-time from before the pandemic. Others had worked remotely at least once due to reasons like attending to personal chores (26.2%), being sick or physically ill (21.7%), avoiding commute and saving time (19.4%) or due to home and family responsibilities (15.8%). Figure 5 and figure 6 summarize the primary benefits of remote work as reported by participants. It is worth noting that remote work setting had been a good fit for 37.8% participants while 54.2% participants had mixed experiences while working from home. For others, remote work had not been a good fit. However, participants missed their office for reasons such as ease of talking to coworkers (70.8%), clear separation between 'home' and 'work' (64.6%), face-to-face meetings (59.2%), office banter with coworkers and team mates (53.1%), and seeing everyone around work, which boosted motivation (53.1%). Most of the participants had a suitable workspace at home (77.4%) and had established a good work routine (61.9%). While 66.2% participants reported that they had been working longer hours than when working in the office, the other 33.8% felt that their working hours had remained the same or reduced while working remotely during the pandemic. 65.5% participants disagree or remain undecided that remote work has impacted the relationship with their manager. The other 34.5% participants agree that this relationship has been impacted by remote work and that maintaining it has been harder. 50.7% participants agree that remote work has impacted the relationship with their peers and made connecting with them more difficult.

Many participants reported having received additional benefits or perks from their organization during the lockdown-enforced remote work situation such as home broadband connection costs (54.3%), reimbursement for WFH setup or upgrading home office (35.6%), learning and development opportunities, or online training course reimbursement (22.1%), and extra vacation days or holiday allowance (17%). 35.9% participants did not connect with their team for non-work-related matters. 61.9% participants looked forward to returning to the office, whereas 28.1% participants did not look forward and 9.1% participants were unsure. However, if remote work was an option after the Covid-19 pandemic for the participants at their organization, 72.3% participants said that they would choose a balance between office and remote work. 14.1% participants said that they would prefer to work from the office and 13.6% participants would prefer a completely remote work option.

Table 1: Basic socio-demographic information of participants

Characteristics	Definition	N	%
Age	21-30	107	75.3
	31-40	24	16.9
	41-50	11	7.8
Gender	Female	73	51.4
	Male	69	48.6
Employment status	Employed full-time	125	88.1
	Employed part-time	17	11.9
Industry	IT and services	80	56.3
	Financial services	14	9.8
	Education	10	7.2
	Consumer products	9	6.3
	Other	29	20.4
Organization	MNC / large enterprise	87	61.2
	Medium enterprise	22	15.5
	Startup	22	15.5
	Other	11	7.8
Job role	Engineering	45	31.6

Characteristics	Definition	N	%
	Design	24	16.9
	Operations	18	12.6
	Research and development	16	11.2
	Other	39	27.4

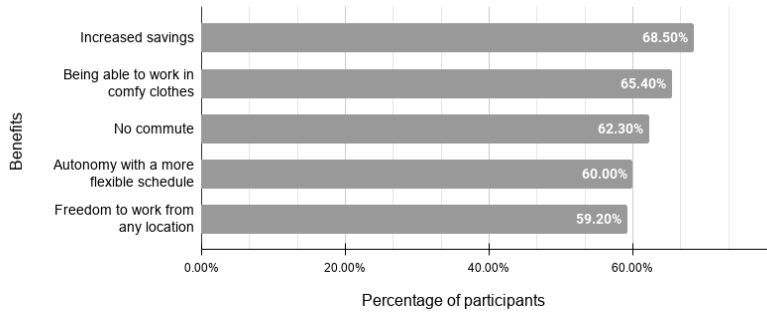**Benefits of Remote Working**

Figure 5: Benefits of Remote work
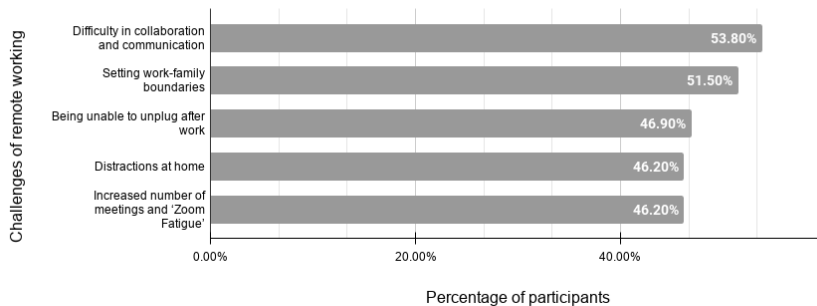
Challenges of Remote Working

Figure 6: Challenges of Remote work

Statistical analysis methods were used for testing each of the hypotheses with a significance level set at $p < 0.05$. Based on our analysis from Chi-square tests, we found the self-reported productivity to be significantly associated with job motivation, access to resources needed to get work done, the amount of communication from the manager, and benefits received from organization. With the above result, we can accept the null hypothesis for H3, H5, and H7; and reject the null hypothesis for H1, H2, H4, and H6. Job motivation was also found to be significantly associated with the access to resources needed to get work done, being informed on new developments and initiatives, the amount of communication from the manager, perceived social connectedness with the team, and gender. Thus, we can reject the null hypothesis for H8, H9, H10, H11, and H12.

Through the questionnaire, participants were asked about the importance of 20 variables to increase the success of remote work. Each variable was rated by the participants on a Likert scale of 1 to 5, 1 being least important and 5 being most important. For determining the underlying factors that were measured by a (much larger) number of observed variables, we conducted the EFA using SPSS software version 25. A five-factor structure for 18 out of the 20 items was evident, based on a principal component EFA with a varimax rotation. On the basis of the groups formed, each factor has

been labeled (Figure 7) as 'Remote Social Interaction', 'Social Support and Knowledge Sharing', 'Upskilling and Reskilling Opportunities', 'Remote Work Policy', and 'Interaction between Leadership and Employees'. Figure 8 shows the conceptual framework of the study based on the hypotheses.
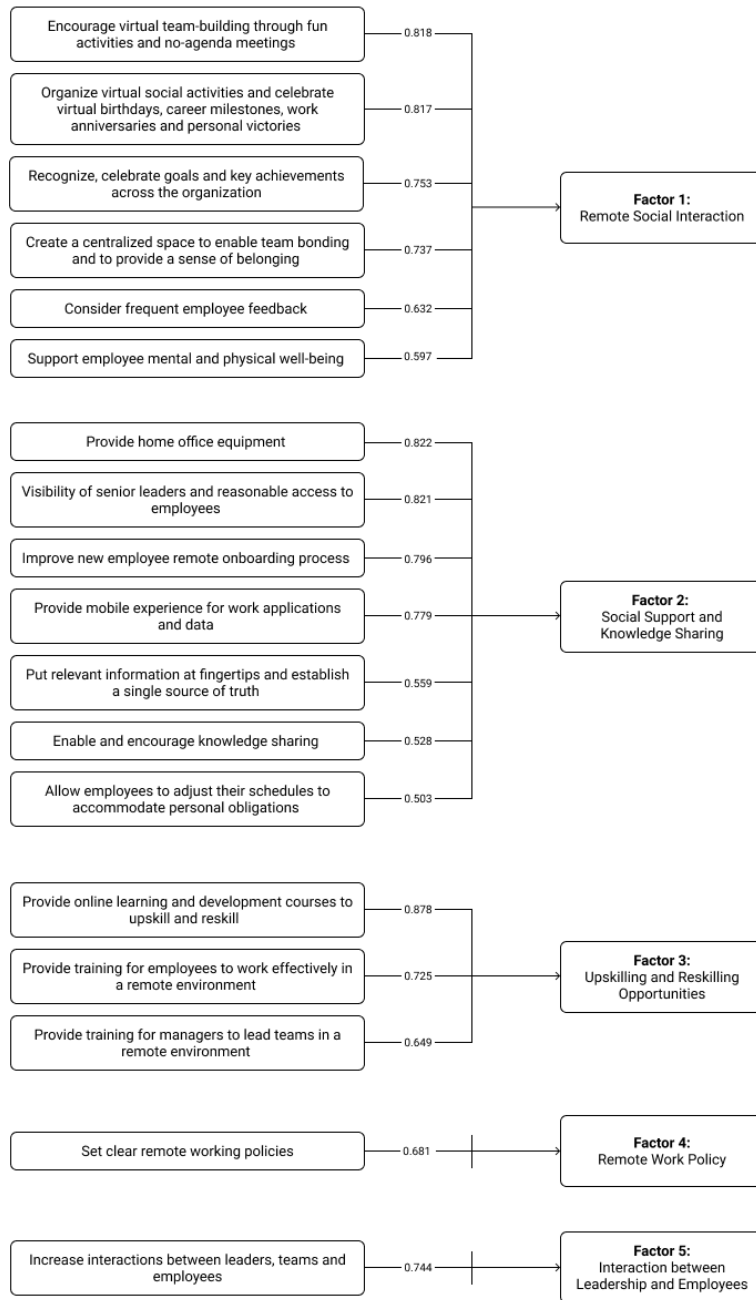

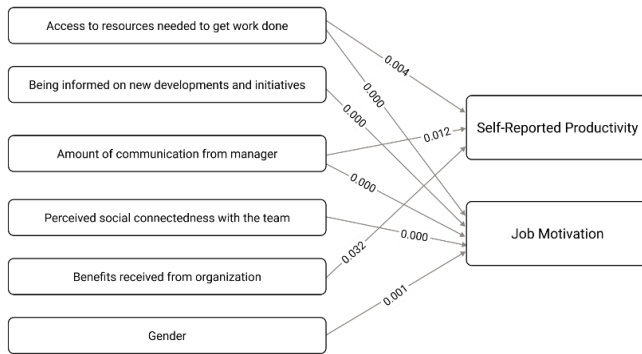**Figure 7:** Results of the Exploratory Factor Analysis of 20 variables

Figure 8: Conceptual Framework

4.2 Phase 2: Focus Group

Focus group interviews were conducted where participants were shown three storyboards. A set of questions were asked to understand the usability aspects and value of the features for the target user group, rather than about the appearance and functional aspects of them. They were encouraged to react to previous answers as well as to add their own. Participants shared their reactions, likes, dislikes, and also mentioned suggestions or concerns. We analyzed participants' reactions to each of the three concepts (Figure 9). Participants reacted positively to the concepts. The 'Social Activity Feed' feature was perceived as greatly useful by 5 out of 10 participants and fairly useful by 2 participants (1 = Not useful, 2 = Fairly useful, 3 = Greatly useful). Participants mentioned that it would be absolutely beneficial to them as it will help to bond with their teammates apart from work. "Fantastic. In the office, bumping into someone in the lift or grabbing lunch together seems unrelated to the company's success, but impromptu moments like these discover common interests, build trust, spark conversations and new ideas."—P3. "I agree with P3's point and also, in big organizations we don't know a lot of coworkers personally. So having interactions with people from different departments makes sense to me."—P4. P5 suggested the use of various badges that people can earn when their coworkers appreciate them or thank them on the feed.

The 'Guided micro-breaks and science-based exercises reminder' feature was perceived as greatly useful by 7 participants and fairly useful by 2 participants. "Ever since the virus has come into picture, health has suddenly become a priority for most of us. So, this feature really sounds very important in the current times where we are working out of our homes but have restrictions on physical movement."—P1. "I know a lot of people who would love this feature. Will people also be able to share their exercise progress through the social activity feed feature or can there be challenges with everyone on the team just for some friendly competition?"—P8. Participants mentioned that this feature would not only be important just in the work-from-home setting, but also when they move back to working from their offices. Participants expressed concerns such as frequency and context of reminders: "Sounds like a cool feature, but will the reminders still show up if I am in a meeting or presenting on my desktop?"—P10, "If I have set a few focus hours for deep thinking work then I would prefer not to be disturbed for those hours"—P2. Participants suggested that they would be more comfortable doing the longer exercises with a virtual workout partner, a pre-recorded video, or an animated character accompanying them through their screens.
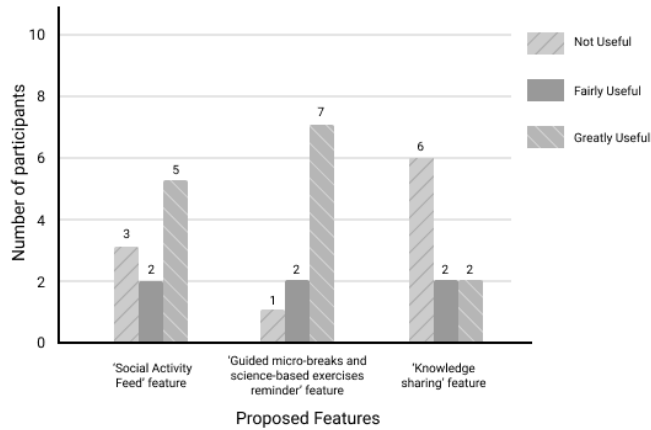
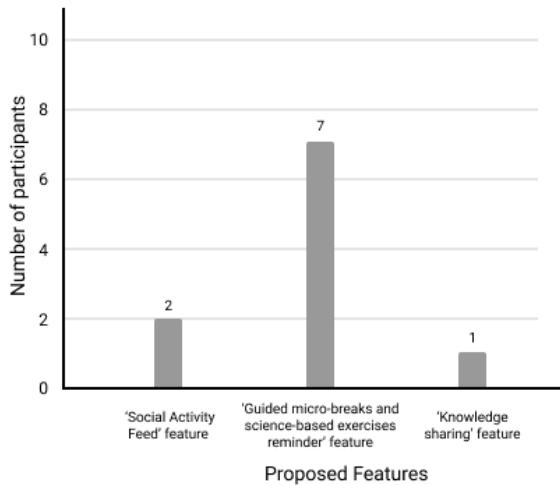**Figure 9: Usability of features as marked by participants**

Figure 10: Features marked as 'Greatly useful' by participants

The 'Knowledge sharing' feature was perceived as fairly useful by 2 participants and not useful by 6 out of 10 participants. "This feature is cool, but doesn't seem very necessary in my opinion."—P9. "I am not sure if I would find this useful or how."—P3. In the end, we asked the participants which of the three features would be the most useful to them. Notably, 7 out of 10 participants voted for the 'Guided micro-breaks and science-based exercises reminder' feature as the most useful to them (Figure 10).

5 Discussion

In this paper, the key drivers that impact the self-reported productivity and job motivation of remote working employees and the underlying factors that remote working employees perceive as important to increase the success of remote work have been found within the Indian population. The data was collected through a self-administered questionnaire in phase

1. This study tries to contribute to the existing literature by identifying the factors that impact the productivity and job motivation of remote working employees who had to switch from a traditional work mode to remote work almost overnight. For remote working employees, the decreased visibility, lack of physical presence, reduction in face-to-face interactions, and lower frequency with a reduced richness of communication has been found to affect both horizontal relationships (employee-employee) and vertical relationships (employee-manager) [31, 50, 51]. In our study, more than half of the participants disagree or remain undecided that remote work has impacted the relationship with their manager. Few others agree that remote work has impacted this relationship and maintaining it has been harder than usual. Similarly, half of the participants agree that remote work has impacted the relationship with their peers and has made connecting with them more difficult.

Previous studies have identified that age, gender, individual beliefs and attitudes, the quality of social interactions with managers and family members, and caring responsibility influences the productivity of remote working employees [20, 87, 88, 89]. Adding to the existing literature, we constructed a conceptual framework with more factors that impact the self-reported productivity of remote working employees such as job motivation, access to resources needed to get work done, the amount of communication from the manager, and benefits received from organization. In the Indian context, such research studies are scarce. With regards to job motivation, a previous study by Maruyama & Tietze (2012) depicted that employees are motivated by the expectation of receiving a reward or benefit, which may be either intrinsic or extrinsic including acknowledgement from the managers, higher salary, or paid time off [90]. This roots back to Herzberg's (1996) hypothesis where he identified extrinsic factors that do not necessarily motivate but cause dissatisfaction if not met such as pay, working conditions and quality of supervision [94]. He also identified intrinsic factors such as achievement, advancement, and recognition that promotes employee motivation, their growth and satisfaction. In our study, we further found job motivation to be significantly associated with the access to resources needed to get work done, being informed on new developments and initiatives, the amount of communication from the manager, perceived social connectedness with the team, and gender. Finally, the results of the EFA method generated five factors namely 'Remote Social Interaction', 'Social Support and Knowledge Sharing', 'Upskilling and Reskilling Opportunities', 'Remote Work Policy', and 'Interaction between Leadership and Employees'. Such FA is unavailable in the existing literature.

In phase 2 of the study, we conducted an exploratory focus group where participants shared feedback about the proposed design concepts from the analysis of responses in phase 1. We converted three features into user storyboards where each storyboard represented different use cases of the concepts. We received positive reactions from the participants to two of the three features. The 'Guided micro-breaks and science-based exercises reminder' feature was perceived as greatly useful by seven out of ten participants. Participants mentioned that this feature is not only useful in the remote work setting, but also when they restart working from their offices. The 'Social Activity Feed' feature was perceived as greatly useful by two out of four participants and fairly useful by the other two participants. Participants mentioned that this feature would be useful to them as it will help them bond with their teammates. The analysis of our focus group discussions using storyboards helped us identify users' expectations, desirability for the concept, perceived utility, and overall impression. It was observed that using such an approach increases participant engagement in qualitative methods and opens up opportunities for conversations that otherwise may be missed in typical interviews or group discussions. Data generated from such creative methods can further be deepened and made richer as meaningful participation is promoted in the research process. A handful of other studies have adopted the approach of using storyboards in focus groups. These studies report advantages such as higher participation that empowers the participants to take more control over the research process [91, 92].

Despite all the hype that remote work has received, the desire to be seen as 'present' for remote working employees, to be contributing and creating value may sometimes take on a very unusual form [19]. They often feel a need to prove their engagement in the workplace despite being geographically distant [11, 12]. This could lead to developing strange behaviors in the process e.g., sending unnecessary emails or messages at the start and end of their day, or the urge to respond to emails as soon as they are received. With no distinct end-point to a workday, some employees fall into a worsening way of working; dipping in and out of work. Remote working employees often take fewer breaks, skip their meals, and work longer hours possibly due to the ambiguous boundaries between work and personal life, and overlapping conflict between the two [13, 61]. Employees' professional development can also suffer due to the lack of

visibility in the team causing remote work to be perceived as a drag on career growth. A 2017 study by TinyPulse revealed that having physical presence at the workplace increases the chances of positive appraisals, promotion, and raises [93]. These factors only further lead to the infuriating need to prove the employee's presence and contribution to the team.

6 Conclusion

The present study was undertaken to identify the key drivers that impacted their self-reported productivity and job motivation and to identify the underlying factors that remote working employees perceive as important to increase the success of remote work. The results of the questionnaire helped in proposing application features and the following five factors were extracted from the EFA: 'Remote Social Interaction', 'Social Support and Knowledge Sharing', 'Upskilling and Reskilling Opportunities', 'Remote Work Policy', and 'Interaction between Leadership and Employees'. We validated three concepts in focus groups through storyboards, from which the 'Guided micro-breaks and science-based exercises reminder' feature was perceived as greatly useful by 7 participants. Further, 7 participants chose this feature as the most useful to them from all proposed features. However, we acknowledge certain limitations in our research. First of all, our sample is limited to knowledge workers in India and therefore cannot be generalized for other populations, as cultural aspects might influence people's perceptions of remote work. In addition, measuring self-reported productivity and job motivation with a single question has limitations. We chose single response items to keep the survey length reasonable because shorter questionnaires have been found to receive higher response rates. Since the main variables contemplated in this study were self-reported by participants, and not directly measured, it is possible that subjective biases influenced the dependability of the research findings. In spite of this consideration, the results of the statistical tests ensure the consistency of our data.

Our study opens up new research opportunities for remote work. Many participants (75.35%) in our study were aged below 30 years and were relatively new to working from home who had no time to mentally prepare for remote work. For a more balanced study, future research can include participants from broader demographics and who have experience in remote work to better understand their perceptions about remote work. Additionally, given that the variables in our study were self-reported by participants, there is a scope for future research where these variables can be measured directly [82]. Working fully remote has already been the norm for some companies even before the pandemic, for example, GitHub and Automattic [83]. Sytch and Greer (2020) argue that the post-pandemic work will be hybrid, where remote work will be more prevalent in the future [84]. Many companies including Google, Microsoft, Twitter, Facebook, Shopify, Atlassian, Dropbox have now announced either a shift to full remote work or to partial remote work in a hybrid fashion, where employees may be allowed or encouraged to WFH permanently or several days a week [18, 85, 86]. The post-pandemic work model i.e., the hybrid model will potentially create new challenges and prospects. Researchers can focus on such hybrid settings to understand the challenges of hybrid teams and the many factors to consider in them. The findings of this study could benefit the Human-Computer-Interaction community for designing usable, meaningful products and services for remote and hybrid teams. Organizations can also use the findings from this paper to design better remote and hybrid work programs for their employees.

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