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Working from Home in the Post-Pandemic World: A Structural Equation Modeling-based Study

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***Abstract*—The COVID-19 pandemic forced organizations and employees to switch to working from home. We conducted a survey to understand the opinion of people on working from home, and if they would like working from home after the pandemic is over. We found that the respondents, most (92%) of whom were in IT-related professions, appreciated the comfort and flexibility afforded by working from home, but also had difficulties because of lack of facilities at home, low motivation and reduced synchronous communication, collaboration and teamwork. The possibility of IT-related activities (t = 2.214), flexibility (t = 2.603) and effective communication (t = 2.012) made the respondents feel that working from home can lead to positive changes in society (P < 0.05). The shift to working from home allowed organizations to continue with their business processes during the pandemic and lockdowns, and the experience was mostly positive for employees. The shift to working from home also brought a much needed change in the work culture in many organizations. Organizations may allow their employees to work from home as a norm rather than as an exception after the pandemic but will require redesigning their business processes.**

Keywords—COVID-19 pandemic, working from home, flexibility at work, team building

I. Introduction

The University of Cambridge closed down and its students went home because of the plague epidemic in 1665. One of the students, Isaac Newton, was forced to stay at his home for the next two years where he laid the foundations of calculus and worked on his theories in optics and planetary motion [1]. He was elected a fellow of Trinity College when the university reopened in 1667. This is perhaps the best example of productivity of working from home (WFH). However, the situation is more complex in the twenty-first century and everyone is not as intelligent as Newton.

People have been going to their workplaces on a daily basis for more than two hundred years. The industrial revolution saw the setting up of factories in the late-eighteenth century where workers would assemble everyday for work. The practice continued even after the advent of white-collar jobs in multinational companies in the early-twentieth century. The invention of the World Wide Web near the end of the twentieth century made it possible for people to do their office work from home. However, WFH was practiced only in a small scale in information technology (IT) and allied sectors, and not considered a serious alternative in most other professions [2]. The COVID-19 pandemic led to an overhaul of the status quo.

II. Experience of WFH during the Pandemic

The first outbreak of COVID-19 was reported in China in December 2019. The disease spread around the world in the next few months and lockdowns had to be imposed in most countries. Organizations had to shift their entire business processes online and allow WFH for their employees. Brynjolfsson et al. [3] conducted a survey in the US in April-May 2020 and found that 35% workers had switched to WFH because of the pandemic while another 15% were WFH even before the pandemic. Bick et al. [4] conducted another survey in the US and found 35% respondents to be working entirely from home in May 2020 while only 8% did so in February 2020. The speed with which organizations and their employees shifted to WFH surprised many [5].

Information and communication technology has been evolving over the last several decades and it could support WFH even before the pandemic. The pandemic however demonstrated that WFH is feasible in many more jobs than previously thought [6]. The pandemic led to a massive worldwide unplanned experiment on WFH [7] and researchers tried to empirically assess the effects of the same on workers in India [8], Indonesia [9], Kuwait [10], USA [11] and other countries. The experience [12] and preference [13] of people regarding WFH varied widely. However, many people believed that the work conditions that prevailed before the pandemic needed review [10].

People liked WFH for several reasons. Working from the comfort of their home was appreciated the most by employees [13]. WFH allowed people to avoid their daily commute between home and office [5] which is considered to be tiring and a wastage of time by many. They could use the time in more productive ways when WFH [5]. Flexibility is another aspect of WFH that was liked by many employees [10, 13]. Employees had the liberty to decide when they will do which work, and break for household chores and rest when necessary. In other words, WFH allows higher job autonomy [14]. WFH also allowed people, especially female employees [8], to take care of family responsibilities in a better way. The WFH experiment was taken positively by many people and there was a sense of trust and anticipation [15]. Many people felt that WFH resulted in a better work-life balance [5, 13]. Overall, WFH was found to be positively associated with job satisfaction [9].

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It was observed that people worked for longer hours and their working hours were spread round the clock when WFH. These were perhaps because people did not have to travel and were in no hurry to complete their work during stipulated office hours [12]. People found that most conditions related to work either remained the same or improved rather than deteriorating when WFH [10]. Employees were divided on how WFH affected their productivity [5, 8, 12]. Some felt that WFH increased their productivity, while others felt that it decreased or did not affect their productivity. Most people gradually adjusted to WFH and fewer people felt that WFH negatively affected their productivity as time progressed [12].

People also faced some serious issues when WFH during the pandemic. WFH needed setting up facilities at home [13] which required space and money. Some employees complained of being prone to distraction and having a lower motivation level while WFH [13]. WFH led to a decrease in synchronous communication which was typically compensated by an increase in asynchronous communication [11]. There was a sharp increase in the number of emails and text messages exchanged daily which in turn increased work-related stress [9]. Many employees found it difficult to collaborate while WFH [11] and fewer new teams were built during the pandemic.

WFH was initially considered a temporary measure by all organizations. Some organizations are now keen in calling their employees back to the office, while others would are allowing their employees WFH or working in a hybrid mode [16]. Therefore, it is necessary to study the scope and benefits of WFH in the post-pandemic world. The objective of this study was to understand the opinion of people, particularly those in IT-related professions, on WFH and the scope of the same in the post-pandemic world. We conducted a survey on various factors related to WFH and analyzed the data using structural equation modeling.

III. Materials and Methods

We framed eight statements covering various aspects of WFH (Table I). We prepared a questionnaire in which we asked the respondents to denote how much they agree with these statements on a 5-point scale with 1 representing "strongly disagree" and 5 representing "strongly agree". The questionnaire also collected demographic information of the respondents. We circulated the questionnaire online among the alumni of the university to which the first author is affiliated. We received responses, along with informed consent, from 1st February 2022 to 28th February 2022. We calculated the mean, standard deviation, skewness and kurtosis of the ratings provided by the respondents for the eight statements.

We constructed a model to examine the influence of various issues related to WFH on the opinion of people on whether WFH should be encouraged in future and whether WFH can lead to positive changes in society (Fig. 1). The model was evaluated using non-parametric partial least squares structural equation modeling (PLS-SEM) as implemented by SmartPLS (version 3.2.8). We calculated the t-statistic and effect size (f^2) for every possible influence in the model according to Cohen (1988). The values of f^2 greater than 0.02, 0.15 and 0.35 represent small, medium and large influences of one variable on another variable, respectively [17]. The analysis was conducted at 95% confidence level.

TABLE I. STATEMENTS COVERING VARIOUS ASPECTS OF WFH.

Mnemonic	Statement
S1	The COVID-19 pandemic led to widespread adoption of WFH in the IT industry.
S2	IT-related work can be done effectively through WFH.
S3	WFH reduces daily travel and is more comfortable.
S4	WFH is more flexible and allows better balance between work and life.
S5	WFH interferes with family life.
S6	Online meetings and communications are better focused.
S7	WFH should be encouraged in future.
S8	WFH will lead to positive changes in society.

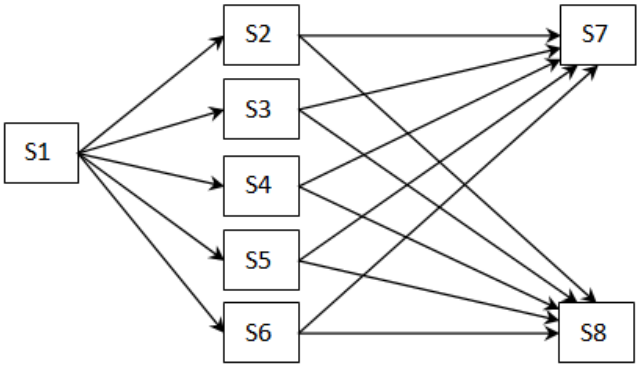

Fig. 1. Model to study the influence of various issues on opinion of people on whether WFH should be encouraged in future and can lead to positive changes in society.

IV. Results

A. Demographic Data

We received responses from 98 people (Table II). Most of the respondents were male (88%), graduates (84%), in their twenties (96%) and living in India (98%). Most of the respondents (92%) were in IT-related professions with a majority (52%) of them working as software developer and tester (52%).

B. Descriptive Statistics

The respondents mostly agreed with S1, i.e. the COVID-19 pandemic led to widespread adoption of WFH in the IT industry. The mean rating provided by the respondents for S1 was 4.684 and the distribution of the ratings was negatively skewed and leptokurtic (Fig. 2).

More specifically, the respondents believed that IT-related work can be done effectively through WFH and the mean rating provided by the respondents for S2 was 3.949. The respondents mostly felt that WFH reduces daily travel and is more comfortable. The mean rating for S3 was 4.306 and the distribution of the ratings was negatively skewed and leptokurtic. The mean rating for S4, i.e. WFH is more flexible and allows better balance between work and life, was 3.500 with the distribution of the ratings being negatively skewed and platykurtic. A majority of the respondents complained that WFH interferes with family life and the mean rating for S5 was 3.704. A majority of the respondents disagreed with S6, i.e. online meetings and communications are better focused, and the average rating and skewness for S6 were 2.673 and 0.362, respectively.

TABLE II. DEMOGRAPHIC DATA OF THE RESPONDENTS.

TABLE III. RESULT OF STRUCTURAL EQUATION MODELING.

Influence	Original sample	S.D.	t-statistic	P-value	f^2-value
S1→S2	0.326	0.133	2.461	0.014*	0.119
S1→S3	0.521	0.110	4.716	0.000*	0.373
S1→S4	0.241	0.111	2.176	0.030*	0.061
S1→S5	0.069	0.139	0.496	0.620	0.005
S1→S6	0.189	0.079	2.397	0.017*	0.037
S2→S7	0.149	0.117	1.279	0.201	0.021
S2→S8	0.223	0.101	2.214	0.027*	0.051
S3→S7	0.169	0.100	1.685	0.092	0.027
S3→S8	0.102	0.096	1.055	0.292	0.011
S4→S7	0.105	0.121	0.869	0.385	0.013
S4→S8	0.311	0.120	2.603	0.009*	0.124
S5→S7	-0.042	0.105	0.395	0.693	0.002
S5→S8	-0.001	0.107	0.008	0.993	0.000
S6→S7	0.315	0.100	3.166	0.002*	0.113
S6→S8	0.202	0.101	2.012	0.044*	0.050

* $P < 0.05$.

Attribute	Value	Number of respondents
Age	21-30 years	94 (96%)
	31-40 years	1 (1%)
	41-50 years	1 (1%)
	>50 years	2 (2%)
Gender	Male	86 (88%)
	Female	12 (12%)
Education	Graduate	82 (84%)
	Postgraduate	16 (16%)
Location	India	96 (98%)
	Abroad	2 (2%)
Nature of work	IT	90 (92%)
	Non-IT	8 (8%)
Job profile	Software developer or tester	51 (52%)
	Analyst, researcher or consultant	8 (8%)
	Manager or business developer	4 (4%)
	Other	35 (36%)

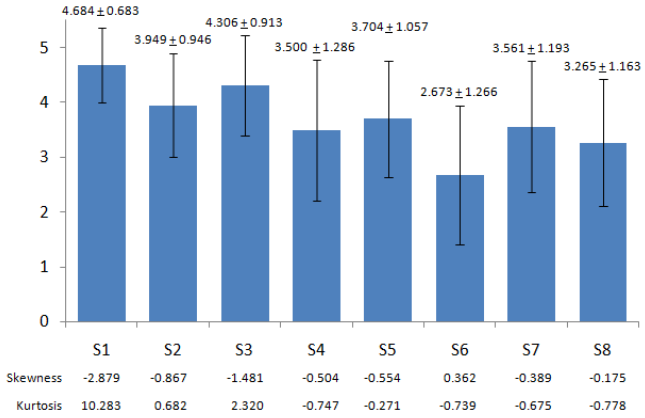

Fig. 2. Mean ± S.D., skewness and kurtosis of the ratings of the statements provided by the respondent.

Overall, a majority of respondents agreed with S7, i.e. WFH should be encouraged in future, and S8, i.e. WFH will lead to positive changes in society. The average rating for S7 and S8 was 3.561 and 3.265, respectively and the distribution of the ratings was negatively skewed and platykurtic for both statements.

C. Analysis of Influence

The widespread adoption of WFH in the IT industry during the COVID-19 pandemic significantly influenced people to believe that IT-related work can be done effectively through WFH (S1 → S2, $t = 2.461$, $f^2 = 0.119$, $P < 0.05$), WFH reduces daily travel and is more comfortable (S1 → S3, $t = 4.716$, $f^2 = 0.373$, $P < 0.05$), WFH is more flexible and allows better balance between work and life (S1 → S4, $t = 2.176$, $f^2 = 0.061$, $P < 0.05$), and online meetings and communications are better focused (S1 → S6, $t = 2.397$, $f^2 = 0.037$, $P < 0.05$) (Table III). However, the experience of WFH during the pandemic did not have a significant ($P > 0.05$) influence on the respondents to believe that WFH interferes with family life. Comparing the values of f^2, it can be inferred that S1 has more influence on S2 than on the other variables, viz. S3, S4, S5 and S6.

The respondents' view on online communication significantly influenced their opinion on whether WFH should be encouraged in future (S6 → S7, $t = 3.166$, $f^2 = 0.113$, $P < 0.05$). Alternatively, the respondents' opinion on whether WFH should be encouraged in future was not influenced significantly ($P > 0.05$) by the effectiveness with which IT-related work can be done through WFH, reduction of daily travel because of WFH, flexibility provided by WFH and interference of WFH in family life.

The respondents were significantly influenced to believe that WFH will lead to positive changes in society because they felt IT-related work can be done effectively through WFH (S2 → S8, $t = 2.214$, $f^2 = 0.051$, $P < 0.05$), WFH is more flexible (S4 → S8, $t = 2.603$, $f^2 = 0.124$, $P < 0.05$), and online communications are better focused (S6 → S8, $t = 2.012$, $f^2 = 0.050$, $P < 0.05$). However, the facts WFH reduces daily travel and interferes with family life did not influence the respondents significantly ($P > 0.05$) to believe WFH will lead to positive changes in society. Again, comparing the values of f^2, it can be inferred that S8 is influenced by S4 more than other variables, viz. S2, S3, S5 and S6.

V. DISCUSSION

A. The Post-pandemic Scenario

The COVID-19 pandemic changed the way people live and work, and affected organizations and employees around the world [9]. Organizations used technologies that were available to them to shift their business processes online and even people who had no experience of WFH, for example school teachers, were able to adapt to the change [7]. The perception of organizations and people about WFH changed [7] and they realized the effectiveness of WFH [8]. A majority of the respondents in this study felt that WFH allows IT-related work to be performed effectively (vide S2). WFH was extremely rare in developing countries before the pandemic [13] where work-related rules are stricter than those in the developed countries often as a consequence of colonial legacies. WFH during the pandemic brought much awaited liberalization in organizations in those countries. For example, WFH was hardly practiced in any organization in India, whether public or private, and its adoption during the pandemic led to a major transformation of the work culture across professions [18].

Researchers tried to determine the scope of WFH in the post-pandemic world and found that more than one-third jobs can be done on WFH basis in developed countries [19, 20]. However, it may be possible to do a lesser proportion of jobs on WFH basis in developing countries, which are now expediting their adoption of digital technologies. Organizations will now try to identify the occupational and individual characteristics that are associated with WFH effectively and encourage appropriate occupational groups and employees to practice WFH [7]. WFH was practiced as a temporary measure during the pandemic and most organizations simply transplanted their existing business processes online imitating what they were doing before the pandemic [5] rather than designing new workflows. After the pandemic is over, organizations are expected to develop new mostly-online business processes which will be better suited for employees WFH.

With employees becoming acclimatized to meeting and transacting online during the pandemic (vide S6), organizations would like shifting to WFH as a norm rather than as an exception [21] in the long run [11]. Turja et al. [22] remarked that organizations may have reasons for not reverting back to the old system after the pandemic is over. In fact, many organizations are expected to follow a hybrid model with employees partly WFH and partly working in office [10, 23]. Organizations will also come up with novel plans for using office space and collaboration [23]. In extreme cases, there can be multinational companies without any physical office and with all employees WFH.

B. *Specific Issues*

Based on the experience of WFH of people across professions and around the world during the pandemic, a few common issues which organizations and employees need to work upon in the near future can be identified. For example, professional networking is essential for the growth of employees in all sectors. Apart from traditional means, people use profession- and employment-oriented social networking sites for this purpose. The popularity of such websites has increased since the beginning of the pandemic and is expected to increase further in the coming years. Online multi-organization networking events may also become popular in the near future. Organizations should support such outreach by their employees.

Every organization has its unique culture and values to which employees get accustomed to when they spend time in the organization. Such organizational culture can also be build while employees are WFH through formal briefing sessions and suitably designed activities.

In the last two decades, multi-site online collaborations have been found to work successfully in various professions [24]. Such collaborations require suitable online tools and able managerial direction. At the beginning of the pandemic, most people thought that the lockdowns will be for a short period. As a result, most organizations kept working with their existing teams and did not try to build new ones. However, if organizations want to adopt WFH as a regular feature, then novel and mostly-online ways of team building have to be developed.

People need different types of facilities to work efficiently and the requirements vary with profession. If people know that they will be WFH regularly, then they will invest to develop necessary facilities at home.

One of the most cherished aspects of WFH is that it allows people to work at any time of the day (vide S4). However, organizations should refrain from exhausting their employees WFH with overwork [25]. Further, there should be a window in the day when employees may send emails and text messages to one another and an even narrower window when one should be expected to attend telephone calls and online meetings [21].

Etiquettes observed in offices today have evolved over the last two centuries. A similar set of rules inculcating polite behavior needs be developed for and by people WFH.

VI. Conclusion

A large majority of the respondents in this study felt that the COVID-19 pandemic led to widespread adoption of WFH in the IT industry. Most of them also felt the IT-related work can be performed effectively with WFH, and appreciated WFH for reducing their daily travel, being more flexible. Some respondents however complained about WFH interfering in their family life. Nevertheless, based on their experience of WFH during the COVID-19 pandemic, the respondents typically agreed that WFH should be encouraged in future and it will lead to positive changes in society.

The benefits afforded by WFH to employees outweigh the disadvantages of the same all of which can be overcome by suitable technological and managerial interventions. In future, many people will prefer WFH particularly during mild illnesses, harsh weather conditions and air pollution spikes in their cities, while some would like WFH permanently. Many organizations have realized the effectiveness of WFH during the pandemic and will not dissuade their employees from WFH after the pandemic. Organizations allowing WFH will be considered favorably by their employees and will attract talented workers and that too from a wider geographical area.

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