The Impact of Covid-19 on Sri Lankan Information Technology Industry: Work From Home Productivity

M.S. Faathima Fayaza, F. Fathima Farhath and Rifai Kariapper

Abstract The COVID-19 pandemic imposed a lockdown around the world. Nations announced employees to continue Work From Home (WFH). This brought chaos to the economy and forced enterprises to think about a new business model. At the same time, employees faced emotional and psychological challenges. Furthermore, it brought many challenges to employees with limited remote work experience. Further, changes in the working environment and work routine impacted on the employees' productivity and blurred the personal and professional life margins. This study investigates WFH productivity during the COIVD-19 pandemic in the Sri Lankan Information Technology (IT) industry by conducting a survey. The survey mainly focuses on gender, marital status, previous WFH experience, team collaboration, superior support, work environment, and productivity by utilizing the responses obtained from 294 individuals island wide. Hypotheses in this study were tested using the chi-squared test and regression analysis. The study reveals that gender or marital status differences don't impact employees' productivity, while the previous WFH experience, team collaboration, superior support, and work environment positively impact productivity. The study sheds insights and recommendations on how to mitigate the negative impact of the COVID-19 pandemic on the employees of the IT domain and assist the business.

Index Terms— **Covid-19, Information Technology Industry, Work From Home, Work Productivity**

I. INTRODUCTION

THE new coronavirus disease, also known as COVID-19, was first identified in Wuhan, China, in late 2019 and early 2020; it vigorously spread worldwide. The World Health Organization (WHO) proclaimed COVID-19 as a 'Pandemic' on March 11, 2020 [1]. COVID-19 cruelly affected almost all countries. Nations imposed lockdowns to reduce the spread. COVID-19 has affected all industries, either directly or indirectly. Further, COVID-19 sets a socio-economic challenge worldwide [2].

In late March 2020, the government of Sri Lanka declared Work From Home (WFH) mode for all public and private sectors. Therefore, organizations were forced to move to remote work. Some organizations faced challenges adapting to this change, and some did not have the proper technical support to adapt to these needs. However, in the context of the Information Technology (IT) industry in Sri Lanka, some companies facilitated WFH before COVID-19. Yet, for some companies, it was a new experience. Overall this is a unique experience for everyone to work in a pandemic situation.

M.S. Faathima Fayaza is with the Department of Information Technology, South Eastern University of Sri Lanka, Sri Lanka (email: fayaza@seu.ac.lk)

F. Fathima Farhath is with the Department of Computing Informatics Institute of Technology Colombo, Sri Lanka (email: fathimafarhath@gmail.com)

Rifai Kariapper Department of Information and Communication Technology, South Eastern University of Sri Lanka (email: rk@seu.ac.lk)

WFH during pandemic situations brings particular challenges, primarily for people with limited experience in remote work. For example, people need to set up a work-home environment with several disturbances such as family members, children, pets, etc. Because schools shut down, employees with children have to work extra to take care of their children's education (e.g., online classes). Further, lockdown reduces face-to-face communication among friends and colleagues, leading to loneliness and reduced focus on work [3]. The next most significant challenge in day-to-day life is to draw a line between work and personal life. All these kinds of factors create stress and affect the well-being of professionals.

COVID-19 significantly impacts the global economy and has created calamity in all phases of our day-to-day life. Crises create stress, affect emotional well-being, and disturb people's daily life [4]. Researchers found that the heavy workload with tight timelines, insecure employment, and personal–professional life imbalance trigger stress for employees [5], and stress impacts the productivity of employees.

Yet during the pandemic situation, organizations still try to increase their productivity in the competitive market. To increase employees' efficiency, organizations need to work hard and implement practices to improve the factors that affect productivity. This study targets the factors influencing the productivity of Information Technology (IT) professionals in Sri Lanka. For this study, researchers collected feedback from 294 professionals from different organizations in Sri Lanka. Though most people believe

that gender differences and marital status heavily impact employees' performance, this research reveals that gender differences and marital status don't impact employees' performance. Further, prior WFH experience, team collaboration, superior support, and work environment positively impact employees' performance.

II. LITERATURE SURVEY

In literature, several studies have discussed the factors that impact the productivity of the IT industry [6]-[8]. These can mainly be grouped into two human factors [9]-[11] and organizational factors [9], [11]. During the Covid-19 pandemic, there was an impact on both factors. Capability [9]-[11], experience [9]-[11], skills [9], competencies [9], motivation [9]-[11], team structure [9]-[11], collaboration among team members [9]-[11], ease of communication [9],[11] are some of the people related factors which affect the productivity.

Johnson et al. [12] argued physical workplace of employees plays a significant role in their satisfaction and ability to accomplish tasks. Further, they claimed that not everybody has a suitable workplace environment at home. Also, they pointed out that communication with team members and team leaders plays a significant role in the employees' productivity in the IT domain. Remote work reduces face-to-face interactions and reduces all forms of communication [13].

Bezerra et al. [14] conducted a study to identify the factors that influence remote work during Covid-19 on software teams in Brazil. This study mainly investigated the human and organizational factors that affect productivity. This study reveals that the key features influencing efficiency are external disruption, environmental adaptation, and emotional aspects. Further, they found out that people with limited experience in remote work face more challenges than others. Moreover, 74.1% of participants believe their productivity remains the same.

Ralph et al. [15] surveyed to understand the relationship between the well-being and productivity of developers. This study collected data from 2250 developers from 53 countries using 12 languages. They find out (1) the well-being and performance of developers are suffering; (2) performance and well-being are closely related; (3) disaster preparedness, virus outbreak fear, and ergonomics of the home office all affect well-being or productivity; (4) it may adversely impact women, parents, and people with disabilities. They concluded that to advance productivity, one needs to care for employees' well-being. Also, they insisted that routine work-from-home and work-from-home during the Covid-19 pandemic are different.

Russo et al. [16] studied the relationship between the single daily activity, well-being, productivity, and other social and psychological variables of a software developer based on 192 practitioners' feedback. They found out software people spend the same amount of time in their single day-to-day activities like coding, bugs, and fixing

even when they WFH, and no significant difference in their work [16]. Further, they find that intercommunication and meetings with coworkers have been reduced [2]. The conclusion was that remote work is not a challenge for IT workers and the company.

According to Russo et al. [2], social contacts positively influence a person's well-being while high stress negatively impacts on person's well-being. Changes in regular practices also impact the person's well-being. Also, productivity is mainly affected by disruptions in the work-home environment and boredom [2], and the leading cause of boredom is loneliness [2].

Career shock is impacted by contextual and individual factors [2]. Also, the career stage plays a significant role in career shock [16]. According to Jung et al. [17], career uncertainty caused by COVID-19 has more impact on Generation Y than on Generation X in the hotel industry.

From their survey, Ipsen et al. [18] concluded that: (1) during Covid-19, productivity increased in Denmark. Further, 55% of employees do more work within a few hours. (2) Danish managers wanted to see their workers during WFH, so they used video meetings and Facebook groups. Also, they concluded that workers had a positive impact, while the managers had to face challenges in managing their workers during the first few months of WFH.

People who live with families face more challenges than people who live alone during the WFH [19]. Also, employees face challenges in drawing a line between office work and personal work during WFH [19]. Also, getting help from coworkers is a challenge in WFH [19]. Team leaders face more challenges in managing the team with remote work [19]. The impact of Covid-19 is more on some over others based on their age, gender, skill, experience, etc. [19]. Remote workforce employees use technology to do their jobs, and using digital technology makes employees work even during non-working hours [20].

III. THEORETICAL GROUNDING AND HYPOTHESIS DEVELOPMENT

A. Gender

In early literature, the gender gap has been documented via significant research in a variety of domains due to discrimination [21], higher performance standards [22], lack of career mentoring [23], etc. Gender difference in professional and family life is supposed to expect women to have lesser work productivity than men because their domestic responsibilities interfere with their professional lives. However, some later work documented that there is little or no gender difference in work productivity [24], [25]. To decrease the gender gap, women work more than men within the same amount of time, and women sacrifice their leisure time [26].

Unfortunately, in the Covid – 19 pandemic, women face more challenges balancing professional and family life

because of WFH. Covid –19 WFH blur the line between professional and personal life. When professionals do WFH, their families, especially children, will demand more time and attention. This makes it very challenging since school kindergartens are closed, and nannies are also not allowed to visit. This challenge is acute for working women.

B. Marital Status

Traditionally, married men or women have more significant responsibilities outside the workplace than a single person. In the pandemic situation, catering to the family's well-being, caring for the children, and their education is also acute for married individuals. Due to the schools being closed, parents need to put more effort into their children's education. All these factors can play a significant role in professionals' performance. Previous research shows that married status impacts the performance of the employees [27]

C. WFH Experience

Johnson et al. argue that the work environment impacts the productivity of individuals in the software industry [12]. A comfortable working atmosphere with few interruptions improves productivity. In the pandemic situation, IT professionals were asked to WFH by their employers. Luckily before the pandemic, most Sri Lankan IT companies allowed WFH, and most IT professionals had WFH experience.

Even before the pandemic, some companies practiced remote work [28],[29]. Among the remote workers, 57% are teleworking [30]. Also, literature shows that WFH has a positive impact on productivity. Previous WFH experience may give the employees and organizations some added advantages during the Covid-19. If an employee had a WFH culture before the pandemic, then the employee may have arrangements or settings to do office work at home. At the same time, previous experience helps draw a line between personal and professional work.

D. Team Collaboration

Many studies were conducted to identify the factors impacting project success and productivity. This revealed that one of the critical project success factors is team collaboration [31], [32]. Due to the pandemic, the government forced WFH to reduce face-to-face communication. Therefore, the organizations had to put more effort into bringing networks among their employees, which led most of the organizations to adopt new technologies.

E. Superior Support

One of the crucial project success factors is superior support [32]. During the forced WFH, trust plays a significant role between employees and superiors since the superior cannot directly manage the junior employees. Before assigning a task, superiors need to consider employees' and their families' well-being during the pandemic. Superior moral support gives more flexibility to employees.

F. Work Environment

The work environment plays a significant role in the performance of an employee. An uninterrupted flexible work environment gives more output than an interrupting environment. Lockdown forces everyone to stay at home, and school closer makes children be at home continuously. This forces employees to share the workspace with the household with many disruptions. Further practitioners with limited remote work experience face many challenges in setting up their workspace.

G. Productivity in WFH

Many factors influence the productivity of employees. Several studies were conducted to identify remote work productivity [12], [13]. Software development productivity heavily depends on the productivity of software professionals, tools adapted, and methods used [12]. Therefore, investigating the productivity of individuals helps to identify the organization's productivity.

IV. CONCEPTUAL FRAMEWORK

The conceptual framework was modeled based on seven variables, namely gender, marital status, previous WFH experience, team collaboration, superior support, work environment, and productivity during the Covid-19 pandemic. According to this study, "gender," "material status," "previous WFH experience," "team collaboration," "superior support," and "work environment" are taken as independent variables. "Productivity during the Covid-19 pandemic" is considered a Dependent variable. Table .I show the outline of the hypothesis used in this research.

TABLE I
HYPOTHESES USED IN THE MODEL

Identifier	Hypothesis
H1	Gender differences don't make a significant impact on the productivity of the employees during the Covid-19 pandemic in the Sri Lankan IT industry
H2	The difference in marital status has no significant difference in the productivity of the employees during the Covid-19 pandemic in the Sri Lankan IT industry
H3	There is a positive relationship between " previous WFH experience " and " productivity" during the Covid-19 pandemic in the Sri Lankan IT industry.
H4	There is a positive relationship between "team collaboration " and " productivity " during the Covid-19 pandemic in the Sri Lankan IT industry.
H5	There is a positive relationship between "superior support" and " productivity" during the Covid-19 pandemic in the Sri Lankan IT industry.
H6	There is a positive relationship between the "work environment " and " productivity " during the Covid-19 pandemic in the Sri Lankan IT industry.

V. RESEARCH DESIGN

A. Data collection

The main objective of this study is to examine the causes that impact the productivity of Sri Lankan IT professionals during the Covid-19 work from home. Therefore, the researchers designed and conducted an online survey. The researchers collected the data using two approaches: (i) self-recruitment [13], sharing the survey with IT professional social media groups and email groups (ii) sending a direct request to IT professionals whom the researchers personally know. Practitioners are from product-based and project-based IT companies in Sri Lanka. Also, researchers selected professionals from different backgrounds, such as software engineers, quality assurance people, business analysts, team leads, system administrators, network engineers, application support engineers, designers, and project managers. The data was collected during the period from January to August 2021.

B. Data Analysis

In this study, most of the questions were evaluated using a single-item scale [21]. The authors used a five-point Likert scale (1: strongly disagree to 5: strongly agree). The data collected by the survey was analyzed by SPSS software. The authors conducted descriptive and inferential statistical analyses in this study—conceptual model analysis using Pearson correlation and regression analysis. The reliability of the variables was tested using reliability analysis.

VI. RESULT AND DISCUSSION

A. Demographic details (gender, marital status)

The first phase of this study analyzes the characteristics of the participants based on demographic and job-related data using descriptive statistics. 26.5% of the participants were females, while 73.5% were males. 41.8% of the participants were single, while 58.2% were married. Among the married participants, 69% didn't have children, and 31% had one or more children 81.6% of the participants were between 25-34 years, 16.3% were in the age range of 35-44 years, 1% were above 45 years, and the remaining 1% were below 25 years (Fig. 1).   52% of the participants had 1-5 years of experience, 32.7% had 6-10 years of experience, 13.3% had 11-15 years of experience, and the rest had more than 15 years of experience [Fig. 2]. The questionnaire was circulated among different groups of IT professionals. Fig. 3 shows the participants with experience in the field of IT.
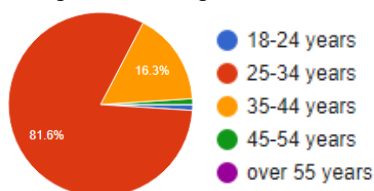

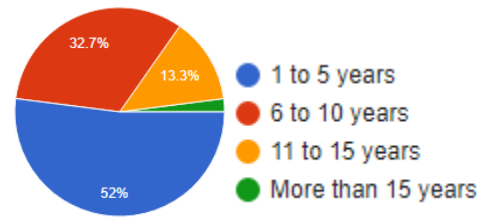Fig. 1. The age group of the participants
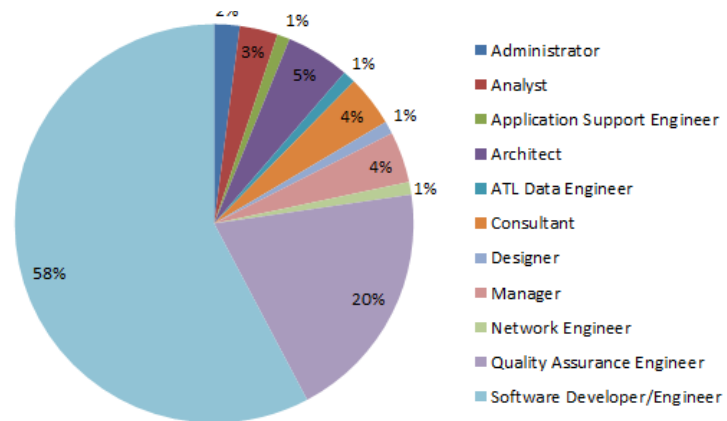

Fig. 2. Experience levels of the participants

Fig. 3. Job profile

B. Previous WFH experience and Work environment

In the pandemic situation, IT professionals were asked to WFH by their employers. Among the participants, 77.6% had previous WFH experience, while the rest, 22.4%, did not have any such previous experience [Fig. 4]. Since most of the participants had previous WFH experiments, they also had a small arrangement for WFH. However, unfortunately, the people who didn't have previous WHF experience did not have a proper WFH setting when they started WFH due to the pandemic. Therefore, they were forced to share working space within the home. Fig. 5 shows the work environment satisfaction concerning gender. Here most of the people were satisfied with their workplace arrangements.

Further, people face more challenges when performing critical tasks and miss the office environment and coworkers. Especially married men and women were missing more than single men and women (Fig. 6). Fig. 7 elaborates on the participants' feelings, work-life balance, work routine, and regular breaks during the pandemic WFH. Fig. 8 shows the work level with emotions.
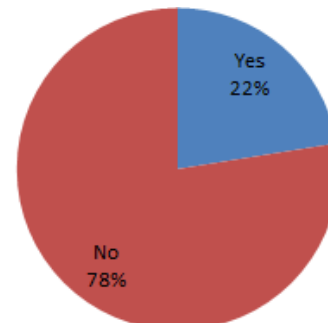

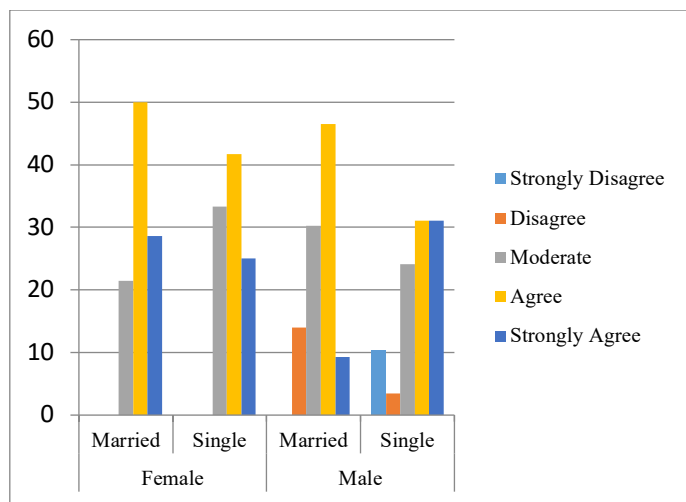Fig. 4. Previous WFH Experience

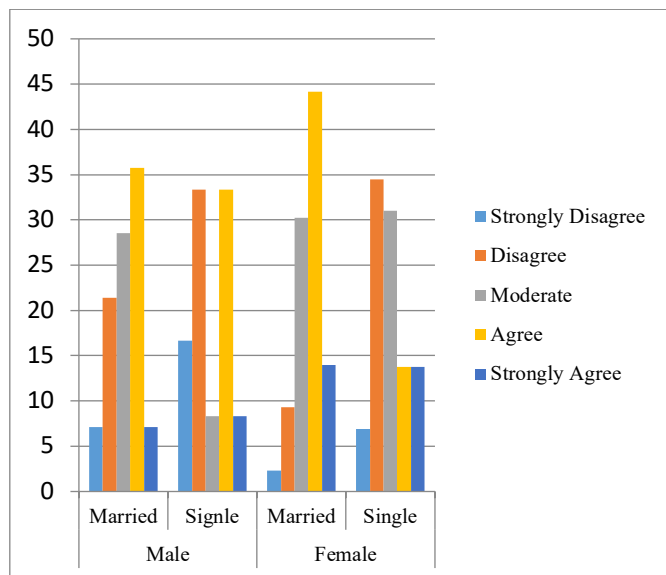Fig. 5. Satisfaction of WFH arrangements

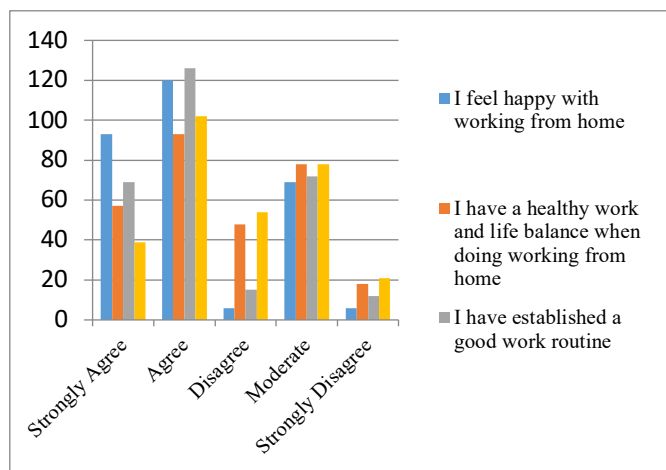Fig. 6. Missing Coworkers in the critical tasks
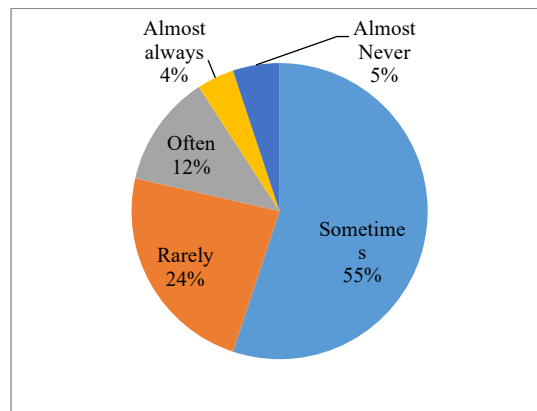

Fig. 7. Feelings and work-life balance

Fig. 8. Feel emotionally drained from my work.

C. Team collaboration and superior support

The authors analyzed team collaboration and superior support through multiple perspectives such as regular chat, help, motivation, and trust. 28% of the employees strongly agree that their managers trust them, while 38% agree and 25% moderately (Fig. 9). The rest felt their managers do not trust them.

When it comes to the support, they get from their coworkers during the WFH on a typical office day, 30.61% of the employees responded that they almost always got it, and 41.84% said they used to get it often, while the rest get it rare or sometimes. IT professionals are good at technology and can give hands to each other even in remote work mode.

During the WFH, superiors and employees maintained smooth communication. 24.49% responded almost always, 42.86% as often, 27.55% as sometimes, 4.08% as rarely, and 1.02% rarely had communicated with their superior. Most Sri Lankan IT companies follow a flat hierarchy approach where employees and superiors have a friendly relationship, which contributed much during the WFH to do a good job. Likewise, employees get enough support from superiors during the pandemic. Fig. 10 summarizes the response to the following questions: 1. I feel trusted by WFH (TWFH), 2. I feel I am missing the motivation of my team (MMT), 3. My supervisor /manager feels satisfied with my work (SS), 4. I am in regular contact with my coworkers (RCC), 5. I get work-related support from my coworkers like a normal working day (GRSC), 6. I am regularly contacting my supervisor/management (RCS), 7. I am in regular contact with my supervisor/management(GRSS).
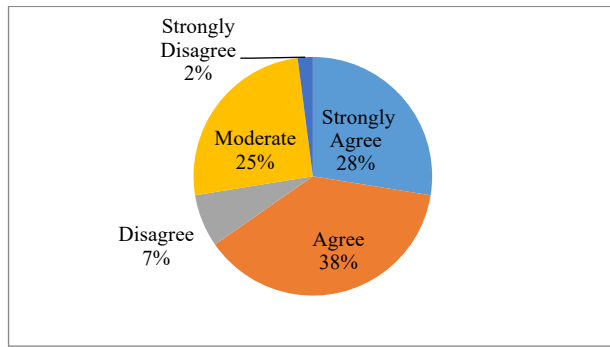
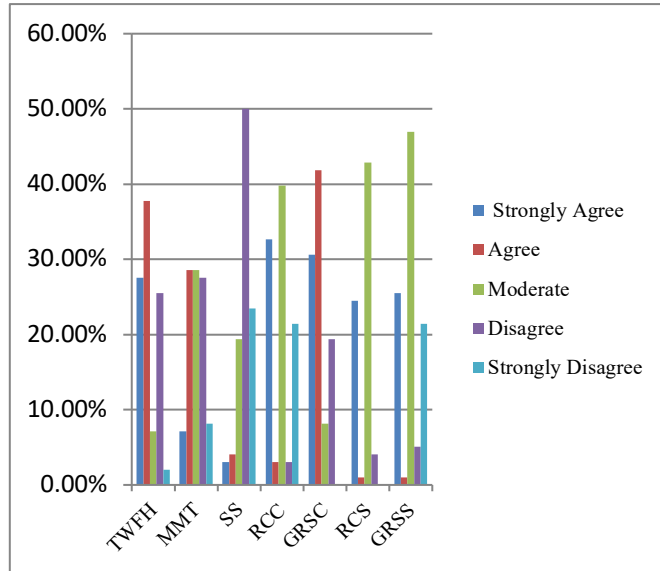Fig. 9. Superior trust in employees for WFH during the pandemic period

Fig. 10. Team collaboration and superior contact during the pandemic period

D. Reliability and validity analysis and descriptive statistics

The reliability and validity of the data set were tested using Cronbach's alpha values. Table II shows the Cronbach values obtained in this study. Values clearly show that the questions are reliable and valid. Data collected in the Likert scale (1 to 5) and variable mean and standard deviation are listed in the table.

TABLE II
RELIABILITY ANALYSIS

Variable	Cronbach's alpha	No of Items	Mean	Std. Dev
team collaboration	0.85	6	4.42	0.52
superior support	0.81	8	4.31	0.56
Work environment	0.758	6	3.82	0.65
WFH productivity	0.82	10	4.88	0.51

E. Hypotheses Testing

Regression analysis and chi-squared were used to test hypotheses in this study. Derived results were: H1(X^2=10.67,p<.05); H2(X^2=13.91,p<.05); H3(R=.291,p<.05); H4(R=.387,p<.05); H5(R=.538,p<.05);

H6(R=.659,p<.05), which suggests rejecting all Null hypotheses. From this study, researchers observed that Sri Lankan IT professionals are delighted with WFH, and their gender or marital status doesn't affect their productivity. Further, their previous WFH experience helped them carry out their job smoothly during the pandemic. Also, most of the employees set up a work environment at home. Moreover, team collaboration and superior employee connections were maintained satisfactorily. Therefore, Sri Lankan IT companies can think of hybrid work opportunities in the future. Companies can allow WFH and work-in-the-office environment options to the employees.

VII. CONCLUSION

Covid -19 brings unexpected challenges all over the world. Nations are instructed to continue Working From Home (WFH) for their employers. In the Sri Lankan Information Technology (IT) industry, some companies allow WFH even before the pandemic, but most of the companies are new to WFH. Unfortunately, all the employees are new to WFH because the pandemic changed their way of working. Further, employees were forced to share work at home and struggled to draw a line between work and home even though employees maintained their productivity. This study collected data from 294 Sri Lankan IT professionals by circulating questionnaires. The questionnaire mainly targeted understanding the relationship between gender, marital status, previous WFH experience, team collaboration, superior support, work environment, and productivity. The collected data were analyzed using the chi-squared test and regression analysis. The survivor shows that gender or marital status differences don't impact employees' productivity, which breaks the traditional belief that gender and marital status effects productivity. In contrast, the previous WFH experience, team collaboration, superior support, and work environment positively impact productivity. Also, this study suggests that after the pandemic, organizations allowing both onside and WFH will improve employees' productivity.

REFERENCES

[1] 2019 State of Remote Work Report. (n.d.). Retrieved December 2, 2021, from https://owllabs.com/state-of-remote-work/2019

[2] Akkermans, J., Richardson, J., & Kraimer, M. L. (2020). The Covid-19 crisis as a career shock: Implications for careers and vocational behavior. Journal of Vocational Behavior, 119(May), 1–5. https://doi.org/10.1016/j.jvb.2020.103434

[3] Aryee, S., Srinivas, E. S., & Tan, H. H. (2005). Rhythms of life: Antecedents and outcomes of work-family balance in employed parents. Journal of Applied Psychology, 90(1), 132–146. https://doi.org/10.1037/0021-9010.90.1.132

[4] Aslam -a, W., Hafeez -ab, M., -b, A., Ahmad -b, A., Ud Din -c, M., & Khan -b, M. (2020). Evaluating the Impact of Marital Status on Employees' Job Performance: Moderating Role of Hired Hand's Gender. International Journal of Advanced Science and Technology, 29(11s), 1699–1706.

[5] Bezerra, C. I. M., De Souza Filho, J. C., Coutinho, E. F., Gama, A., Ferreira, A. L., De Andrade, G. L., & Feitosa, C. E. (2020). How Human and Organizational Factors Influence Software Teams Productivity in COVID-19 Pandemic: A Brazilian Survey. ACM

International Conference Proceeding Series, October, 606–615. https://doi.org/10.1145/3422392.3422417

[6] Bilir, C. (2021). Project Success Criteria, Critical Success Factors (CSF), and Agile Projects. 52–72. https://doi.org/10.4018/978-1-7998-7872-8.ch004

[7] Blake-Beard, S. D. (2001). Taking a hard look at formal mentoring programs: A consideration of potential challenges facing women. Journal of Management Development, 20(4), 331–345. https://doi.org/10.1108/02621710110388983

[8] Canedo, E. D., & Santos, G. A. (2019). Factors affecting software development productivity: An empirical study. PervasiveHealth: Pervasive Computing Technologies for Healthcare, 307–316. https://doi.org/10.1145/3350768.3352491

[9] Chadee, D., Ren, S., & Tang, G. (2021). Is digital technology the magic bullet for performing work at home? Lessons learned for post COVID-19 recovery in hospitality management. International Journal of Hospitality Management, 92(October 2020), 102718. https://doi.org/10.1016/j.ijhm.2020.102718

[10] Fairlie, R. W., & Robb, A. M. (2009). Gender differences in business performance: Evidence from the characteristics of business owners survey. Small Business Economics, 33(4), 375–395. https://doi.org/10.1007/s11187-009-9207-5

[11] Ford, D., Milewicz, R., & Serebrenik, A. (2019). How remote work can foster a more inclusive environment for transgender developers. Proceedings - 2019 IEEE/ACM 2nd International Workshop on Gender Equality in Software Engineering, GE 2019, 9–12. https://doi.org/10.1109/GE.2019.00011

[12] Frick, V. (2020). Understanding software changes (Issue January 1995). https://doi.org/10.1145/3377812.3381400

[13] Gajendran, R. S., & Harrison, D. A. (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. https://doi.org/10.1037/0021-9010.92.6.1524

[14] Johnson, B., Zimmermann, T., & Bird, C. (2021). The Effect of Work Environments on Productivity and Satisfaction of Software Engineers. IEEE Transactions on Software Engineering, 47(4), 736–757. https://doi.org/10.1109/TSE.2019.2903053

[15] Jung, H. S., Jung, Y. S., & Yoon, H. H. (2021). COVID-19: The effects of job insecurity on the job engagement and turnover intent of deluxe hotel employees and the moderating role of generational characteristics. International Journal of Hospitality Management, 92(October 2020), 102703. https://doi.org/10.1016/j.ijhm.2020.102703

[16] Kniffin, K. M., Narayanan, J., Anseel, F., Antonakis, J., Ashford, S. P., Bakker, A. B., Bamberger, P., Bapuji, H., Bhave, D. P., Choi, V. K., Creary, S. J., Demerouti, E., Flynn, F. J., Gelfand, M. J., Greer, L. L., Johns, G., Kesebir, S., Klein, P. G., Lee, S. Y., … van Vugt, M. (2020). COVID-19 and the Workplace: Implications, Issues, and Insights for Future Research and Action. American Psychologist. https://doi.org/10.1037/amp0000716

[17] Lyness, K. S., & Heilman, M. E. (2006). When fit is fundamental: performance evaluations and promotions of upper-level female and male managers. The Journal of Applied Psychology, 91(4), 777–785. https://doi.org/10.1037/0021-9010.91.4.777

[18] Machuca-Villegas, L., & Gasca-Hurtado, G. P. (2019). Towards a Social and Human Factor Classification Related to Productivity in Software Development Teams. Advances in Intelligent Systems and Computing, 1071, 36–50. https://doi.org/10.1007/978-3-030-33547-2_4

[19] Masayuki, M. (2020). Productivity of Working from Home during the COVID-19 Pandemic: Evidence from an Employee Survey. Discussion Papers. https://ideas.repec.org/p/eti/dpaper/20073.html

[20] Mattingly, M. J., & Bianchi, S. M. (2003). Gender differences in the quantity and quality of free time: The U.S. experience. Social Forces, 81(3), 999–1030. https://doi.org/10.1353/sof.2003.0036

[21] McCreery, J., & Moranta, V. (2009). Mapping team collaboration in software development projects. PICMET: Portland International Center for Management of Engineering and Technology, Proceedings, 1088–1102. https://doi.org/10.1109/PICMET.2009.5262038

[22] Meyer, A. N., Fritz, T., Murphy, G. C., & Zimmermann, T. (2014). Software Developers ' Perceptions of Productivity Categories and Subject Descriptors. Proceedings of the 22nd ACM SIGSOFT International Symposium on Foundations of Software Engineering - FSE 2014, 2(Section 4), 19–29.

[23] Moss-Racusin, C. A., Dovidio, J. F., Brescoll, V. L., Graham, M. J., & Handelsman, J. (2012). Science faculty's subtle gender biases favor male students. Proceedings of the National Academy of Sciences of the United States of America, 109(41), 16474–16479. https://doi.org/10.1073/pnas.1211286109

[24] Oliveira, E., Conte, T., Cristo, M., & Valentim, N. (2018). Influence Factors in Software Productivity - A Tertiary Literature Review. International Journal of Software Engineering and Knowledge Engineering, 28(11–12), 1795–1810. https://doi.org/10.1142/S0218194018400296

[25] Petersen, J. K., Taylor, D., Bergström, P., Buer, A.-L., Darecki, M., Filippelli, R., Gren, I.-M., Hasler, B., Holbach, A., Nielsen, P., Petersen, L. K., Lindegarth, M., Lund, I., Maar, M., Ritzenhofen, L., Sagan, S., Saurel, C., Schernewski, G., Stybel, N., & Timmermann, K. (2020). Policy guidelines for implementation of mussel cultivation as a mitigation measure for coastal eutrophication in the Western Baltic Sea. DTU Aqua Report, 362, 1–33. https://doi.org/10.11581/dtu

[26] Ralph, P., Baltes, S., Adisaputri, G., Torkar, R., Kovalenko, V., Kalinowski, M., Novielli, N., Yoo, S., Devroey, X., Tan, X., Zhou, M., Turhan, B., Hoda, R., Hata, H., Robles, G., Milani Fard, A., & Alkadhi, R. (2020). Pandemic programming: How COVID-19 affects software developers and how their organizations can help. Empirical Software Engineering, 25(6), 4927–4961. https://doi.org/10.1007/s10664-020-09875-y

[27] Russo, D., Hanel, P. H. P., Altnickel, S., & van Berkel, N. (2020). Predictors of well-being and productivity among software professionals during the COVID-19 pandemic – A longitudinal study. ArXiv.

[28] Russo, D., Hanel, P. P. H., Altnickel, S., & van Berkel, N. (2021). The Daily Life of Software Engineers during the COVID-19 Pandemic. http://arxiv.org/abs/2101.04363

[29] Sahni, D. J. (2020). Impact of COVID-19 on Employee Behavior: Stress and Coping Mechanism During WFH (Work From Home) Among Service Industry Employees. International Journal of Operations Management, 1(1), 35–48. https://doi.org/10.18775//ijom.2757-0509.2020.11.4004

[30] Ünal-Karagüven, M. H. (2009). Psychological Impact of an Economic Crisis: A Conservation of Resources Approach. International Journal of Stress Management, 16(3), 177–194. https://doi.org/10.1037/a0016840

[31] WHO. (2020). Coronavirus Disease 2019 Situation Report 51 - 11th March 2020. WHO Bulletin, 2019(March), 2633. https://www.who.int/emergencies/diseases/novel-coronavirus-2019

[32] Zimmermann, T. (n.d.). Rethinking Productivity in Sof tware Engineering.