Decision (December 2021) 48(4):391–402
https://doi.org/10.1007/s40622-021-00295-5

RESEARCH ARTICLE

Identifying and ranking techno-stressors among IT employees due to work from home arrangement during Covid-19 pandemic

Shyamali Satpathy · **Gokulananda Patel** · **Khushboo Kumar**

Accepted: 26 October 2021 / Published online: 12 November 2021

Abstract Due to the outbreak of the Covid-19 across the globe, the extensive use of information technology has become the "new normal" in the present scenario of work from home arrangement. While many claim this policy to be a "win–win" strategy for both the employers and the employees, the Covid-19 pandemic has given the industries a valuable opportunity to assess the advantages and challenges of this strategy from a relatively long-term perspective. The remote work–psychological stress relationship is complex, and the current pandemic characterized by uncertainties and crisis atmosphere is making the situation worse. Amid constant changing scenario and prevailing decision fatigue, the objective of this research is twofolded. First, it aims to identify the techno-stressors impacting IT Professionals in the work from home mode. For this purpose, primary data were collected from 334 IT sector full-time employees and analysed using exploratory factor analysis and confirmatory factor analysis. Second, derive weight/rank of each techno-stressor using analytical hierarchy process to quantify the relative priority of the techno-stressors. This method includes both the qualitative and quantitative aspects of the complex problem. Findings revealed "fear of job loss due to new ICT" due to highest weightage appears to be the most pressing issue while "work beyond office hour" has least weightage. By identifying and prioritizing the type of techno-stressors using the mixed method approach, the present research intends to provide the useful input to decision makers in making wise decisions during Covid-19 pandemic and beyond.

Keywords Work from home · Technostress · Covid-19 · IT · Analytic hierarchy process

S. Satpathy
IILM Graduate School of Management, Greater Noida, India
e-mail: shyamalisatpathy@gmail.com

G. Patel (✉)
Birla Institute of Management Technology, Greater Noida, India
e-mail: gn.patel@bimtech.ac.in

K. Kumar
Jaypee University of Engineering and Technology, Guna, India
e-mail: khushboo.15aug@gmail.com

Introduction

The challenges created by Covid-19 pandemic have impacted the whole economy largely. Based on the prevailing unpredictable situation, flexible working models have been accelerated by the organizations in all over the world. "Work from home" (WFH) as a concept of remote working where employees work from their houses, has been adopted by all organizations. Almost all sectors have implemented the work from home policy as a measure to the maximum extent feasible for all activities. This became an important step against Covid-19 to reduce workplace contact. Many organizations switched to teleworking and virtual meetings through video conferencing to adapt and cope up with the current scenario. Working from home may continue even when the economy reopens. Companies in IT sector and financial service have invested in remote work tools as there is no trace of resuming the old way of working. The mode of working is now completely with rapid use of mobile phones, computer technology, e-mail, and collaboration tools. Long commutes have been replaced with zoom and other conference mode of working. The coronavirus pandemic changed the way of business and work system facilitated by smart technologies. According to an article, NASSCOM (The National Association of Software and Services Companies) is working to create new models of working and engagement systems. Though technology with work from home model has facilitated the organizations with positive outcomes such as increase in overall efficiency and production, saving the commute time at the same time it has posed a threat to the wellbeing and motivation of employees resulting in technostress with the more use of it. There are certain challenges with significant changes in the professional and personal life of individuals now. One of the challenges is psychological impact of technology on individuals which is known as "technostress". When employees go through a certain level of stress and anxiety, they lose confidence and interest in taking responsibilities, and their performance go down. Stress related to technology at workplaces has been investigated since 1980s, and many studies have addressed this problem for decades. The same problem has gained the researcher's much needed attention during Covid-19 pandemic due to ongoing work from home setting in IT industry all over the world. While organizations are constantly putting efforts to make virtual working mode effective in the current crisis, many people are finding it more stressful with this work-extension technologies. There is a negative impact on the psychological wellbeing of the employees due to this excessive and compulsive use of technologies. "Technostress"—stress caused by use of technology—leads to fatigue, anxiety, lack of sleep, depression and reduced performance. During this outbreak of Covid-19, IT industry in India has adopted "work from Home" as per government's mandate. There are numerous stressors due to information and communication technology at workplaces, and these stressors have been highlighted in many of the studies previously. The gap still exists in the area of technostress, and more is to be explored.

In view of the above, the objectives of this research are to explore and identify the techno-stressors impacting IT professionals in the work from home mode and deriving the weights of each stressor in order to prioritize them. Ranking of techno-stressors has been done using Analytical hierarchy process that is widely accepted method for multi-criteria decision analysis. This helps the decision support systems in structuring the potential stressors, assess their severity and take remedial action. This result may also provide support to the decision makers in order to assess ongoing or future decisions. For this purpose, four techno-stressors (techno-insecurity, techno-overload, techno-invasion and techno-complexity) originally classified by Tarafdar et al. (2007) and later widely used by the researchers for examining, prioritizing or comparing technology induced stress (Spagnoli et al. 2020) were selected. In this study, these four techno-stressors dimensions have been included because of their relevance to the present Covid-19 pandemic work settings where these techno-stressors have been highlighted as the more prevalent ones (Molino et al. 2020). The reason for selecting these techno-stressors is guided by the industry experts' opinion as well in addition to the literature survey. During the process, telephonic discussions were held with selected executives of reputed IT organizations, psychologists and university level academicians in order to understand the distressing factors affecting most individuals in the present scenario of work from home.

Next, exploratory factor analysis followed by confirmatory factor analysis of the techno-stressors has been performed and analysed. At the end, the analytic hierarchy process (AHP), based on mathematics and psychology, is a structured technique for analysing complex decisions. AHP deals with defining decision making processes taking in to consideration decision makers' perceptions, feelings, inputs, and judgements. It provides the decision makers an objective and logical structure to categorize a decision problem, for weighing its components (Karpak 2017; Saaty and Vargas 2012). The hierarchical model describes the criteria objects aligned with the main goal. Thus, it simplifies the whole decision making process by structuring the complex issue with multiple facets in a systematic way (Abdullah and Najib 2016).

At the outset, the aim of the study is to design techno-stressors framework based which would facilitate the policy makers, governments and decision makers to prioritize the stressors based on the weights assigned to them and later, decide upon the proposal of extending work from home post-Covid-19 pandemic. As government has lifted lockdowns in many parts of the world, employers are in huge discussion about resuming the regular office work culture. Therefore, in this context, the significant contribution of this study is the nature of the research technique adopted which is evidence based and can be replicated in different contexts and culture. Section 2 presents the literature review. Section 3 describes the used methodology and data. Section 4 presents and analyses the obtained results, and Sect. 5 concludes the paper.

Review of literature

'Technostress'—stress caused by technology—has been defined as the negative psychological impact of technology on people. Technostress is an emergent psychological illness induced by individual's lack of ability to adapt to new technology in an efficient and right way (Brod 1984). The model on technostress explains how IT create stressors which ultimately affect employees at workplaces (Ayyagari et al. 2011). Individuals depend on technologies, such as mobile and communication technologies, database technologies and social media technologies. Therefore, anything which causes technostress while working is an important consideration.

Use of ITC depends on both a user's attitude towards the using technology and what he/she perceives about the benefits or advantages of using the same (Davis 1989). More categorically, perceived usefulness can be explained as the extent to which an individual perceives that utilizing computer technology would lead to more efficiency and productivity. However, some individuals may possess a negative impression of the utility of ICT, still they are required to use it at their workplace. This perceptual subjectivity provokes the attitude to work harder to complete more and more assignments beyond one's capacity (Åborg and Billing 2003). The IT requirements also results in almost constant "connectivity" with frequent use of e-mail and the phone which demands the employees to be connected and available always. This leads to working beyond office hour where individuals are not able to control working hours, which creates feelings of being stressed out. This is one of the main reasons of dissatisfaction about the work which ultimately causes techno-invasion and triggers negative feelings towards technology (Weil and Rosen 1997). The techno-stressors related to ICT at the workplaces have been scientifically classified as: techno-overload (pressure to work much faster with extended hours), techno-invasion (constant connectivity causing blur boundary between professional and family life), techno-complexity (feeling of inadequate knowledge and skills related to ICT and pressure to learn and update), techno-insecurity (job insecurity due to new ICT upgradation or new ICT skilled person) and techno-uncertainty (difficulty to match with frequently changing ICT) (Tarafdar et al. 2007). Ayyagari et al. (2011) developed the P–E fit model of stress to describe computer-related stress. In sum, all the above-mentioned studies indicated individual's way of interaction with technology and the subjective evaluation of the ICT eventually leads to psychological reaction to ICT. The ICT also leaves individuals in organizations with obsolete skills (Ayyagari et al. 2011). The rapid changes in technologies also create a problem of higher level of techno-insecurity. He also stated that the constant changes of technologies have negative impact on the perceptions of individual on the use of ICT as they have a pressure to be updated to face the competition.

IT projects assigned to the users are causing health related problems, as such the complexity of technology pose a particular challenge to users in acquiring new skills to handle such projects (Morris and Venkatesh 2010). Some specific intrinsic characteristics of IT jobs including frequent changes in the technology, unexpected demand of new skills, and pressing deadlines always create a fear of obsolescence of skills of the users. While organizations foster new IT advancements, the workforce in IT sector is on a learning curve showing reduced productivity (Sethi et al. 1999). Technological changes resulting in increased job demands have pressurized individuals to acquire new job skills to handle new set of work environment (Sami and Pangannaiah 2006). In order to complete the tasks, employees are adopting new technologies which creates a scenario of competition with a sense of techno-insecurity. Individuals, who are in the pressure of facing competition with fear of losing jobs, are experiencing more anxiety and frustration. There are many observed impacts of technostress such as lower job commitment, reduction in professional effectiveness, low output, more conflict and isolation and more employee turnover (Igbaria and Siegel 1992). There is also an impact of technostress creators on employee innovation based on the nature of each creator (Chandra et al. 2019). This requires an awareness on the adverse effect of technostress and effective measures and also implementation of desired practices and strategies for managing technostress.

After a review of literature, it was found that a lot of work has been done in identifying the causes of technostress and its association with productivity and performance. But more attention needs to be paid on the indicators of technostress on employee working from home in detail. The current scenario of lockdown imposed by the widespread coronavirus pandemic has taken this technostress to the next level. Though work from home has reported increased productivity and efficiency during pandemic, there are evidences of IT employees working longer than usual hours, mixing work and family time and facing anxiety and depression. In the light of these speculations, it is vitally important for the employers or decision makers to adopt a systematic approach to analyse the repercussion of technostress on IT professionals and reconsider the proposal of extending work from home post-pandemic. As Covid-19 pandemic has emerged as a rare phenomenon, its consequences on mental stress have not been adequately reported. Consequently, in the year 2020–2021 use of data science and mathematical approaches to develop decision support system during pandemic for decision makers has grown extensively (Sardar et al. 2020). Further, Pileggi (2020) has revealed that a systematic approach in which all outcomes (positive, neutral and negative) are taken for evaluation produces accurate results and leads to better decision making. Unlike Chatterjee and Shukla (2020), the present study applies AHP approach (specifically designed for multi-criteria decision making) to identify and rank the most important factors creating technostress during work from home so that they should be considered while deciding upon the implementation and extension of work from home during and post-lockdown, respectively.

Methodology

Data collection

For collecting data, researchers exercised their judgement to select the 17 IT companies of India which have moved to work from home policy due to outbreak of Covid-19 pandemic. Based on extensive review of literature and inputs taken from the IT industry experts, two sets of questionnaire were prepared in two different phases in order to meet the research objectives.

In first phase, a questionnaire of 25 items with a five-point Likert scale was prepared to go for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to identify the stressors. A total of 398 employees were approached randomly out of which only 334 questionnaires were usable after eliminating incomplete and missing data. Based on the EFA and CFA, four stressors were identified.

In the second phase, a second set of questionnaire was developed based on the fundamental scale of Saaty (1980) after identifying stressors and sub-stressors from first phase to develop pairwise comparison matrices. This set of questionnaire was administered to the respondents of first phase, and out of 334 respondents, 225 responses were recorded.

Research method

Tests for reliability and validity of self-developed questionnaire items were performed on responses of first phase of questionnaire. Techno-stressors were identified with EFA followed by CFA with all 25 items of first phase. Using these techno-stressors, sub-stressors were identified under each stressor based once again with EFA, CFA and expert views. Using these techno-stressors and sub-stressors as criteria and sub-criteria for analytic hierarchy process (AHP), weights are derived for each factor and sub-factor and then ranking is assigned. In AHP, weights of the criteria as well as sub-criteria have been derived using eigenvector method (EM) as principal eigenvector captures transitivity to obtain the correct ranking on a ratio scale of the alternatives (Saaty and Hu 1998).

When the element dominance properties are violated, linear programmes (LP) are formulated based on pairwise comparison matrix derived from AHP. A two-stage LP approach for generating a priority vector was used. On the first stage, a linear programme was formulated that provides a consistency bound for a pairwise comparison matrix. In the second stage, we use the consistency bound in a linear programme whose solution is a priority vector of alternatives. This method is known as LP-AHP approach (Chandran et al. 2005; Patel et al. 2016).

Results

Exploratory factor analysis (EFA)

Initially, to verify the factorability of the data for exploratory factor analysis, Kaiser–Meyer–Olkin (KMO) test was performed. The KMO value was 0.950 which is above the threshold value indicated the adequacy of the sample to perform exploratory factor analysis (Hair 2009). Finally, EFA was executed for all 25 items of measurement scale using Principal Component Analysis with varimax rotation to identify underlying factor structure and test the construct validity. All 25 items were considered in four stressors based on their loadings. Total four factors/stressors were extracted with factor loadings greater than 0.4 and eigenvalue greater than 1 (Nunnally 1994). These items are explaining 67.756 per cent of total variance. The factor loadings of each item are shown in Table 1.

Confirmatory factor analysis (CFA)

CFA for techno-stressors

Confirmatory factor analysis confirmed how well the measured techno-stressors, i.e. techno-insecurity, techno-overload, techno-Complexity and techno-invasion (F1, F2, F3 and F4, respectively), represent the number of latent variables (f1 to f25). Structural equation modelling technique has been used to conduct CFA. Figure 1 shows the measurement model reflecting standardized estimates for all 25 variables. All are satisfying the minimum requirement except CFI (0.893) and average variance explained of techno-invasion (0.483) which was missing marginally by 0.007.

The model fit indices are reported in Table 2.

CFA for sub-stressor techno-overload

All 10 items under techno-overload were subjected to CFA, and model fit indices are shown in Table 3. All the parameters are satisfying the minimum requirements. Sub-stressors for techno-insecurity, techno-complexity and techno-invasion have 7, 4 and 4 items, respectively, for which we have gone for sub-stressors based on expert views. Sub-stressors with variables of these techno-stressors are shown in Table 4.

Analytical hierarchy process (AHP)

Goal setting and developing hierarchical structure of criteria

Total 10 sub-stressors categorized under 4 main techno-stressors (techno-insecurity, techno-overload, techno-complexity and techno-invasion) derived in Sects. 4.1 and 4.2, have been included for conducting AHP. Figure 2 provides the list of criteria and sub-criteria of techno-stressors.

Developing pairwise comparison matrices

Two criteria having a common parent are compared. The numerical representation of the comparison in the matrix form is known as pairwise comparison square matrix. In a matrix, for a set of n criteria, $n(n-1)/2$ comparisons are needed. All elements of the diagonal are 1 because on the diagonal, elements are compared with themselves. The remaining half of the judgements are reciprocals. The scale was proposed by Saaty (1980). The numbers 1, 3, 5, 7 and 9 represent the intensity of comparison with even numbers 2, 4, 6 and 8 being used for intermediate judgments. The elements of a pairwise comparison matrix are designated as a_{ij} where a_{ij} the geometric mean of the responses of respondents to minimize the effect of outliers.

Let w_i be the weight of ith criteria and w_j the weight of jth criteria, then we have

Table 1 Factor loading, Cronbach's alpha (α) and KMO measures of sampling adequacy

Techno-stressors	Item no	Variables/item	Factor loading	Cronbach's alpha	KMO
Techno-insecurity (F1)	f7	I feel constant threat to my job security	0.521	0.91	0.916
	f15	There is always a fear of obsolescence in skill	0.601		
	f21	New technology always puts threat on me	0.736		
	f22	I always have to upgrade my skills to avoid being replaced	0.549		
	f23	I feel threatened by the new recruits having new technological skills	0.674		
	f24	I feel there is a less sharing of knowledge among co-workers for fear of being replaced	0.708		
	f25	I do not see a long-term commitment towards my job (job security)	0.544		
Techno-overload (F2)	f1	I often attend too many assignments at the same time	0.575	0.93	0.931
	f2	I often have to work more than I can handle	0.580		
	f3	I am forced to work with very tight work schedule	0.603		
	f4	I am forced to change my work habits to be updated	0.631		
	f5	I often have to work beyond office hours	0.672		
	f16	I often receive assignments without adequate resources	0.628		
	f17	I often have to go beyond the work policy to carry out my assignments	0.624		
	f18	There are unreasonable pressures to meet the deadlines	0.599		
	f19	I often receive different assignments from two or more sources	0.609		
	f20	I am often asked to perform different roles	0.543		
Techno-complexity (F3)	f6	I do not know much about the technology to perform my job	0.544	0.88	0.793
	f8	I do not find enough time to understand new technology	0.694		
	f9	I often find it too complex to understand a new technology	0.748		
	f10	I find others know more about the technology than I do	0.484		
Techno-invasion (F4)	f11	I feel my personal life being invaded during work from home	0.493	0.78	0.747
	f12	I hardly meet my personal commitments during work from home	0.631		
	f13	I have to work during my weekends and vacations	0.540		
	f14	I feel my individual privacy has been compromised	0.682		

KMO (all items) = 0.95 Cronbach's alpha(all items) = 0.960

$$a_{ij} = {}^{w_i}\!/_{w_j} \quad i,j = 1,2,\ldots,n \tag{1}$$

$$A = \begin{pmatrix} w_1/w_1 & w_1/w_2 & \ldots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \ldots & w_2/w_n \\ \vdots & \vdots & \vdots & \vdots \\ w_n/w_1 & w_n/w_2 & \ldots & w_n/w_n \end{pmatrix} = (a_{ij})$$

For the matrix A with eigenvalue n, the vector $w = (w_1, w_2, \ldots w_n)$ is the principal eigenvector. The matrix A is consistent if $Aw = nw$

If A is not consistent, we write $Aw = \lambda_{\max} w$, (2)

$$\text{Where,} \quad \lambda_{\max} = \sum_{i=1}^{n} \sum_{j=1}^{n} a_{ij} w_j \tag{3}$$

Eigenvector method (EM)

An eigenvector vector of a linear transformation is a nonzero vector that changes at most by a scalar vector during application of that linear transformation. The corresponding eigenvalue is the factor by which

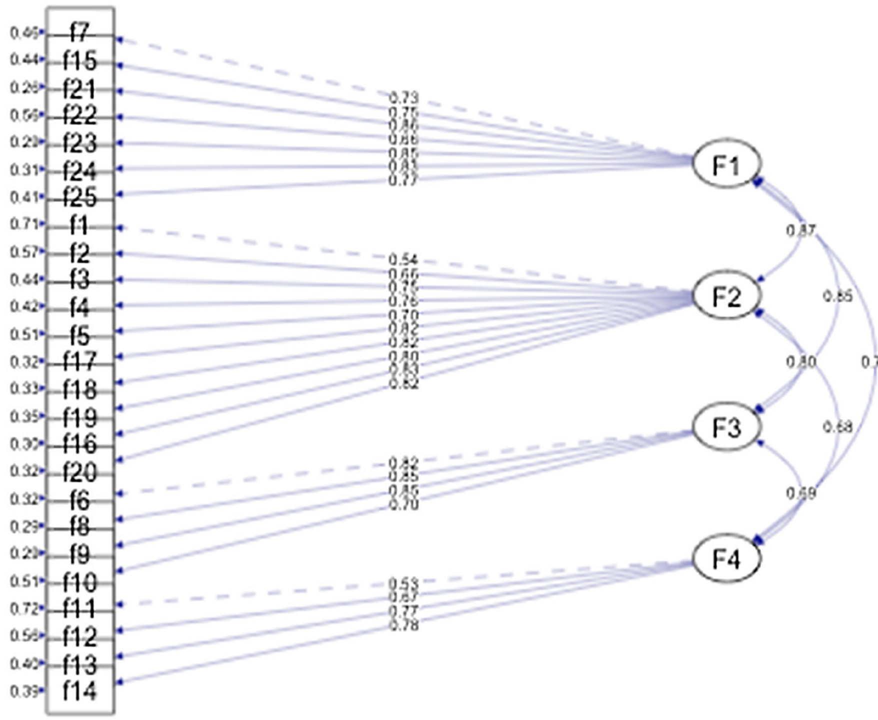

Fig. 1 The measurement model developed in R

Table 2 Model fit indices for criteria

Sl no	Techno-stressors/criteria	AVE	CR	
1	Techno-insecurity	0.649	0.928	CFI: 0.893
2	Techno-overload	0.632	0.944	TLI: 0.881
3	Techno-complexity	0.652	0.882	RMSEA: 0.084
4	Techno-invasion	0.483	0.785	SRMR: 0.053

Table 3 Model fit indices for sub-criteria

Techno-stressors/criteria	Sub-factors/sub-criteria	Item number	AVE	CR	
Techno-overload	Working beyond office hours	f4,f16, f18, f20	0.588	0.811	CFI: 0.937
	More sources of work	f1, f2, f5	0.493	0.733	RMSEA:0.098
	Pressure to meet deadlines	f3, f17, f19	0.517	0.922	SRMR: 0.046
					TLI: 0.911

eigenvector is scaled. Principal eigenvector of the comparison matrix A can be used as the desired priority vector. EM is based on solving the following equation.

$$Aw = \lambda w,\ e^T w = 1$$

The principal eigenvector $\lambda_{\max}$ of A is determined after solving the characteristic equation,

$$\det(A - \lambda_{\max} I) = 0$$

where I denotes the identity matrix.

Table 4 Sub-criteria based on expert views

Techno-stressors/criteria	Sub-factors/sub-criteria	Item no	Techno-stressors/criteria	Sub-factors/sub-criteria	Item no	Techno-stressors/criteria	Sub-factors/sub-criteria	Item no
Techno-insecurity (F1)	Pressure to update skills	f15 f22	Techno-complexity (F3)	Lack of techno-knowledge	f6 f10	Techno-invasion (F4	Lack of privacy	f11 f14
	Threat from new recruits	f23 f24		Challenges in tools and platforms	f8 f9		Inability to meet personal commitments	f12 f13
	Fear of job loss due to new ICT	f7 f21 f25						

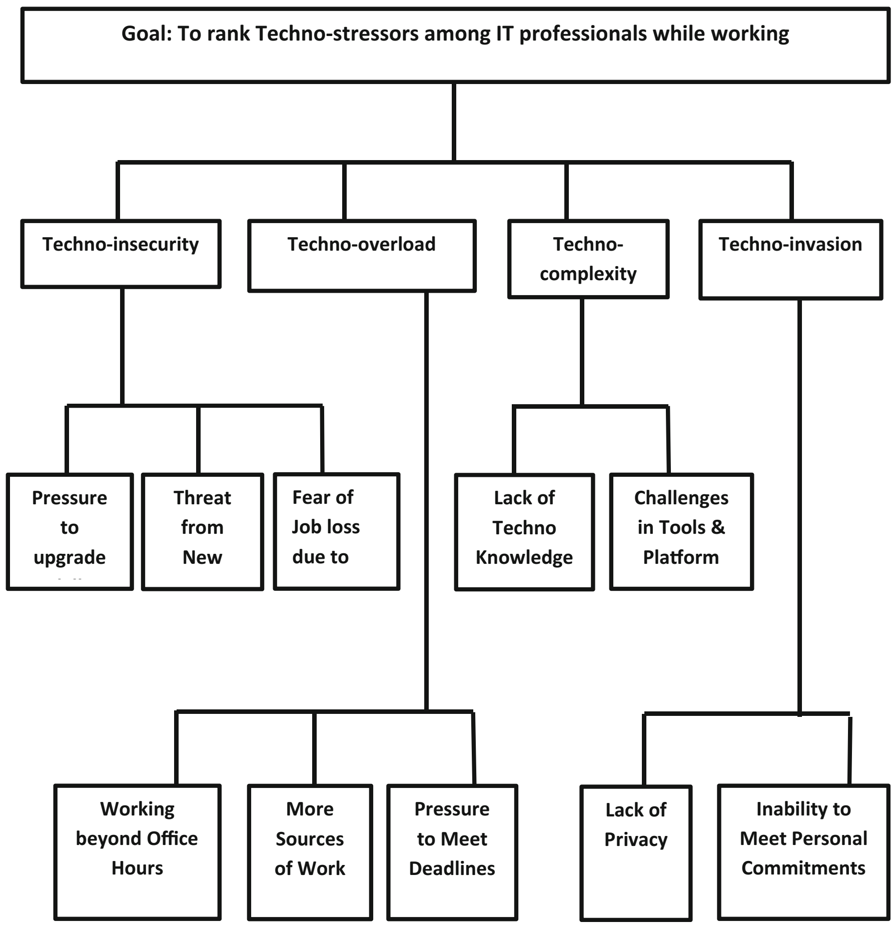

Fig. 2 The hierarchical structure of techno-stressors (Criteria for AHP)

Then, using the value of $\lambda_{\max}$, the eigenvector $w = (w_1, w_2, \ldots w_n)$ is found out from the set of simultaneous linear equations:

$$(A - \lambda_{\max} I)w = 0$$

Consistency check

Consistency is checked to determine to what extent an assessment made by the decision makers is reliable. Consistency ratio (CR) is to measure how consistent the judgements are relative to large samples of random judgements. CR is calculated by dividing the consistency index of pairwise comparison matrix by the set of judgements by the index for the corresponding random matrix. Saaty suggested (1980) that if the ratio exceeds 0.1, the set of judgements may be too inconsistent to be reliable. The consistency index (CI), random consistency index (RI), and consistency ratio (CR) have been computed to check the inconsistency of comparison matrix using the formula proposed by Saaty (1980).

$$CI = \frac{\lambda_{\max}}{n-1}, \quad CR = \frac{CI}{RI}$$

where $\lambda_{\max}$ is the principal eigenvector.

Table 5 represents the random consistency index values (RI) for different matrix sizes (n). Maximum acceptable limit for CR is 0.1. If it is greater than 0.1, then the decision assessment is considered to be inconsistent.

Table 6 presents the details of pairwise comparison matrix. Weights using eigenvector method (EM) are shown in the last column and consistency ratio in the last row.

In Table 6, it can be observed that $a_{42} = 1.253$, which implies that the weight of fourth criteria (techno-invasion) be greater than or equal to weight to second criteria (techno-overload), which have been violated here. To obtain weights, without the violation of element dominance, LP-AHP approach discussed in previous studies by Chandran et al. (2005) and Patel et al. (2016) has been used.

Table 5 Random consistency index (RI) values

N	2	3	4	5	6	7	8	9
RI	0.00	0.58	0.90	1.22	1.24	1.32	1.41	1.45

Source: Saaty (1980)

Deriving weights for techno-stressors and their sub-factors

The local weights of other matrices have been calculated with eigenvector method and they did not violate element dominance property. The global weights and the local weights of techno-stressors are mentioned in Table 7. All comparison matrices are satisfying the consistency ratio less than 0.1.

The global weight 0.134 of "pressure to upgrade skills" is calculated as 0.223 multiplied with the weight 0.611 of "techno-insecurity", where "techno-insecurity" is the higher level of "pressure to upgrade skills". Similarly, the global weight 0.038 of "work beyond office hour" is calculated as 0.287 multiplied with the weight 0.138 of "techno-overload", where "techno-overload" is the higher level of "work beyond office hour". In this way, the weights of all items have been derived.

Assigning rank to techno-stressors and their sub-factors

The numbers mentioned inside the bracket in the first and last column of Table 7 represents the ranking of each techno-stressor criteria. The ranks have been assigned to each techno-stressors based on their weights. "Techno-insecurity" (F1) is the most important dimension, while "techno-overload" (F2), "techno-complexity" (F3) and "techno-invasion" (F4) are of same importance. The top three most important indicators with respect to their global weights are "pressure to upgrade skills", "threat from new recruits" and "fear of job loss due to new ICT" and all these fall under the criteria "techno-insecurity". It implies that the higher the weight, more will be contribution to technostress. Thus, the most contributing factor to technostress in IT sector during work from home is "fear of Job loss due to new ICT" under the criteria "techno-insecurity" while the factor perceived by the employees as least contributing is found to be "work beyond office hour" under the criteria "techno-overload".

Discussion

During coronavirus pandemic, "work from home (WFH)" policy proved to be a saviour for employers

Table 6 Pairwise comparison matrix with geometric mean

Criteria	Techno-insecurity	Techno-overload	Techno-complexity	Techno-invasion	Weight by EM
Techno-insecurity	1.000	3.022	6.236	4.521	0.570
Techno-overload	0.331	1.000	3.968	0.798	0.188
Techno-complexity	0.160	0.252	1.000	0.342	0.064
Techno-invasion	0.221	1.253	2.924	1.000	0.177
λ_{max} = 4.105, CR = 0.035					

Table 7 Weights, local weights, global weights and ranking of the main techno-stressors and associated sub-factors

Techno-stressors (criteria)	Weight	Sub-factors (sub-criteria)	Local weight	Global weight with rank
Techno-insecurity (1)	0.601	Pressure to upgrade skills	0.223	0.134 (3)
		Threat from new recruits	0.328	0.198 (2)
		Fear of job loss due to new ICT	0.449	0.270 (1)
Techno-overload (2)	0.133	Working beyond office hours	0.287	0.038 (9)
		Pressure to increase pace of work	0.347	0.046 (8)
		Pressure to meet deadlines	0.366	0.049 (7)
Techno-complexity (2)	0.133	Lack of techno-knowledge	0.377	0.051(6)
		Challenges in tools and platform	0.623	0.082 (4)
Techno-invasion (2)	0.133	Lack of privacy	0.411	0.054(5)
		Inability to meet personal commitments	0.623	0.082 (4)

as well as employees. WFH was embraced all over the world especially in IT industry as a "win–win" strategy. Industrialists claimed to have increased employee productivity during remote working. But at the same time, WFH is taking a toll on employees' mental health in the form of increased technostress, anxiety, work-overload and inability to separate work from their personal lives, violence, etc. (Piquero et al., 2020). Psychologists have also claimed that extensive use of ICT has adverse effect on employee's mental health.

But, these types of virtual workplace arrangements reduce the employer's overall cost and ensure high connectivity with contractors and other stakeholders as well (Spreitzer et al., 2017). Consequently, months after the lockdown was relaxed and removed in many countries, a heated debate on extending WFH post-pandemic has sparked. Gartner (2020) has also confirmed in his study that current Covid-19 situation is likely to trigger the WFH trend after the pandemic too.

Grounded on the above-mentioned fact, the purpose of the present study is twofolded. First, it provides the weighted framework of present techno-stressors prevalent due to WFH policy among IT employees. This will give a practical insight to the policy makers and employers to prioritize these technostress creators and take appropriate measures in order to reduce them. Second, due to the uncertain and vague nature of Covid-19 pandemic AHP methodology which is appropriate for multi-criteria decision making (Abdullah and Najib 2016) has been applied so that the weighted hierarchy model of techno-stressors would help them in designing better post-pandemic work policy. The present result that prioritizing the indicators/factors would help the policy makers and governments to design post-lockdown work strategy. Recent work on technostress by Spagnoli et al. (2020) has highlighted multi-tasking, pressure to acquire new skills, often ICT upgradation, technical glitches and consequent insecurities and threat related to job to be the most prominent technostress creators during pandemic.

Our finding shows that "techno-insecurity" having weight 0.601 has been perceived as the biggest stressor among employees in IT sector during work from home. In congruence with the findings of Spagnoli et al. (2020), fear of job loss due to new recruits, frequent ICT system upgrade and pressure to upgrade one's own skills have been important indicators of techno-insecurity. Recent works have extensively reported how WFH has triggered fear of job loss among workforce which is not only because of the pandemic situation but also due to the rapid technological advancements that employees are not able to match up. Our findings are consistent with these evidences. Notably, dimensions like had equal rank in terms of prioritization. That does not mean they are irrelevant or less important. Clearly, in such complex pandemic situation, technostress creators under the dimension "techno-insecurity" need immediate attention while others are long-term priorities.

Conclusions

Working from home due to Covid-19 has transformed the whole economy with its industries and jobs. Managers and the policy makers are facing decision fatigue in this pandemic characterized by uncertain and complex nature. In the light of this, this study brings insights to form managerial implications for understanding the emerging phenomenon of the techno-stressors in connection with working from home and take tactical decisions later. Our finding shows that "fear of job loss due to new ICT" under the criteria "techno-insecurity" has been perceived as the biggest stressor among the employees of IT sector. Techno-insecurity is due to the reason that employees in IT sector feel immense pressure to upgrade their ICT skills to keep their jobs safe. These employees are even worried that new recruits may perform their jobs posing a threat to them. Moreover, the advancement in new ICT is posing the threat employees. Thus our evidence on the reasons associated with techno-insecurity has potentially important implications for the management in IT sector. While advances in technology, skill gap and new recruits are increasing the stress and anxieties among the employees, their effects could be offset by stronger policies in IT organizations. Further, post-pandemic strategy (e.g. WFH) must ensure stability and job security among the employees as a robust Covid-19 containment policy tends to decrease the unemployment rate (Tran et al. 2020). These policies can include transparency in hiring process, enhancing trust in management, increasing the sense of procedural fairness, raising employees' efforts and achieving greater workforce flexibility. The existing work system in a working from home mode can be restructured and redesigned with appropriate collaboration of technology.

At the outset, the findings of this paper intend to provide an insight to the managers and policy makers in various ways. The managers can use this approach as an investigation tool to explore the degree to which each stressor affects the remote employees and to take necessary actions to deal with technostress in the present scenario. However, It is imperative to note that multi-criteria decision making methods indicates towards the possibility of best answer therefore, it should only be used as decision support tool not as the method to derive final solution. As, the scope of this study was limited to only four out of the five technostressors originally reported by previous researcher, in future, a more detailed and comparative study on technostress can be conducted in other sectors and technostress coping alternatives can also be discussed in greater detail. The findings of this study also guide the future researchers to replicate this study in different context.

Funding No funds have been utilised for this research work.

Declarations

Conflict of interest There is no conflict of interest.

References

Abdullah L, Najib L (2016) A new preference scale mcdm method based on interval-valued intuitionistic fuzzy sets and the analytic hierarchy process. Soft Comput 20(2):511–523

Åborg C, Billing A (2003) Health effects of 'the Paperless Office'–evaluations of the introduction of electronic document handling systems. Behav Inf Technol 22(6):389–396

Ayyagari R, Grover V, Purvis R (2011) Technostress: technological antecedents and implications. MIS Q 831–858

Brod C (1984) Technostress: the human cost of the computer revolution. Addison-Wesley, Reading

Chandra S, Shirish A, Srivastava SC (2019) Does technostress inhibit employee innovation? Examining the linear and curvilinear influence of technostress creators. Commun Assoc Inf Syst 44(1):19

Chandran B, Golden B, Wasil E (2005) Linear programming models for estimating weights in the analytic hierarchy process. Comput Oper Res 32(9):2235–2254

Chatterjee S, Shukla A (2020) Identification and risk profiling of major stressors in the Indian IT sector. Global Bus Rev 0972150919886457

Davis FD (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q 319–340

Gartner (2020) Gartner HR survey reveals 41% of employees likely to work remotely at least some of the time post coronavirus pandemic. News Release. https://www.gartner.com/en/newsroom/press-releases/2020-04-14-gartner-hr-survey-reveals-41–of-employees-likely-to-

Hair JF (2009) Multivariate data analysis, DigitalCommons@Kennesaw State University

Igbaria M, Siegel SR (1992) The reasons for turnover of information systems personnel. Inf Manag 23(6):321–330

Karpak B (2017) Reflections: Mathematical principles of decision making. Int J Anaytic Hierarchy Process 9(3)

Lönnroth K (2020) Income security during public health emergencies: the COVID-19 poverty trap in Vietnam. BMJ Glob Health 5(6):e002504

Molino M, Ingusci E, Signore F, Manuti A, Giancaspro ML, Russo V, Zito M, Cortese CG (2020) Wellbeing costs of technology use during Covid-19 remote working: an investigation using the Italian translation of the technostress creators scale. Sustainability 12(15):5911

Morris MG, Venkatesh V (2010) Enterprise resource planning systems implementation and organizational change: impacts on job characteristics and job satisfaction. MIS Q 34(1):143–161

Nunnally JC (1994) Psychometric theory 3E. Tata McGraw-hill Education, New York

Patel G, Mjema GD. Godwin KM (2016) Linear programming models for estimating weights in analytic hierarchy process and for optimization of human resource allocation. Int J Hierarchy Process 8(2)

Pileggi SF (2020) Is the world becoming a better or a worse place? A data-driven analysis. Sustainability 12(1):88

Piquero AR, Riddell JR, Bishopp SA, Narvey C, Reid JA, Piquero NL (2020) Staying home, staying safe? A short-term analysis of COVID-19 on Dallas domestic violence. Am J Crim Justice 45(4):601–635

Saaty TL (1980) The analytic process: planning, priority setting, resources allocation. McGraw, New York

Saaty TL, Hu G (1998) Ranking by eigenvector versus other methods in the analytic hierarchy process. Appl Math Lett 11(4):121–125

Saaty TL, Vargas LG (2012) Models, methods, concepts and applications of the analytic hierarchy process, 2nd edn. Springer, London, pp 5–6

Sami LK, Pangannaiah NB (2006) "Technostress" A literature survey on the effect of information technology on library users. Libr Rev

Sardar T, Nadim SS, Rana S, Chattopadhyay J (2020) Assessment of lockdown effect in some states and overall India: a predictive mathematical study on COVID-19 outbreak. Chaos Solitons Fractals 139:110078

Sethi V, Barrier T, King RC (1999) An examination of the correlates of burnout in information systems professionals. Inf Resour Manag J (IRMJ) 12(3):5–13

Spagnoli P, Molino M, Molinaro D, Giancaspro ML, Manuti A, Ghislieri C (2020) Workaholism and Technostress during the Covid-19 emergency: the crucial role of the leaders on remote working. Front Psychol 11:3714

Spreitzer GM, Cameron L, Garrett L (2017) Alternative work arrangements: two images of the new world of work. Annu Rev Organ Psych Organ Behav 4:473–499

Tarafdar M, Tu Q, Ragu-Nathan BS, Ragu-Nathan TS (2007) The impact of technostress on role stress and productivity. J Manag Inf Syst 24(1):301–328

Tran PB, Hensing G, Wingfield T, Atkins S, Annerstedt KS, Kazibwe J, Turel O, Gaudioso F (2018) Techno-stressors, distress and strain: the roles of leadership and competitive climates. Cognit Technol Work 20(2):309–324

Weil MM, Rosen LD (1997) Technostress: coping with technology@ work@ home@ play, vol 13. Wiley, New York, p 240