How does technostress during a pandemic affect employee attrition in IT/ITeS industries? Insights from India
by Anuj Batta and Arpan K. Kar

Abstract
Many organizations utilize information and communication technologies (ICTs) to maximize the efficiency and effectiveness of their employees in order to achieve best possible resource utilization. With many salient positive outcomes and benefits for organizations, the use of ICTs also imposes a risk of increased stress for employees, referred to as ‘technostress’. This study tests a model to identify the relationship between technostress and employee attrition in information technology (IT) companies in India during a pandemic which in turn escalated dependencies on ICTs, creating stress among employees. Multiple constructs have been utilized using the ‘person-environment fit’ model for this study. Primary data collection with stratified sampling was administered on a multinational IT firm. Statistical tests were performed and inferential model was developed. The findings support the model, providing insights into the role, significance, and ranking of six constructs in employee attrition. The outcome clearly suggests the presence of technostress due to ICTs and its effects on employee attrition during a pandemic.

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1. Introduction
Globally, in information technology (IT) industries, employees increasingly feel the need to relearn new skills to remain relevant. Major challenges often occur when focused learning is introduced due to sudden changes in the ecosystem, with the time to cope with changes is suddenly and drastically reduced. Such changes could occur during a pandemic when employees may be forced to work on new digital platforms in efforts to meet deliverables. Such changes create stress for employees, leading in some cases to undesirable behavior (Longenecker, et al., 1999).
This study focuses on the effect of technostress on employee attrition during the COVID-19 pandemic in 2020. Employee attrition in this paper means a gradual reduction of the work force by resignation or retirement of existing employees (Alao and Adeyemo, 2013). In existing literature, different disciplines have different meanings for stress. As defined by Levine (2005), stress is a complex, multidimensional construct, where three ingredients play significant roles: (a) observational inputs, when the stressor is noticed and evaluated; (b) primary centralised processing of information related to stress; and, (c) reaction as a stress response (de Kloet, et al., 2019). Stress may arise when demands imposed by an environment exceed an individual’s resources, threatening their well-being (Srivastava, et al., 2015).

Technostress, as a term, was introduced in a popular sense by Brod (1984), a clinical psychologist. He defined technostress caused by one’s inability to cope or deal with ICTs in a healthy manner (Ayyagari, et al., 2011). Technostress refers to stress that results from both the use of information and communication technologies (Brod, 1984; Tarafdar, et al., 2010) and the pervasiveness and expectations of ICT use in society in general (Riedl, et al., 2012; Robinson, et al., 2020). The technostress model explains how IT artefacts create stressors and how those stressors affect workers in organizations (Tarafdar, et al., 2010; Ayyagari, et al., 2011).

The prevalent usage of ICTs often results in almost constant connectivity through e-mail, phone, and social media (Valecha, et al., 2018). Because connectivity, employees may feel that they are always available and on call. This leads them to believe that they have lost control over their time, in turn generating stress. Stress leads to dissatisfaction about work-life balance, triggering negative feelings (Sellberg and Susi, 2014). Some studies have suggested that technostress may be both positive and negative and can be useful for both employees and organizations — if managed appropriately (Califf, et al., 2020).

The World Health Organization describes a virus pandemic as an event in which a new virus appears which the human population has no immunity, resulting in several, simultaneous epidemics worldwide with enormous numbers of deaths and illness. In the COVID-19 pandemic, quarantine, social distancing, and isolation of infected populations contained the virus (Anderson, et al., 2020). Following trends from other countries, India implemented a lock-down starting 24 March 2020 for 21 days and then extended it until 31 May 2020 (Robinson, et al., 2020). As the economy was badly affected, with closed offices, every enterprise planned and operationalized for employees to work from home with the help of ICTs. Professionals used virtual private networks to operate within organizational systems (Biswas, 2020). Professionals in information systems experienced relatively high absenteeism, lower job commitment, and relatively high employee attrition (Heinssse, et al., 1987). Further, given the continuous adoption of new information technology (IT) by organizations, the IT workforce has always on a learning curve and consequently exhibits low productivity (Fuglseth and Sørebo, 2014).

Much of the research on stress in information systems has been on the stress levels of IS professionals (Moore, 2000; Ahuja, et al., 2007; Tarafdar, et al., 2010). These studies did not specifically explore the relationship between technostress and negative effects on business through performance indicators, such as attrition. This study examines this relationship.

ICTs play a very important role in an individual’s life and especially during a pandemic (Carter and Grover, 2015). In a pandemic, when every employee in IT may be working from home, usage of ICTs increases many times. Some organizations may take advantage of the situation by assigning more work than usual, in part because some employees are worried about job security (Blake, et al., 2010). This study attempts to answer a primary research question — ‘How does ICT based interaction for organizational deliverables affect employee engagement as reflected in employee attrition during a pandemic?’ This specific study focused on the IT and ITes domains because they were affected a great deal during the pandemic. The broader scope of this study examines the following questions:

1. How does technostress affect employee attrition in IT/ITes firms?
2. How can antecedents of technostress be prioritized, based on their effects on employee attrition?
To summarize, the main purpose of this study is to investigate the direct impact of technostress on employee attrition in IT companies during a pandemic. To conduct this study, primary data from employees of a multinational IT company in India was collected. Statistical tests were performed on this data. Finally, inferential models were developed and tested. Based on the results of this study, managers can plan effective strategies to optimize the usage of ICTs in order to minimize attrition and improve organisational performance.

2. Theoretical background

In the last decade, there has been a radical change in information flow and communication. The primary reason appears to be advancements in technology as well as the evolution of the Web and exponential growth of social media. New technologies, with their rapid evolution and ubiquitous access, have resulted in very different effects on personal and professional lives. In the most recent cases of lock-downs and a pandemic, the importance of ICTs has become more pervasive.

2.1. ICTs and employees

Employers engage their employees in many different ways thanks to technologies (Benitez-Amad, et al., 2015; Johnson, et al., 2016). Effective utilization of information and communication technologies has an impact on economic growth and development. Adoption of ICTs has enabled enterprises to compete globally, bringing customers and suppliers closer.

ICT usage results in more visibility, faster information access, overcoming traditional barriers, reducing turnaround time, and securing financial transactions (Mittlböck and Schemper, 1996; Senivongse, et al., 2019). For employees, ICT provides flexible working hours, sharing of ideas, learning opportunities, and professional growth (Ahmad and Huvila, 2019; Phung, et al., 2019). ICT is also beneficial for the internal support teams including human resources, enhancing overall capabilities and performance of a given organization (Benitez-Amado, et al., 2015; Turulja and Bajgoric, 2018).

Despite numerous benefits of ICT usage, there are some negative issues for employees and indirectly for organizations (Morrison and Gomez, 2014; Majchrzak, et al., 2016; Yang and Yin, 2020; Kloker, 2020). Research suggests that ICT usage affects the well-being and work motivation, leading to reduced performance and increased stress (Tarafdar, et al., 2010). One of the primary functions of ICT usage is enabling information flow, sometimes resulting in information overload and stress (Ayyagari, et al., 2011).

2.2. Technostress

This study focuses on the negative aspects of technology identified as ‘technostress’ — stress caused by technologies and its direct impact on employee attrition. Technostress occurs when a person, subjected to information overload and continuous contact with digital devices, develops stress, or an abnormal response characterized by specific symptoms at cardiovascular, mental, and neurological levels (Chiappetta, 2017).

Technostress was recognized as an occupational disease in 2007. As a consequence, technostress is considered a work-related risk. Assessment of technostress in the workplace requires adequate protection and prevention measures, such as increased training of employees and implementation of specific strategies for managing symptoms. Technostress is composed of three separate, but overlapping dimensions: (a) feelings of anxiety; (b) negative attitudes; and, (c) negative cognitions (Weil and Rosen, 1997).

In spite of research on technostress in organizations, there is little evidence on identifying the direct impact of technostress on employee attrition, especially in the unique circumstances of a pandemic. Employee attrition has several organizational costs including training and replacement, loss of expertise, insecurity,
and inconsistent performance. Hence it is important to examine factors contributing to high employee attrition (Salanova, et al., 2013). Companies retain critical employees because their contextual knowledge and skills (Sumbal, et al., 2020).

2.3. Employee attrition

In this study, attrition is identified as resignation due to technostress. Employee attrition is one of the most significant problems which organizations face on an ongoing basis because it is very difficult to predict and control subsequent damages (Igbaria and Siegel, 1992; Wang, et al., 2017). It leads to multiple issues and challenges including an impact on timely delivery of services, negative effects on employees, reduced quality of work, high costs for replacement, and declining customer loyalty (Sexton, et al., 2005). Voluntary turnover rates have also been linked to a decreased financial performance (Glebbeek and Bax, 2004) and reduction in a firm’s reputation (Flanagan and O’Shaughnessy, 2005).

As a result, it is imperative that organizations understand and identify the causes of employee attrition, preventing it by formulating strong retention strategies (Lo, 2015; Zhao, et al., 2019). Technostress during a pandemic may be a cause of employee attrition. Some employees may not adapt to a changed environment, induced in part by a greater dependency on IS. This study explores this phenomenon.

2.4. Theoretical model

The ‘Person-Environment fit (P-E fit) model’ is used as a theoretical framework for this study. Person-environment fit can be defined as the fitness and compatibility between an employee’s personality, characteristics, and aspirations with a given work environment. Even though an individual is influenced by Person-Environment fit at the beginning of a career it will change over time in various stages of a career. Thus, it can lead to different levels of fulfilment or stress (Abbas, et al., 2015). The P-E fit model is often used in research on stress.

![Person-Environment fit theory](image-url)

**Figure 1:** Person-Environment fit theory (Abbas, et al., 2015).
The same level of demand on two individuals can be interpreted and felt as different levels of demand based on personalities (Ayyagari, et al., 2011; Esmaeelinezhad and Afrazeh, 2018). This approach can be useful when analyzing an individual’s capabilities to meet demands imposed by an environment.

Some researchers have proposed that, for any business, employees are one of the most valuable stakeholder groups (Guimaraes and Igbaria, 1992; Thatcher, et al., 2002; Ferratt, et al., 2005). Thus, employee orientation by an organization contributes more to corporate financial performance and growth than orientation towards any other individual primary stakeholder group, including customers, communities, suppliers, and shareholders. There can be several behavioral aspects for employee engagement; however, one of the most crucial is retention of employees. Employee attrition can be severely expensive for an organization. When an employee voluntary quits, it affects human capital investment; subsequent replacement of a given employee leads to multi-fold costs for the organization (Bairi, et al., 2011; Wang, et al., 2011). These replacement costs include, but are not limited to, searching for an appropriate replacement, sourcing and selection, hiring, training, and consideration of the time spent before a replacement starts performing. Many researchers argue that high employee attrition rates may have negative effects on the profitability of organizations, if not managed properly (Sumbal, et al., 2020).

2.5. Six stressors causing technostress

Based on different studies on causes of technostress, six stressors were selected and included in this study. they have been found to be the most prominent of many stressors (Tarafdar, et al., 2010; Fuglseth and Sorebo, 2014; Srivastava, et al., 2015). These stressors are:

- **work overload** — a perception that required work is beyond an individual’s capability to manage or deliver in a timely fashion, due to a lack of skills (Moore, 2000)
- **techno-complexity** — a form of complexity that arises due to the usage of ICTs
- **techno-uncertainty** — an uncertainty or unpredictability that arises due to innovations supported by technologies
- **role conflict** — perceived conflict between a given job description for which an individual and the actual responsibilities (Suh and Lee, 2017)
- **invasion of privacy** — the level of individual privacy compromised
- **job insecurity** — perception by an individual of a potential loss of employment (Miyazaki, et al., 2012)

For statistical tests and inferential modelling, these stressors were quantified, based on a questionnaire. In the first section of the questionnaire, there were six sub-sections, one for each stressor. Based on the average score of five individual questions in each subsection, these stressors were quantified to develop inferential models as independent variables.

3. Theory and development of hypotheses

The study investigates the employee engagement behavior within an organization during the COVID-19 pandemic, examining the role of technostress on employee attrition. This work extends a model, illustrated in Figure 2, based on a case study. The model is tested based on inputs from employees of an organization. Hypotheses are developed in this section.
3.1. Objectives

How does ICT based interaction for organizational deliverables affect employee engagement/disengagement, as reflected in employee attrition during a pandemic? To address this objective, we investigated the following research questions:

1. What is the impact of technostress on employees in the IT and ITeS sector in India?
2. How does technostress affect employee attrition?
3. How can antecedents of technostress be prioritized based on their impact on employee attrition?

3.2. Research methodology

To answer these questions, the investigation and analysis was performed with a combination of statistical tests and an inferential statistical model. For testing the hypotheses using statistical tests, the full-time employees of an IT company were segregated into two groups, a treatment group and a control group. A survey was administered to both groups. Based on an analysis of the survey, this study tested the relationship between resignation and technostress. The behavior between these two groups was compared using statistical tests to identify factors resulting in employee attrition.

Multiple supervised models were developed and tested from which a model with superior evaluation metrics was chosen.

The overall methodology is illustrated in Figure 3:
3.3. Hypotheses

**Work overload**: When an employee perceives demands to be unmanageable with available time and skills, it can turn into work overload. With advancements in ICT usage, increases in communication flow can result in increased productivity expectations (Miyazaki, *et al.*, 2012). The scenario where an employee is working under time pressure to meet strict timelines has been demonstrated as one of the primary sources of work overload.

Hypothesis one (H1): Overuse of ICTs has a positive effect on work overload in the treatment group as compared to the control group.

**Techno-complexity**: With advancements in technology, routines are disrupted for employees. Tasks and processes are changed with automation and innovation, adding complexity for employees. Complexity and less available time place unnecessary pressure, forcing employees to upgrade their skills related to ICTs (Tarafdar, *et al.*, 2010). Techno-complexity can have additional perceived challenges, including added burden on employees, increased operational costs, reduced productivity, and unhealthy competition between employees.

Hypothesis two (H2): Overuse of ICTs has a positive effect on techno-complexity in the treatment group as compared to the control group.

**Techno-uncertainty**: Techno-uncertainty relates to short life cycles of computer systems and applications. Continuing changes and upgrades do not provide sufficient time to acquire experiences with a particular system. Techno-uncertainty is sometimes compared to role ambiguity as both result in a perceived ambiguity about objectives and expectations, in turn resulting in stress (Tarafdar, *et al.*, 2010). Techno-uncertainty is one of the basic causes of instability, primarily because of the evolving nature of processes.
and the resulting nature of work due to the constant introduction of new technologies (Sumbal, et al., 2020).

Hypothesis three (H3): Overuse of ICTs has a positive effect on techno-uncertainty in the treatment group as compared to the control group.

**Role conflict:** Role conflict relates to the mismatch or incompatibility between a job or position of an employee and demands placed on that employee in terms of assigned tasks (Fuglseth and Søarbø, 2014). According to the American Psychological Association (https://dictionary.apa.org/role-conflict), role conflict “is a state of tension or distress caused by inconsistent or discordant expectations associated with one’s social or group role, as when a single rolee’s demands are inconsistent with each other (intra role conflict) or when individuals occupy more than one role and the behaviors required by these roles are incompatible (inter role conflict)”. There is a positive correlation between role conflict and technostress.

Hypothesis four (H4): Overuse of ICTs has a positive effect on role conflict in the treatment group as compared to the control group.

**Invasion of privacy:** Invasion of privacy, sometimes known as techno-invasion, occurs when demands are put on employees outside working hours. These demands translate into work at home, causing conflicts with family activities and priorities (Tarafdar, et al., 2010). Depending on the organization, a job might involve using a specific information system tool which could be accessed from anywhere using a smartphone, leading to work at any hour or at any location (Ayyagari, et al., 2011).

Hypothesis five (H5): Overuse of ICTs has a positive effect on invasion of privacy in the treatment group as compared to the control group.

**Job insecurity:** Due to the high usage and need of ICTs, job insecurity can arise where a particular employee feels threatened about losing a position in an organization to others with a better understanding about new technologies (Senivongse, et al., 2019). This condition arises where ICT users feel threatened and has a significant negative impact on work performance, positively correlated with technostress (Ahmad and Huvila, 2019).

Hypothesis six (H6): Overuse of ICTs has a positive effect on job insecurity in the treatment group as compared to the control group.

### 3.4. Data collection

This study was conducted with primary data collection from a multinational IT company with offices in India. It is a ‘digital product engineering services’ company founded in 2000 with headquarters in San Jose, Calif. It has over 16,000 employees worldwide out of which over 12,000 are based in the Indian offices. Data was collected using an online survey. Validated scales from existing literature were adapted to this research to formulate a questionnaire which was used for data collection. A five-point Likert scale was used for the questions. For sampling, a stratified sampling technique was used where two separate set of employees were examined; a control group with those employees working in the organization, and a treatment group with those employees who have resigned and are serving a notice period in the company (Trost, 1986). With the help of the HR department, the questionnaire was administered amongst employees who regularly used ICTs to accomplish their professional tasks within these two groups. The total responses received were 112. There were 61 valid responses for the control group and 51 valid responses for the treatment group. One senior leader also completed the survey which was discarded as it was identified as an outlier. Thus, for the control group there were 60 accepted responses. With this sample size, the current study implements a non-parametric statistical test to reduce bias or errors in analysis.

### 3.5. Data analysis

After the survey, data was prepared. Data cleaning was performed for fields like ‘gender’ and ‘family type’. Data consistency was checked for all fields. Once completed, exploratory data analysis provided
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clues to data distribution and visual relationships.

Based on scores given to every question, an average score for each construct was calculated for every employee. Once this was done for both groups, a non-parametric test (Oh, et al., 2011), was run to check if there was a statistically significant difference between these two groups.

For the inferential statistical model, multiple supervised algorithms were trained and tested (Ghimire, et al., 2010; Chen, et al., 2011; Timsina, et al., 2015; Tsangaratos, et al., 2016; Kumar, et al., 2018). Best performance and outcome have been achieved using Support vector machine classifier. The comparison between different algorithms is given in Appendix A. For hyperparameter tuning of the algorithm, the GridSearchCV function from the model_selection method of the sklearn library of Python was used after feature scaling (Shuai, et al., 2018). The best parameter set was obtained. All the grid scores based on cross validation using GridSearchCV are given in Appendix B.

The model can be represented based on the following functional relationship:

Resignation = \( f(\text{work overload}, \text{techno-complexity}, \text{techno-uncertainty}, \text{role conflict}, \text{invasion of privacy}, \text{job insecurity}, \text{gender}, \text{age}, \text{tenure with the company}, \text{marital status}) \), where the four variables — gender, age, tenure with the company, and marital status were used as control variables.

Python programming was used for hypothesis testing at .05 significance level and inferential model analysis.

4. Findings

A detailed analysis was completed on all surveyed employees, to understand overall trends, mix, and distribution. As a first step, exploratory data analysis was performed on all employee data before moving to an analysis of respondents’ data.

4.1. Exploratory data analysis

To understand the attrition rate, exploratory data analysis was performed. Out of over 12,000 employees, 3,840 employees left. The relative attrition is higher in India as out of the 3,840 employees who left, 60 percent were based in the Indian offices.

Looking at the overall experience and average tenure of employees between the two groups, employees who left had significantly low overall experience and less tenure with the organization. The average experience of employees in the control group, those who continued to work for the company, was 15 years. The average experience of employees in the treatment group, employees in the notice period, was 12 years. Tenure for employees in the control group was 11 years, whereas, the average tenure for employees in the treatment group was nine years.

Looking at attrition seasonality by month, maximum employees leave occurred during July-August timeframe after getting an annual appraisal, supporting assumptions of HR in the organization.
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4.2. Demographic profiles for respondents

For respondents from the control and treatment groups, demographic variables were analyzed. In the questionnaire, a section was dedicated for collecting this information; gender, age, tenure with the company, and marital status. These variables were important because of factors included in the study. These are shown in Table 1. Out of the total 111 respondents, 81 of the respondents (73 percent) were males and only 30 (27 percent) were females. Fifty-one percent of the respondents were below 30 years old, 51 percent between 30 and 40 years old, and only eight percent above 40 years old. Fifty-one percent of the respondents were married, 32 percent single, and seven percent did not disclose their status. Four groups were recognized for tenure with the company; there were 23 percent of employees who had spent less than a year, 38 percent between one and three years, 22 percent between three and five years, and 18 percent spent more than five years with the company. These details are captured in Table 1.

Figure 4: Employee attrition by month.
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4.3. Hypothesis testing

For sample data not following normal distribution, where variance in the two groups is unequal, the Mann-Whitney \( U \) test is one of the best choices as a non-parametric test (Zimmerman, 2014; Ghobadi, et al., 2017). For the six hypotheses formulated for this study, implementing the Mann-Whitney \( U \) test on all six constructs at the five percent significance level provided the following results:

For **work overload**, the statistics were equal to 596.5 with the \( p \) value being less than the significance level; the null hypothesis can be rejected. For **techno-complexity**, the \( p \) value was 0.090, failing to reject the null hypothesis. For **techno-uncertainty**, the null hypothesis was rejected because the statistic is 1161 and \( p \) value was less than the significance level. For **role conflict**, the \( p \) value was .000, less than the significance level; the null hypothesis can be rejected. For the last two factors, **privacy/work-life imbalance** and **job insecurity**, the \( p \) value was less than the significance level with test values equal to 494.5 and 516 respectively and thus the null hypothesis can be rejected.

The result of the test indicate that five factors show a significant difference between the control group and treatment group. Thus, these factors contribute in technostress due to ICT usage, leading to employee attrition. **Table 2** summarizes the outcome of the tests.

<table>
<thead>
<tr>
<th>Demographic Data Analysis</th>
<th>Control Group</th>
<th>Treatment Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percentage</td>
<td>Count</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
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<td>68%</td>
<td>40</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>32%</td>
<td>11</td>
</tr>
<tr>
<td><strong>Age (Years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 30</td>
<td>32</td>
<td>53%</td>
<td>25</td>
</tr>
<tr>
<td>30 to 40</td>
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<td>45%</td>
<td>18</td>
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<td>More than 40</td>
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<td>2%</td>
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<tr>
<td><strong>Tenure with the company</strong></td>
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<td></td>
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</tr>
<tr>
<td>Less than one year</td>
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<td>20%</td>
<td>13</td>
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<tr>
<td>One to three years</td>
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<td>37%</td>
<td>20</td>
</tr>
<tr>
<td>Three to five years</td>
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<td>30%</td>
<td>6</td>
</tr>
<tr>
<td>More than five years</td>
<td>8</td>
<td>13%</td>
<td>12</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
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<td>Married</td>
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<td>47%</td>
<td>29</td>
</tr>
<tr>
<td>Single</td>
<td>32</td>
<td>53%</td>
<td>15</td>
</tr>
<tr>
<td>Undisclosed</td>
<td>0</td>
<td>0%</td>
<td>7</td>
</tr>
</tbody>
</table>

**Table 1:** Demographic details of respondents.
Table 2: Consolidated results of Mann-Whitney $U$ test for all constructs.

As the hypotheses for $H01$, and $H03$ through $H06$ have been rejected based on Mann-Whitney $U$ test, we can infer that for these constructs there was a significant difference for the treatment group. These factors influenced decisions by employees to leave the organization to some extent due to technostress in the course of the pandemic.

4.4. Inferential modeling

A value of ‘yes’ (1) and ‘no’ (0) was assigned to the dependent variable for treatment group and control group respectively, depending upon whether an employee resigned or not. As shown in exploratory data analysis, the proportion of values in the control variable was well balanced between the treatment and control groups and did not result in any bias. After training multiple algorithms on 75 percent randomly selected training data in multiple iterations, the support vector machine classifier resulted in best evaluation and performance metrics with test accuracy of 89 percent, recall as 100 percent, precision of 80 percent, and area under the curve (AUC) equal to 0.9 which is 90 percent of the maximum possible value on test and validation data (Hodge and Pollack, 1962; Sokolova and Lapalme, 2009). Thesr scores are above the recommended and accepted thresholds (Choi and Lee, 2017; Johnson and Khoshgoftaar, 2020). A nonlinear boundary as classifier has been modelled, illustrated in Figure 5.
The confusion matrix shown in Figure 6, is based on test data with 27 rows of data kept for testing and validating the model. There were no true negatives due to which the recall is 100 percent. With three false positives, precision is at 80 percent. With accuracy of almost 90 percent and well-balanced precision and recall, this model proves to be a valid, supporting the hypothesis tested above (Sokolova and Lapalme, 2009).
It can be trained further with more data and can be used by managers in some organizations to predict the probability of an employee voluntarily resigning, based on inputs such as indicators of technostress. By focusing on employees with a high risk of resigning and taking appropriate corrective measures, attrition could be reduced.

**Figure 6** shows the ROC curve with 0.9 AUC, 90 percent of the maximum possible value of 1, supporting the earlier arguments and inferences (McClish, 1989).
5. Discussion

In a pandemic, companies are forced to make arrangements for their employees to work from home for a long periods of time, ranging from weeks to months. The usage of ICTs increases dramatically for all employees in order to accomplish day-to-day tasks (Ayyagari, et al., 2011). The role and effects of technostress becomes more evident in these situations, leading to amplified outcomes.

Figure 7: ROC curve and area under the curve.
The findings in this study indicate that technostress due to ICT usage in some IT companies is due to multiple factors, eventually increasing employee attrition. Using the Mann-Whitney $U$ test, there was a statistically significant difference for five out of six factors in this study, between employees from control and treatment groups. With a model, accuracy was close to 90 percent, with a clear boundary between the two groups based on the selected features. It clearly supports hypotheses, providing another way of examining the relationship between technostress and employee attrition. With evaluation metrics showing very high and accurate predictions, true negative and true positive percentage being close to each other, the model was well balanced for both classes.

Looking at the factors in this study leading to employee attrition, it is important for organization to formulate strategies as preventive measures, so that the employees are well equipped to manage work during a pandemic. Organizations can work towards absorptive capacity in order to better utilize ICT usage for the benefit and growth of employees and business (Senivongse, et al., 2019). This study and findings has research and managerial implications, briefly explained below.

5.1. Theoretical implications

Very little was known about the direct relationship between technostress and its effects on business outcomes and performance during a pandemic. This study attempts to fill that gap in a preliminary fashion with an examination of one organization and a sample of its employees (Bairi, et al., 2011; Barnes, 2012).

This study will encourage further research with multiple organizations in other locales. Multiple theoretical models can be built using this study, connecting factors leading to technostress and its consequences. These future studies will validate the accuracy of the findings in this work.

5.2. Managerial implications

The primary implication of this research for managers is to implement strategies for creating opportunities to reduce technostress and ultimately employee attrition. Factors identified in this work could be utilized by managers to correct sources of stress for employees in their organizations that may lead to employee attrition. The model in this study can be refined with additional data to develop greater accuracy and control over employee attrition.

Attrition is one of the biggest challenges facing companies (Li, et al., 2020). Every organization uses a variety of techniques to reduce attrition, as there are multiple factors that contribute to attrition. If managers know about specific factors causing technostress and employee attrition, organizations can continuously evaluate levels of ICT usage to reduce employee attrition. By taking appropriate precautionary measures, organizations can create a balance which will help them in reducing attrition rates.

6. Conclusion

The findings of this study will be used by practitioners in order to implement changes in organizations to reduce technostress and attrition. At the same time, these results will be a basis for further research on technostress and attrition in certain organizations. There is certainly a need for organizational attention into the exact causes of technostress. The unique situations of a pandemic have highlighted the technological demands on employees in new contexts. It is crucial for organizations to efficiently and effectively equip employees with tools to positively manage technostress while using technologies judiciously and efficiently.
How does technostress during a pandemic affect employee attrition in IT/ITeS industries? Insights from India

About the authors

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Appendix A: Comparison of scores between multiple models

<table>
<thead>
<tr>
<th>Classifier</th>
<th>Accuracy</th>
<th>Precision</th>
<th>Recall</th>
<th>AUC_Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Vector Machine</td>
<td>0.893786</td>
<td>0.803643</td>
<td>1</td>
<td>0.901146</td>
</tr>
<tr>
<td>Random Forest Classifier</td>
<td>0.838125</td>
<td>0.800095</td>
<td>0.957659</td>
<td>0.810753</td>
</tr>
<tr>
<td>Linear Discriminant Analysis</td>
<td>0.784421</td>
<td>0.796381</td>
<td>0.865652</td>
<td>0.751612</td>
</tr>
<tr>
<td>Logistic Regression</td>
<td>0.763312</td>
<td>0.782239</td>
<td>0.845463</td>
<td>0.732214</td>
</tr>
<tr>
<td>Decision Tree Classifier</td>
<td>0.760156</td>
<td>0.785697</td>
<td>0.830175</td>
<td>0.730391</td>
</tr>
<tr>
<td>K Neighbors Classifier</td>
<td>0.714367</td>
<td>0.732992</td>
<td>0.810221</td>
<td>0.708300</td>
</tr>
<tr>
<td>Gaussian Naive Bayes Classifier</td>
<td>0.692081</td>
<td>0.683289</td>
<td>0.847720</td>
<td>0.588224</td>
</tr>
</tbody>
</table>

Appendix B: Grid scores for cross validation based on GridSearchCV

Grid scores on development set:

- 0.259 (+/- 0.014) for {'C': 1, 'gamma': 0.001, 'kernel': 'rbf'}
- 0.259 (+/- 0.014) for {'C': 1, 'gamma': 0.0001, 'kernel': 'rbf'}
- 0.818 (+/- 0.332) for {'C': 10, 'gamma': 0.001, 'kernel': 'rbf'}
- 0.259 (+/- 0.014) for {'C': 10, 'gamma': 0.0001, 'kernel': 'rbf'}
- 0.836 (+/- 0.211) for {'C': 100, 'gamma': 0.001, 'kernel': 'rbf'}
- 0.818 (+/- 0.332) for {'C': 100, 'gamma': 0.0001, 'kernel': 'rbf'}
- 0.777 (+/- 0.350) for {'C': 100, 'gamma': 0.001, 'kernel': 'rbf'}
- 0.836 (+/- 0.211) for {'C': 1000, 'gamma': 0.0001, 'kernel': 'rbf'}
- 0.777 (+/- 0.350) for {'C': 1, 'kernel': 'linear'}
- 0.776 (+/- 0.352) for {'C': 10, 'kernel': 'linear'}
- 0.791 (+/- 0.312) for {'C': 100, 'kernel': 'linear'}
- 0.803 (+/- 0.284) for {'C': 1000, 'kernel': 'linear'}
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